

The Engineering and Mining Journal

VOL. LXXXVI.

NEW YORK, SEPTEMBER 26, 1908.

NO. 13.

Mercury Mines at Koniah, Asia Minor

Ancient Workings Discovered after Probably 3000 Years on Deposits of Cinnabar Ore Now Being Opened and Prepared for Operation

BY FREDERICK F. SHARPLESS*

A short article in the JOURNAL of August 11 recalls an extremely interesting investigation that I made in Asia Minor during the spring of 1905, in company with the Whittall Bros., of Constantinople

now known as Koniah, the Koniah Mercury Syndicate, Ltd., is opening and operating a cinnabar deposit of considerable promise. The cinnabar occurs in veinlets, nodules and small particles in a crystal-

gesting that the quartz and mercury had a common origin or were deposited at about the same time.

While there are a few nodules and rich veinlets of several inches in width, the



DUMPS, KONIAH MINE



SURFACE FORMATION, KONIAH MINE



KARABOURNOU MERCURY MINE NEAR SMYRNA



LOOKING EAST FROM KONIAH MINE

and Capt. Thos. Jenkins of Redruth, Cornwall.

About 400 miles by rail southeast of Constantinople, in the department of Koniah, near the old city of Iconium,

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line limestone close to a talcose-schist contact at no great distance from old eruptives. The occurrence of the mineral is not uniform throughout the limestone; it appears to be present only where, or near where, the limestone is much silicified or entirely replaced by quartz, sug-

greater part of the workable deposit consists of the silicious limestone seamed and veined with the little stringers of the sulphide, the whole assaying from 1 to 2½ per cent. mercury. One considerable body was found associated with stibnite; this carried about 8 per cent. of mercury.

Quartz croppings and float occur at numerous points near that where work is now being prosecuted. All of this quartz contains visible cinnabar, but little is of a grade to be treated profitably. Scattered over a considerable area, however, it suggested, at the time the writer's examination was made, that where the quartz penetrates the limestone other workable deposits would be found. Subsequent developments have proved this to be the case.

a limestone cave within a short distance of one of the buried cities of the Holy Land. Night after night they were taken there for protection. One night a refractory goat refused to enter the portal, and the goatherd, picking up a stone to discipline the offending animal, noticed that it was heavy and dark red in color, different from other stones around there. Laying it aside, he one day broke it open between two large stones and saw that it was a beautiful rose color on the inside.

stantinople, and he too, thinking the stones were curious, sent them on to the seaport, to his principals when making a shipment of wool.

One of the Messrs. Whittall is a graduate of the Royal School of Mines, and as soon as the stones fell into his hands he recognized them as high-grade cinnabar. Knowing that mercury had been found at several points in Asia Minor, Hugh Whittall, the engineer, decided that when convenient he would visit the lo-



WATERING TROUGH, KONIAH ROAD



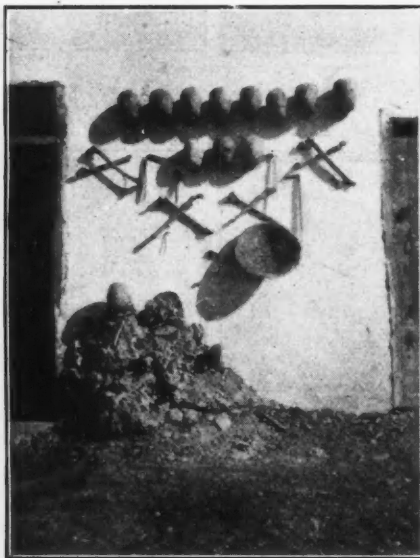
ENTRANCE OF ANCIENT CARAVANSARY



VIEW IN NEIGHBORHOOD OF KONIAH



MERCURY MINE NEAR SMYRNA



KILLED BY CAVE-IN 3000 YEARS AGO



KARABOURNOU MINE

OLDEST MERCURY MINE

This property is probably one of the earliest mercury mines to have been worked, though the date of its early operations is not exactly known. In this connection its re-discovery and opening are interesting.

About four years ago a goatherd who kept his flocks on the almost barren hills near Koniah, corralled them at night in

With curiosity aroused he went to an arroya below the cave to look for other similar stones; he found one more but that was all.

After his next clip was made, he went on his annual trip to Koniah to dispose of it, taking these two peculiar stones with him. The wool and the stones fell into the hands of a local merchant acting for the Whittall Bros., exporters of Con-

cality. In the course of time he made the trip. With the assistance of the local agent in Koniah the goatherd was found, also the cave where the goats were kept and the ravine below it, but nothing that in any way resembled cinnabar.

The cave had the appearance of any limestone cave with sides worn smooth and the bottom covered with the dirt of centuries. The search for cinnabar

was about given up when Mr. Whittall began to disfigure one of the walls with his sample pick. An incrustation was broken off and a tiny veinlet of something pink was seen; picking through the incrustation in various places, the same conditions were found to exist in several places. In short, the whole bed of limestone appeared to be impregnated with small seams and veinlets of cinnabar, and what had appeared to be an ordinary limestone cave resolved itself into something looking like an old mine. The property was denounced for mining purposes and instructions given for cleaning out the dirt.

WORKINGS 3000 YEARS OLD

When the work was started, the opening was about 15 ft. wide and it extended 50 ft. into the hill, with the roof about 10 ft. above the floor. When completely cleaned out it was found to extend a little more than 100 ft., dipping with the limestone beds at an angle of about 10 deg. from the horizontal; everywhere that the silicified limestone appeared there too was cinnabar found. When the cleaning had been done it was decided to put down a winze in the floor of the deposit to see what thickness the impregnated beds might have. The winze was started and at 6 ft. it broke into a second chamber, almost under the first, parallel with it, and of about the same dimensions except that it was nearly 250 ft. long.

If it was a surprise to find that the first cave was a mine, a greater surprise was in store in the second case. Entering through the opening in the bottom of the winze, a weird sight met the eyes of the miners. Scattered over the floor of the chamber, in all conceivable positions, were seen the remains of more than 50 human skeletons. Many of the bones were imbedded in the secondary deposit of lime on the floor. There were great quantities of stone hammers, several pottery lamps, a fair amount of charcoal, several rubbing stones and some flint arrow heads.

PRIMITIVE METHODS

Mining had apparently been done by firing the barren rock, by breaking the softer portion with hammers and by gouging where there were rich seams of cinnabar. Deep grooves followed all high-grade streaks, but the tools for this work were gone.

Working out to the surface, following the floor of the second chamber, 40 or 50 ft. of caved ground was penetrated, suggesting that the miners had been entombed by a fall of rock around the portal of the opening.

Some time before this discovery, Sir W. Ramsay, the well known English archeologist, had unearthed a tablet in a neighboring buried city. This tablet was dedicated to the Phrygian goddess of the

mines, Zizima. The Phrygians inhabited this part of Asia Minor 1500 years B. C., and it is quite possible that the deposit was worked as long as 3000 years ago.

There is no positive evidence connecting the tablet with the mercury deposit, but on the other hand, nothing else has been found resembling a mine. The thick deposit of lime on the floor and walls of the openings, in such an arid country as this, is positive proof that the bones have been lying there a very long time, and the probability is that the deposit was a flourishing paint mine many centuries before the birth of Christ.

The Cananea Consolidated Copper Company

SPECIAL CORRESPONDENCE

The copper production during the last week or two is satisfactory in amount, averaging about 50 tons per day. An old stack has recently been taken down back of the converters and put up at the reverberatory furnace, and the necessary connections made so that now the heat from the reverberatory that has been going to waste is being used under some extra boilers, producing steam for the main power house. The fuel oil in the reverberatory continues to give good satisfaction. The new method of feeding the blast furnaces dropping the ore directly into them through chutes from the small steel bins is a perfect success, not having given the slightest trouble. The ore charge coming from the spreading beds, where it has been carefully laid down in proper mixture, is very uniform, and consequently smelts well. The success of the reclaiming machines, which are of an entirely new design, and being tried here for the first time, is being watched with interest all over the country. These machines, with a few small changes, are working well now, and without a doubt the entire bedding-plant system, taking the ore from the railroad cars, through the sampling mill, onto the beds, reclaiming it and conveying it to the bins above the furnaces, is a success from start to finish. The amount of work the reclaimers are capable of doing is highly satisfactory, one machine being able to handle 3000 tons of ore daily with one white man and a Mexican helper on a shift.

There are four McDougal roasters being put into readiness to operate within the next few days. A portion of the fine concentrates will be treated in these roasters and from them sent directly to the reverberatory instead of as at present being put on the spreading beds.

Nothing has been heard about increasing the copper production by blowing in any additional furnaces within the near future. The force of men over the entire plant changes very little, few new men being hired except to replace those who leave.

The Anti-Smelter Fight in California

SPECIAL CORRESPONDENCE

The Anti-Smelter Association, of Alameda county, which is on the opposite shore of San Francisco bay from the site of the proposed Selby smelter at Baden, is actively engaged in getting alleged facts which may prevent the completion of any smelter on San Francisco bay. The committee on information of this association has made a report in which it makes certain allegations as to what would happen in San Francisco if the smelters were put in operation.

"San Francisco lies within a ten-mile radius of the place where the smelter is to be built. According to the weather bureau, the wind during two months of the year blows from the smelter toward the city, five months of the year the prevailing wind is toward the east. In other words, for one-sixth of the time, the San Francisco peninsula would be getting the maximum destruction from the fumes, while for the balance of the year, although the damage would be lessened on account of the direction of the wind, as shown at other smelters, the danger would still be great.

"The smelter at Baden is to have a capacity of about 5000 tons of ore in 24 hours. There would be discharged into the atmosphere from this smelter every 24 hours about 1,250,000 cu.ft. of fumes containing 1500 tons of sulphur dioxide and 28 tons of arsenic trioxide. In one year there would be spread over the neighboring country over 10,000 tons of arsenic trioxide.

"The smelter at Baden would probably give employment to many men; it would create about it quite a town; would increase the shipping in and out of the port; would raise the value of the land in its proximity. Operated as they have been, what smelters have done in the past they will do in the future, and we cannot but feel that the good accomplished by the location of the smelter at this point would be far outweighed by the harm that would be done, including the disastrous action upon cemeteries, gardens, parks and the state of the public health."

This extract from the report is given merely to show what sort of opinion the smelter people have to combat in preventing adverse municipal legislation. All sorts of exaggerated statements are made public and placed before official bodies, who have no technical knowledge on the subject of smelter fumes. It becomes very difficult to overcome prejudice inculcated by loose and inaccurate statements. Of course the smelting company will bring in expert testimony to combat erroneous statements, but it is up-hill work to get official bodies to vote in opposition to public sentiment.

Disposal of Gases at Selby, California

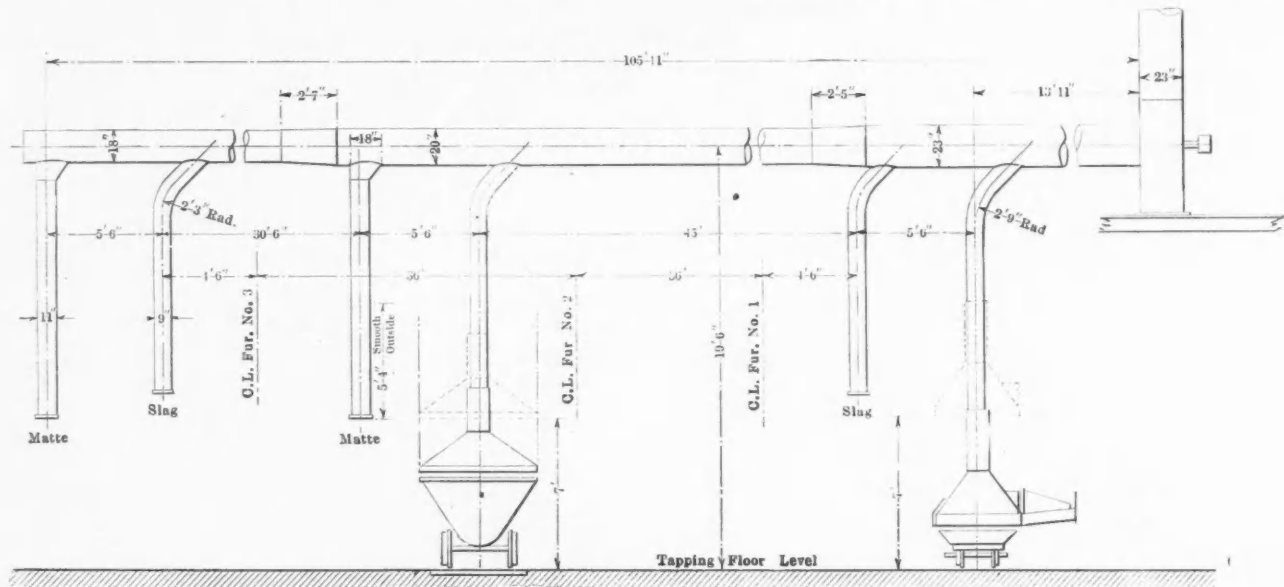
BY JAMES C. BENNETT.*

Owing to the direction of the prevailing winds during a large part of the rainy season, the Selby Smelting and Lead Company found it necessary to make provision for clearing both the feeding and tapping floors of the smoke that escaped where the molten matte and slag were exposed to the air. The first attempt was to use natural draft from chimneys, erected at the front of each furnace and leading directly upward to a point above the ridge of the roof, where they discharged into the open air. While this arrangement gave fairly good results, so far as the furnace spouts were concerned, it did not carry away the smoke liberated where the slag discharged from the settlers into the pots, and where the matte was tapped out

away, to be replaced by empties. Those over the matte pans are left down so long as the matte is flowing, and until the tap hole has been plugged. The hood is then raised and is thus kept entirely out of the way until the next tapping, when it is lowered immediately after the flow of matte has started. Each hood is equipped with a counterweight, about 15 ft. distant, and is thus always convenient to reach, but never in the way of any movements about the furnaces. As shown in the accompanying drawing, the distance from the ground level to the lowest point of each hood, when raised to its extreme position, is 7 ft. This height, in addition to affording clear head-room, permits the free handling of the long furnace bars. A detail which was considered, but not incorporated, was the equipping of each branch pipe with a valve or damper which should be automatically opened or closed with the lowering or raising of the hood. This could have been effected by a very

the power consumption, it is computed to be 6.6 h.p. The fan and motor are installed in a small inclosure erected for the purpose on the shed-roof extension to the main blast-furnace building. This affords a direct and straight line of pipe, in front of the furnaces, and approximately on the level of the charging floor, from the fan to the opposite end of the building; and yet the fan and motor are easily reached for daily inspection by a runway extending out from the feeding floor. The discharge pipe is led as nearly vertical as local conditions permit, from the fan to a point 3 or 4 ft. above the highest point of the roof.

This method of clearing the furnace building of smoke has been successful from the start, and requires no further attention than oiling once a day. In view of the simple, cheap and effective nature of this plan, I have often thought that the not uncommon cases of lead-poisoning among blast-furnace workmen could be



ARRANGEMENT OF EXHAUST PIPES AND HOODS AT SELBY, CAL.

into the matte pans.¹ It was finally decided to install an exhaust fan, and to carry branch pipes to each of the points where the gases issued, thus collecting the smoke where it originated instead of permitting it to become diffused in the atmosphere of the building; when so diffused it would be impossible to remove it by artificial means, owing to the open sides. In addition to the two branches for each furnace, provision was made for fitting a pipe over the furnace spout; but this was never installed because it was found that, with the other points cared for, the chimneys were able to remove the smoke liberated at those points.

OPERATION OF THE SYSTEM

In operation, the hoods over the slag pots are raised when the pots are hauled

simple arrangement and would have reduced the power consumption by 40 or 50 percent, since it is seldom that more than three hoods are in use simultaneously. The small cover over the matte spout is not connected with the main hood, as the construction of the settler would interfere with its vertical movement. A snout projects from the slag-pot hood over the spout of the settler, and is permanently attached to the main hood. That part of the main pipe which is 18 in. in diameter is somewhat larger than necessary, but advantage was taken of some old pipe of that size on hand.

The fan is designated by its manufacturer as a "Sixty-inch planing mill exhaustor." It is driven by a 10-h.p. induction motor, at 702 r.p.m., at which speed it delivers 6778 cu. ft. of air per minute, at a pressure of 2.89 oz. per sq. in., equivalent to 5 in. of water. Although no measurements have been made to determine

largely eliminated. This would insure better attention to the operation of the furnaces, and better general health of the men, both of which are equally valuable to the management.

Gold Production in Western Australia

The August production of gold from West Australian mines is reported at 136,688 oz. fine, which is 3264 oz. more than in July, but 2454 oz. less than in August, 1907. For the eight months ended Aug. 31 the total was 1,105,952 oz. fine in 1907, and 1,097,131 oz.—or \$22,677,698—in 1908; a decrease of only 8821 oz. The small decrease was due largely to the condition of the large mines of the Kalgurlie district, which are making a better showing, and in most cases compensating the lower grade of the ores by more extensive mining operations.

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¹Eng. and Min. Journ., Feb. 1, 1908, p. 252.

Lead and Zinc Ores in Missouri

The Mining Districts of Southeast and Southwest Missouri. The General Character of the Ores. Methods and Costs of Mining

B Y J. R. F I N L A Y *

Missouri is second in the list of States in the production of lead ores, and first in that of zinc ore. The mining is confined to two districts, the Southeast and the Southwest. The Southeast district produces ores from which, in round numbers, 100,000 tons of pig lead are smelted yearly; from the ores of the Southwest—or Joplin—field the product is 25,000 tons of lead and 140,000 tons of spelter.

In both fields the external conditions are favorable. Mining is conducted in the midst of the great agricultural regions of the Mississippi valley, where the cost of living is low, labor abundant, fuel and transportation cheap and markets close at hand. The internal factors also are favorable to low costs. The depths reached are not great, the orebodies are fairly large. In southeast Missouri the orebodies are persistent, though somewhat irregular, while those of the Joplin field are not only irregular but non-persistent. In both districts, however, exploration by drilling provides against underground perplexities. In both fields also, the ores are favorable for water concentration.

In the Southeast district there is, unfortunately, little to be found in the way of reports of mining companies. The following notes are from my own observation, and while I cannot vouch for the accuracy of the figures as representing any particular property, I believe that they may be taken as fairly representing the district as a whole.

SOUTHEAST MISSOURI LEAD

Mining in southeast Missouri is based on orebodies that carry an average of about 5 per cent. in metallic lead, or a little more. The ore is called disseminated from the fact that the galena is often sprinkled through the limestone; although usually most of the lead is confined to rich streaks. The ore concentrates well and can be turned into a 65 to 70 per cent. product, with a saving of 80 per cent. Commercially speaking, therefore, the ore yields about 4 per cent. net lead. Developments have proved that the orebodies are exceedingly persistent and extensive, though they show such irregularities that it requires time to demonstrate this.

The formation lies approximately flat, though grades of from 3 to 10 per cent. are not uncommon. It has, throughout the district, a gentle dip toward the southwest. The ore now being mined occurs in the lower 100³ ft. of the St. Joe lime-

stone, and often at the very bottom of this formation in contact with an underlying sandstone. Occasionally it happens that in the 100 ft. just mentioned, there are successive enrichments making workable orebodies one above the other. In this case more than one level may be necessary. But it is more common to find only one large irregular sheet of ore immediately above the sandstone, so that it can all be worked from one level; although sometimes the ore may shoot up some distance above the general level. The upper orebodies are relatively unimportant.

In the Flat River district proper, these orebodies are arranged in several parallel zones trending N. 50 minutes W. These zones lie in a space about 3½ miles wide from N.E. to S.W., and about 9 miles from N.W. to S.E. It is expected that these zones will be extended materially both to the northwest and to the southeast. I think there is also very good reason to expect that other zones will be developed southwest of those now worked. There are some indications already of three such new zones at the west end of the district.

I do not know why the ore follows this N.W.-S.E. course. I have never been able to see any system of persistent fissuring in that course. Most of the fissures have a course of E.-W. to N.E.-S.W. These fissures have a most obvious relation to the orebodies which often follow them out long distances on either side of the real ore channel.

The sketch, Fig. 1, shows this relation in plan. The ore zone may carry some lead scattered through the rock on both sides of the workable channels, which may be only 5 ft. wide. The fissures are apparently the source of the ore from which it has fed out into the surrounding rocks. The richest ore, therefore, is right at the fissure, and it fades out on either side, so that midway between fissures the ore may be too poor to work.

Fig. 2 is a longitudinal section of the ore zone across the fissures, showing this relation. The ore is workable to a thickness varying from 6 ft. to as much as 100 ft.

EXPLORATIONS IN THE SOUTHEAST DISTRICT

It will be evident from the above that the exploration of these orebodies by the sinking and drifting methods used in Western mines would be difficult and unsatisfactory. To follow the ore underground, it is almost necessary to stope the ore as you go. There is enough ver-

tical irregularity to prevent following the ore successfully by horizontal drifts; and there is enough horizontal irregularity to make it impossible to keep in the channel, unless you are prepared to follow up each turn. If the ore rises you must be prepared to go up after it; if it sinks you must go down after it.

The problem of blocking ore out ahead has resolved itself entirely into diamond drilling from the surface. This varies in difficulty according to the depth. The formation dips slightly toward the southwest, while the surface rises a little in that direction. The southwestern part of the field is, therefore, the deepest part. In the older mines at Flat River, the depth to the sandstone is only 300 to 400 ft. In the newer mines like the Derby (Federal) and the Hoffman (St. Joe) the depth is 500 to 600 ft. In the deepest part, between Leadwood and Irondale, the depth is from 500 to 800 ft. When the depth is not over 550 ft., the drilling is all through very favorable rock; but where it is deeper, the cherty Potosi limestone comes in. This cherty formation is very hard to drill through, and it is best, whenever it is found, to use a churn drill through that formation, and then put in a diamond drill.

The drill is used first to find out in a general way, the position of the ore channel by running a line of holes N.E.-S.W. at intervals of about 200 ft. When lead ore is found that looks worth following up, holes are put in closer in the attempt to follow it in its usual N.E.-S.W. course. If ore is found in considerable amount in 15 or 20 holes, enough is blocked out to justify sinking a shaft. As a general rule it is not found desirable to try to map out the orebody accurately by drilling until some progress has been made in stoping it, and more knowledge gained about its peculiarities.

Owing to the soft nature of the richer ore streaks, the drill cores invariably give an underestimate of the value of the ore. Even where ground is most carefully drilled, the actual mining shows from 20 to 100 per cent. more lead ore than the drilling would indicate. It is very common to have blank holes in the middle of a good orebody through grinding up of the ore streaks. Owing to the irregular shape of the deposit, some poor ground is apt to run into the middle of the space occupied by the ore. For these reasons it often happens that one-half the holes, even in good stoping ground, do not indicate pay ore.

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The cost of drilling for many years went constantly upward, owing to the increased price of diamonds and of labor. Where drilling could be done 10 years ago for 40 to 50c. a ft., in 1907 it cost from \$1 to \$1.25 per ft. In the deeper holes, where the Potosi limestone must be penetrated, the cost probably averages \$1.50 per ft. Perhaps recent events have reduced these costs again.

The above description refers especially to the mines in the vicinity of Flat River only. At Bonne Terre, the orebodies are a little different, in that the longer axis there seems to extend N.E.-S.W., instead of N.W.-S.E. These orebodies are northeast from the ore zones of Flat river. It now seems very probable that a connection will be established between Bonne Terre and the Flat River orebodies.

found that carries 5 per cent. copper, and 2.5 per cent. nickel and cobalt. Everything indicates that there are possibilities of extension in copper mining in that neighborhood. The copper ores have exactly the same structural characteristics as the orebodies above described, except that, instead of pure galena, the ore is mainly sulphides of copper, nickel and cobalt.

PROBLEM OF MINING IN THE SOUTHEAST DISTRICT

The most difficult part of actual mining operations is the preliminary exploration by drilling. This determines the depth to which the shafts must be sunk, and their location. Usually only one level is necessary, but the fact that the ore does not lie exactly flat, makes some provision

from each shaft is about 300 tons a day. This output may be greatly exceeded, however, by the use of electric haulage so as to cover a large area from one opening. Ventilation may be secured by drilling large churn-drill holes from the surface.

The most economical power equipment used in the district is at the plant of the St. Louis Smelting and Refining Company. Here a central steam plant operates a compressor and an electric generating plant. The mill, hoists and pumps are operated by electricity. Electric trams are also used to haul the ore from various shafts to the mill.

The cost of mining, hoisting and pumping is from \$1 to \$1.50 per ton. To this may be added 10c. a ton for drill prospecting, and about 10c. a ton for hauling the ore to the mill. The total cost of ore is, therefore, from \$1.20 to \$1.70 at the mill.

THE PROBLEM OF MILLING THE ORES

The milling practice is now pretty well established. The ore is ground to 9 mm. Everything smaller than 9 mm. is screened out as soon as the ore passes the crusher. When crushed, the ore is screened to various sizes, from 9 to 2 mm., and this product jigged. The tailings from the coarser jigs are all re-ground. The material below 2 mm. is classified and treated on Wilfley tables, as are also the re-ground tailings. Middlings from the tables are also re-ground in Huntington mills and treated on Frue vanners.

The cost of milling in a 1000-ton plant is from 30 to 75c. per ton. The cost of a concentrating mill, together with a power plant for the mines, may be estimated at \$500,000 for 1000 tons capacity. The new plant built by the Federal Lead Company is expected to handle about 2400 tons a day. It is built of steel and concrete, has a large air-compressing and electric plant, and elaborate crushing and sampling arrangements. It cost \$900,000.

THE PROBLEM OF SMELTING THE ORES

Smelting may be considered either on a custom or an operating basis. The ore leaves the mill in the shape of a concentrate carrying 70 per cent. lead and 5 per cent. moisture. Freight to East St. Louis is about \$1.50 per dry ton. This ore may be sold to custom smelters, who will pay for 90 per cent. of the lead at current quotations, and charge from \$6 to \$8 per ton smelting charges. On this basis, the cost of freight and treatment, figures as follows:

	Lead, 4c.	Lead, 5c.	Lead, 6c.
Freight.....	\$1.50	\$1.50	\$1.50
Treatment say.....	7.00	7.00	7.00
Deduction 10 per cent., 140 lb.....	5.60	7.00	8.40
Total.....	\$14.10	\$15.50	\$16.90

On an operating basis the cost is about

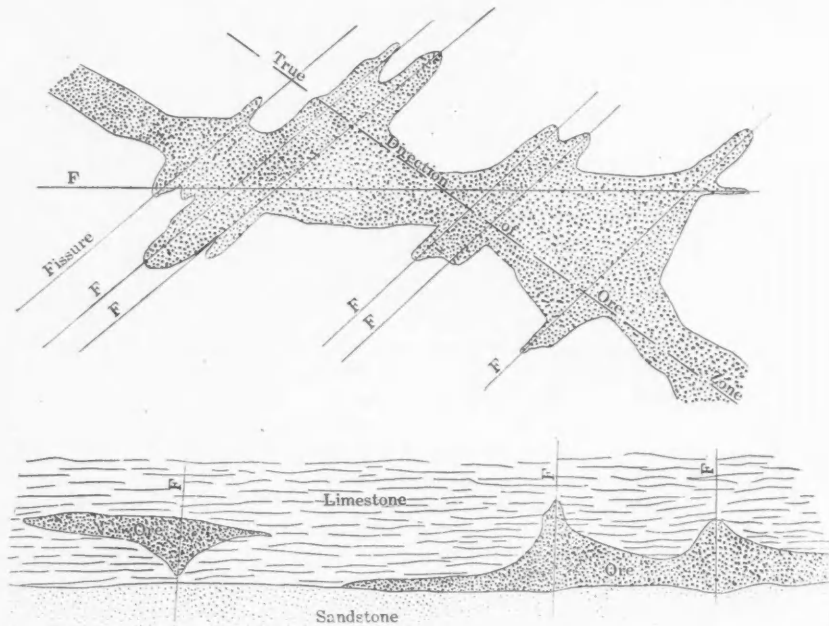


FIG. 1 AND 2. PLAN AND SECTION, SHOWING TREND OF OREBODIES AND FISSURING

EXTENT OF THE DISTRICT

The Flat River district proper, containing developed mines, is a quadrilateral area of about 30 square miles, or 19,000 acres. If we extend the lines so as to take in Bonne Terre and Irondale, we get a triangular area of about 60 square miles, or 38,000 acres. This area is now producing metallic lead at the rate of about 90,000 tons a year. The output doubled between 1901 and 1907.

Outside of this area are a number of other places where ores of the same kind have been mined. At Doe Run, Fredericktown and Mine La Motte, are important occurrences which differ from the above described field only in that they are in shallower basins of limestone, which are interrupted by knobs of pre-existing granite. At Fredericktown, the ores carry, besides lead, copper, nickel and cobalt. At the North American mine at that place, considerable ore has been

for hauling cars up and down hill necessary. This can best be done, I believe, by electric haulage. This has been installed at one of the Federal plants and is very effective. Provision must also be made sometimes for secondary pumping to raise water from depressions that may reach lower than the shaft-pumping station.

The stoping is very simple. No timbers are used. Round pillars of ore are left, containing 10 to 15 per cent. of the ore. It is often possible to leave pillars in the poorer parts of the deposit by laying out the main entries so as to follow the rich ore along the fissures. Underground diamond drilling is necessary in some mines to prospect ahead for water channels. These are open fissures that carry so much water that, if broken into carelessly, they make disastrous gushes. Some shafts are pretty wet, making 1300 to 1500 gal. of water a minute. The usual output

\$6 per ton and the loss, with the best practice, 3 per cent:

	Lead, 4c.	Lead, 5c.	Lead, 6c.
Freight and treatment...	\$7.50	\$7.50	\$7.50
Deductions, 42 lb. lead...	1.68	2.10	2.52
Total.....	\$9.18	\$9.60	\$10.02

On average prices there would be a saving of about \$5.50 per ton of concentrates in operating a smelter. But it must be remembered that the above costs could only be secured by a plant handling a considerable tonnage, say 3000 to 4000 tons a month.

The cost of the whole operation thus far may be figured as follows:

Prospecting.....	\$0.10 to \$0.10
Development by shafts.....	0.15 to 0.15
Mining.....	1.00 to 1.50
Transfer to mill.....	0.10 to 0.10
Milling.....	0.30 to 0.75
General expense.....	0.10 to 0.26
Crude ore cost.....	\$1.75 to \$2.86

The lower of the two sets of figures represents large thick orebodies, comparatively little water, cheap milling, concentration saving not over 75 per cent., and a simple and economical management. The higher figures are based on thin orebodies, a great deal of water, elaborate milling making a saving of 85 per cent., and an expensive management.

Let us follow the two sets of conditions and costs through the smelter to the production of pig lead from various grades of ore; lead being assumed at 5c. a pound.

I. MINING AND MILLING COST, \$1.75. EXTRACTION, 75 PER CENT.

	Yield in Con- centrates, Per Cent.	Smelting Cost.	Total Cost.	Cost Per Pound Lead, Cents.
With 4 per cent. ore	4.3	\$0.41	\$2.16	3.60
With 6 per cent. ore	6.4	0.62	2.37	3.65
With 8 per cent. ore	8.6	0.82	2.57	2.92
With 10 per cent. ore	10.8	1.03	2.78	1.85

II. MINING AND MILLING, \$2.86. EXTRACTION, 85 PER CENT.

With 4 per cent. ore	4.85	\$0.47	\$3.33	4.90
With 6 per cent. ore	7.27	0.70	3.56	3.50
With 8 per cent. ore	9.70	0.94	3.80	2.86
With 10 per cent. ore	12.10	1.17	4.03	2.37

If all costs remain the same, except milling, we should have:

III. TOTAL COST PER POUND LEAD.

	1. Saving 75 Per Cent.	2. Saving 85 Per Cent.
With 4 per cent. ore	3.60	3.95
With 6 per cent. ore	2.65	2.84
With 8 per cent. ore	2.22	2.31
With 10 per cent. ore	1.85	1.98

It appears that on any ore likely to be mined in the Flat River district cheap milling is essential to economy; and that it will not pay to increase costs to the extent of even 45c. a ton in order to obtain 10 per cent. additional recovery.

COST OF PRODUCING LEAD FROM FLAT RIVER DISTRICT

The average cost of producing pig lead for the St. Louis market from this field

seems to be from 3 to 3.25c. per lb. This may be gathered from the records of the St. Joe Lead Company, which has paid more than \$5,700,000 in dividends and built up its property greatly from an output of about 300,000 tons of lead. The cost, of course, fluctuates with the times. It is always possible during periods of depression to produce more cheaply by cutting wages and curtailing construction and development; on the other hand, in boom times wages are raised and people embark in unusual expenditures for expansion and development. As a matter of fact, lead was sold in St. Louis from the Flat River district in the years following the panic of 1893, as low as 2.6c. per lb. without loss; but in the boom period of 1906-7 it is doubtful if any of the mines were producing it for less than 4 cents.

GENERALIZATIONS ON LEAD MINING

On economic grounds we may divide lead ores into three groups: (1) Disseminated sulphide ores that can be concentrated in a high ratio; (2) sulphides from fissure veins, almost invariably carrying silver, often gold and copper, and concentrating in a moderate ratio; (3) carbonates and rich bunches of sulphides which will not concentrate except by hand sorting.

1. In the first class I have given only the ores of Missouri. It is to be observed that the problem of mining here, and the costs, are closely parallel to those of the Lake Superior copper mines. In both cases the costs for mining, milling and smelting will fall between \$2 and \$3 per ton milled. The disseminated lead ores contain about three times as much lead as the Lake Superior ores do of copper, and the price of lead is one-third the price of copper.

2. The examples of the Cœur d'Alene and of Broken Hill in Australia afford a close approximation to the problem of copper mining at Butte. In both cases mining is rather expensive, owing to the requirements of extensive exploration, expensive timbering and filling, and some selection of ores. The proportion smelted is lower in the case of the lead mines, but on the other hand the concentrate is much richer, imposing higher charges for freight and refining of bullion. In the Cœur d'Alene mines a rough average is 6.5 per cent. lead and 3.5 oz. silver. This may be approximated as equal to 174 lb. lead per ton. The Broken Hill ores average 9.9 per cent. lead, 5.5 oz. silver and 0.005 oz. gold, equivalent to 272 lb. lead¹ per short ton. These figures may be compared with the equivalent of 87 lb. copper per ton which I estimate as the average of Butte ores for 13 years.

¹In both cases I assume that when lead is worth 4.6c. per lb., silver is worth 60c. per oz. This is not true outside the United States. In Australia we may calculate on lead being worth only 3.15c., consequently the whole value of the Broken Hill ore expressed in lead there would be 306 pounds.

In the case of the Cœur d'Alene the actual mining, milling and smelting costs I have computed at \$5.70 per ton, and at Broken Hill \$9 per ton, the difference being mainly in the degree of concentration. The cost of lead is about the same in both places. Here again we note that the lead occurs in the ores in about three times the quantity of copper in Butte ores, costs one-third as much, and sells for less than one-third the price.

3. I have given no clean-cut example of the third class of lead ores. Park City serves as a partial example. The mines of Tintic, Utah; Eureka, Nevada; Sta. Eulalia, in Mexico; Leadville and Aspen, Colo., and many others belong to this type. Undoubtedly the costs are high. Hand-picked ores in the Cœur d'Alene and Park City cost for mining from \$10 to \$15 per ton. In Leadville the costs may have been lower, but I doubt it. In Aspen they were fully as high. Smelting costs are correspondingly high. Such ores are very seldom mined for lead alone; the values in silver and gold are very often much higher than for lead. Undoubtedly, on the average, the costs are nearly proportionate to the values. It is very likely that extraordinary examples could be furnished of bonanzas being worked for low cost and high profit; but these bonanzas do not often last long. For ores of this class the cost of exploration is inevitably high. I know of no hand-selected non-concentrating lead ores that do not cost for mining and marketing at least \$20 per ton; the average is probably at least \$30 per ton.

THE SOUTHWEST MISSOURI ZINC DISTRICT

This district produces 60 per cent. of the spelter of the United States, and, therefore, bears nearly the same relation to the zinc business as Lake Superior mines bear to the iron business of the country. Perhaps no other district of equal importance is so little understood by outside mining people.

The Joplin field is a very extensive one, more or less ore having been mined over an area of perhaps 2000 square miles, but within this extensive field by far the greater part of the production has come from three or four localities. Of these the most important may be called the Webb City zone, which is said to have produced about one-half of the entire output of the field. In the immediate vicinity of the city of Joplin, there are very extensive mineralized zones extending in a northwest and southeast direction. A third place that has produced extensively is in the neighborhood of Galena, Kansas. I shall attempt a general description of these orebodies by using as an example the great Webb City zone.

This productive area extends from Oronogo on the northwest to Porto Rico and Duenweg on the southeast, a distance of 10 miles. For this distance the average width of the zone is perhaps three-

quarters of a mile, though it widens at one or two places to a mile and a half and narrows at other places to a quarter of a mile. In a rough way, I estimate the productive ground at 4800 acres. It would not be inaccurate to describe this entire tract as a continuous orebody although it shows great irregularities. The total production of this zone has been approximately 3,000,000 tons of zinc and lead ore, derived from mining and milling 75,000,000 tons of rock. The value actually realized has been about \$90,000,000 but at present prices the amount would be much greater. The production of the zone for 1907 was 109,229 tons zinc ore worth \$5,000,000, and 24,336 tons lead ore worth \$1,700,000, approximately, making a total value on the ground of \$6,700,000. The spelter realized from this production may be estimated at 55,000 tons, worth in St. Louis \$6,390,000. The pig lead realized may be estimated at 19,000 tons worth in St. Louis \$1,985,000. The average price of spelter was 5.812c. at St. Louis, and of lead 5.225c. On these prices the average yield to the miner was \$45.23 for zinc ore and \$68.73 for lead ore.

GEOLOGY OF THE JOPLIN DISTRICT AT LARGE

The rocks in which the ore occurs constitute a flat-lying formation of chert and limestone about 250 ft. thick. At the bottom of the formation is a persistent bed of flint about 20 ft. thick, called the Grand Falls chert. Above this is limestone containing many layers and nodules of flint. Originally this cherty limestone formation was all covered by a stratum of black shale, which occasionally contains a little coal. The greater part of this shale has been removed by erosion, but certain portions of it still remain in the form of long strips filling trough-like depressions in the underlying limestone.

The orebodies of the region are all contiguous to these areas of depressed shale, occurring either under or along the sides of the shale troughs. These troughs of shale are called, by the way, "soapstone bars." The explanation which I believe to be the true one of the occurrence, both of the shale troughs and of the ore is as follows:

The limestone, along certain lines (of an origin not at present explicable) was dissolved out while the shale formation still overlaid the entire region. The caverns formed by this dissolution finally became so large that they caved in, allowing the overlying shale to settle down into the pits thus formed to a depth of from a few feet to as much as 150 ft. below the surface of the cherty limestone formation. The dissolution of the limestone did not affect the chert beds. These were broken up during the subsidence caused by the disappearance of the lime. The result was that underneath and along the sides of the shale filling of the

troughs there were great quantities of broken flint mixed with mud derived from the soft overlying shale. There were also masses of limestone, of all sizes, remaining on the sides and even in the bottom of the troughs. The limestone remnants increase in quantity as you go from the center of the trough until finally you reach the solid unaltered masses.

Ore has been deposited in the brecciated, or disturbed mass of flint and limestone boulders and clay occupying the space between the depressed shale in the center of the trough and the unaltered formation at its bottom and sides. The ore was brought in by surface waters. Naturally the deposition of ore was not uniform. It is supposed that the organic matter in the shale was the precipitating agent which caused the deposition of zinc and lead sulphates picked up by the surface waters during the process of the erosion of the Ozark plateau to the southeast. At any rate the ore is found in exceedingly irregular bodies in the broken ground along the troughs of shale, or "soapstone bars."

Naturally, channels of dissolution such as those described as causing the troughs would be of varying extent and depth. This is the case. In some of the larger channels the limestone has been removed quite to the bottom of the cherty limestone formation and the broken ground extends down to the basal member—the Grand Falls chert. This chert is a brittle stratum of flint containing innumerable crevices so that it serves as a ready channel for the circulation of water. On this account much ore has been deposited in it. It is called the "sheet ground." This sheet-ground ore, while of exactly the same composition and origin as the other ore, is distinguished from it notably in several respects. Instead of being in a mass of broken ground along the "soapstone bars" it occurs under the solid original limestone masses. Instead of being in a shapeless irregular mass, it forms a regular flat bed, like a seam of coal. Laterally its extent is variable, as also is its richness, but the mineralization is pretty uniform over extensive areas, often as much as 2000 ft. wide. It must never be forgotten, however, that the sheet ground is always attached to the *loci* of mineralization—the "soapstone bars." It forms extensive shoots under the limestone bordering the deepest and most strongly mineralized bars or channels. It often extends 1000 ft. from a bar, very rarely over 2000 feet.

Practically all of the successful sheet-ground mining to date has been confined to the great Webb City ore-channel, between Oronogo and Porto Rico. It is generally believed that the sheet ground yields about 3 per cent. of the rock mined in zinc or lead ore. The zinc ore obtained averages not far from 60 per cent. zinc; the lead ore about 80 per cent. lead.

The ore is obtained by crushing and washing in concentrating mills, which save about 60 per cent. of the zinc and 90 per cent. of the lead actually contained in the rock. The total saving approximates 66 $\frac{2}{3}$ per cent.

EXPLORATION

Practically the only method now employed in searching for ore is churn drilling. The irregular deposits along the soapstone bars are apt to be quite narrow. The vertical extent is often greater than the width. Consequently, in looking for such orebodies it is necessary to drill holes pretty close together. An experienced driller can form a good idea from the kind of ground he encounters of what the chances are of finding ore. If he finds a little ore and open ground, that is, broken rudely stratified material, he will place his following holes not over 50 ft. from the first until he discovers pay ore. Then he will endeavor to follow the ore by drilling along the course of the bar. Where the bars are small and irregular, it is often necessary to drill as many as three or four holes to the acre to explore a tract thoroughly. Since the drilling costs an average of 80 to 90c. per foot and the holes will average about 175 ft. deep, we may place the cost of exploring such a tract roughly at \$500 per acre.

In the sheet ground no such amount of drilling is necessary. On account of the much greater uniformity of the deposits it is often possible to explore the ground satisfactorily with only one hole to every two acres. Holes to explore this ground are drilled more than 200 ft. and the cost per hole will approximate \$200. The actual cost per acre for exploring this ground is probably less than \$100, but I think it should properly be about \$200.

It is the almost universal custom to appraise the value of the ore only by the eye. The cuttings from the drill come out in the form of coarse angular sand which the driller washes in a bucket of water, and simply forms a judgment as to whether the sand contains pay ore or not. If the cuttings show only small amounts of ore, not enough in his judgment to pay for mining he records "a few shins of jack or lead." If he thinks the ground doubtful he writes—"shines" or "good lead" or both.

MINING METHODS

The mining of this ore will be readily understood from the above description of its occurrence. Owing to the shallowness of the deposits there is no occasion whatever for large expensive shafts. As the extreme depth is only 250 ft., and the average depth in mining perhaps less than 175 ft., it is evident that a single-compartment shaft, except in the unusual contingency of encountering a very large amount of water can be sunk very cheaply. It is probable that the average shaft of the Joplin district does not cost more

than \$4000. Hence it is cheaper to open up the ground by numerous shafts rather than by extensive openings underground. It will also be evident that aside from the question of first cost the tramping of ore is cheaper on the surface than underground.

The effect of these considerations is that the accepted method of operating in the district is to have one mill supplied with ore from several shafts, the ore being transported to the mill by inclined tramways.

The hoisting methods of the district are unique and, considering the conditions, exceedingly satisfactory. The ore is shoveled into buckets locally called "cans" which hold about 800 lb. each. These cans are placed upon small trucks underground and run to the shafts where they are attached to the hoisting rope by a man called the "tub-hooker." The hoist is placed in a derrick or headframe vertically above the shaft, the rope passing over the sheave a few feet above the engine. The hoist man pulls the bucket up so that the bottom of it is slightly above his head. He then attaches to the bottom of the bucket a hook which, when the bucket is again lowered, dumps it into a bin. To do this, hoist his empty bucket back to position, detach the hook, and lower again, is in the hands of an expert hoistman, a matter of only a couple of seconds. In this manner it is possible to average 400 cans per shift, or 160 tons. Only two men are employed, whose combined wages are approximately \$5 per day. The hoist itself costs \$250. The derrick in which the hoisting is done, together with the ore bin, costs \$600 more. It is evident that this method of operating, while having the appearance of crudity is exceedingly effective and cheap. The actual cost is probably not over 5c. per ton hoisted.

The mining underground involves the usual requirements of selecting the ground so as to mine out the best of the ore without leaving too much in the pillars and without making the openings too dangerous. In the "upper ground" irregular deposits, this selection opens the field for the exercise of skill. In the sheet-ground deposits the work is far more regular and certain. As a general statement, the advantages of the upper deposits in the way of richer ores and softer ground are nearly, if not quite, counterbalanced in favor of the sheet ground by the greater uniformity and persistence of the latter. There is really very little difference in the methods employed in the two kinds of mines. In the upper ground the ore is taken from large irregular chambers and in the sheet ground from flat deposits from 8 to 20 ft. thick that are as regular over considerable areas as a seam of coal. The only differences in mining between the two kinds of mines are of an unimportant nature which will be readily understood

from the above description and need not be explained.

MILLING METHODS.

The visitor from outside districts is apt to be very much surprised at the crudity of the milling methods employed, and many an engineer has discovered what he believed to be a field for vast improvement by introducing better methods. Thus far nothing whatever has come of such attempts. They have usually been based upon some radical misapprehension of the conditions.

The Joplin mills confessedly only extract about 60 per cent. of the zinc ore. The proportion varies greatly at different mines. The variation, however, is not generally due to the mill practice, but to the character of the ore. The mills are suited to save only the free ore which can be easily separated from the gangue by rather coarse crushing. The remaining zinc which is inclosed in small particles in a secondary growth of flint cannot be saved except by much finer grinding and much more expensive methods for which the resulting ore extracted will not pay.

The ordinary mill consists of not more than three large Cooley jigs supplemented by one or two Wilfley tables. The Cooley jigs are of the Harz type, but contain usually from five to seven cells. The ore after being reduced to about one-half inch is next passed to the rougher jig, which catches some of the coarse lead and makes a rough concentration of the zinc ore. This is drawn as a middling product from the rougher and after being passed over a second pair of rolls, goes to a second jig called the "cleaner." The tailings from the cleaner jig are sometimes passed over a third or smaller jig for further treatment and a certain proportion of finer material is settled out for treatment on one or two Wilfley tables. The ordinary mill costs from \$10,000 to \$20,000 and has a capacity of about 15 tons an hour. The largest mills in the district have cost about \$50,000 and have a capacity of 35 tons an hour.

LOSSES IN MINING

It must be remembered that the mining of zinc ore was first begun as an incident to lead mining, which was done at or near the surface. At first the zinc ore was sold usually at very low prices. It was cleaned on hand jigs, but later cheap and crude mills were built.

As the lead was found in small irregular patches, at or near the surface, there was no inducement to mine it on a large scale. One or two miners would work at it and pay royalties to the farmers who owned the land. Since two men could not work much land, there was no demand for leases of more than a very few acres. As lead mining gradually changed into zinc mining the small leases continued and the

small mills were only expected to handle the richest pockets of "jack." In this way the business has built itself up in ever-increasing volume as a multitude of small leases. The system has all the faults that might be expected of it, but it was the one which the circumstances demanded. That it is attended by frightful losses will appear from the following summary of operating results.

Take 100 tons of ore containing 5 per cent. metallic zinc in the ground, we have the following approximate statement:

IV. COSTS AND LOSSES ON ZINC ORE.

	Costs.	Losses.	Total.
Spelter value 100 tons 5 per cent. ore at 5c., St. Louis.....			\$500.00
Loss in mining, 10 per cent.....		\$50.00	
Mining, 90 tons at \$1.05.....	\$94.50		
Loss in milling, 40 per cent.....		180.00	
Milling 90 tons at \$0.25.....	22.50		
Loss in smelting, 12 per cent.....		35.10	
Smelting and amortization.....	54.00		
Transportation.....	9.15		
Total.....	\$180.65	\$265.10	\$345.75
Approximate profit.....			\$54.25

This shows a recovery by mining of \$450; by milling of \$270; by smelting of \$234.90. The approximate costs are 36.1 per cent. of the total value; the losses, 53 per cent.; the profit, 10.9 per cent. The profit on recovered value is 23 per cent., and this profit is divided as follows: Smelter, \$14.25, or 26 per cent.; royalty, 15 per cent., \$23.60, or 43 per cent.; mines, \$17.15, or 31 per cent. of the total profit.

JOPLIN COST STATEMENTS

The cost statements of the Joplin district are open to a good deal of uncertainty, on account of the lack of accurate information concerning the tonnage handled. The accompanying statement of the Grace Zinc Company illustrates the point. The cans hoisted refers in the local vocabulary to buckets, the greater portion of which are assumed to hold 1000 lb. As a matter of fact, it is known that they do not; some operators estimate that they hold 900 and others 800 lb. On either of these two assumptions the tonnage would be much greater than that taken as the basis for the cost statement. This tonnage estimate is based on the tonnage content of cars holding from 1½ to 2½ tons in which the ore is hoisted to the mill. A considerable amount is rejected as waste. If we were to assume that the cans contained 800 lb. each, our tonnage would be 156,000 and the costs instead of totaling \$1.41, would be reduced to \$1.10. If the cans were estimated at 900 lb. each, the tonnage estimate would be almost 180,000, and the cost would fall to 95c. The low grade of the ore and particularly the method of leasing and mining which has been adopted prevent the installation of devices by which a more accurate measure could be taken of the tonnage.

V. GRACE ZINC COMPANY.
PRODUCTION AND COST STATEMENT
APRIL 1, 1905, TO JAN. 1, 1908.

Cans hoisted.....	390,346
Tons dirt milled.....	121,291
Tons mixed ore recovered.....	5,307

MINING COSTS.

	Per Ton Dust.	Per Ton Concentrates.	
Breaking ore.....	\$0.40	\$9.03	\$47,939.43
Tramming.....	0.21	4.85	25,722.82
Hoisting.....	0.15	3.32	17,616.19
Pumping.....	0.10	2.27	12,050.81
Exploring.....	0.09	2.10	11,160.39
Timbering.....		0.09	452.18
Milling.....	0.23	5.33	28,304.19
General expense.....	0.15	3.56	18,870.34
Construction.....	0.08	1.74	9,248.40
Total.....	\$1.41	\$32.29	\$171,364.75
Royalty paid.....			\$38,957.55
Net value of ore.....			\$221,230.21
Total expense.....			171,364.75
Net profit.....			\$49,865.46

A more accurate statement of costs is based on the tonnage of concentrates produced. The amount of these is, of course, accurately determined. It is probable that the figures given in the accompanying statement give a fair idea of average costs for mining and milling in the Joplin district.

I have not made an estimate of the amortization charge, which should be made against such a plant as that from which the cost statement is taken. The actual cost of such a plant outside of the amounts covered by construction and exploring is probably not over \$20,000. All renewals are covered in operating expense. Construction probably more than takes care of the plant itself. It is probable that a sum of \$3000 a year in addition to the costs given would be an ample return on the actual plant investment. This would amount in Table V to less than \$8000, and would increase the total costs per ton of dirt to \$1.49, and per ton of concentrates to \$34.

Assuming the last figure to represent the complete mining and milling cost, and that a concentrate containing 60 per cent. zinc is smelted at a cost of \$14 a ton, with a loss of 12 per cent., we find that 1056 lb. of spelter costs \$48, or 4.54c. per lb. While it is undoubtedly true that some mines at all times, and most mines for short periods, can produce spelter cheaper, I believe that the above figure is a fair average.

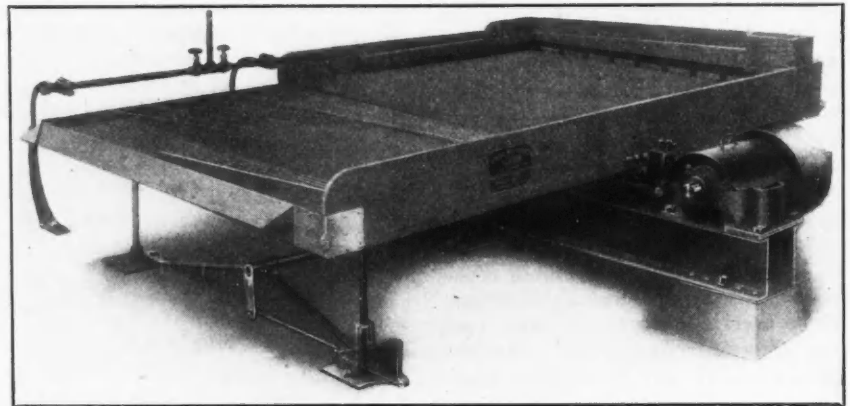
Consul-General Benjamin H. Ridgely is informed that a contract has just been let for a small American cement plant to be established near the City of Mexico for the manufacture of portland cement. This will be the first plant established in the republic for the manufacture of portland cement, although ordinary cement has been manufactured for some time.

For lubricating rock drills a light mineral oil gives satisfactory results.

Deister No. 3 Concentrating Table

The Deister No. 3 Concentrating table, 70 of which were installed at the Combination mill of the Goldfield Consolidated Mines Company, described in the JOURNAL of Sept. 5, 1908, is shown in the accompanying illustration. The table is manufactured by the Deister Concentrator Company, of Fort Wayne, Ind. It is practically rectangular, occupying a floor space of 8 ft. 6 in., by 10 ft. 6 in., and weighing crated for shipment 1600 pounds.

The driving mechanism is of the rolling contact type, and has separate adjustments for differential action and length of stroke. The principal bearings have brass bushings. The tables are made either right or left hand, and the operating adjustment is controlled by a hand-wheel at the front of the machine.



DEISTER SLIME CONCENTRATOR NO. 3

The deck is rectangular in form and is made of wood covered with lineoleum. The table differs from others of the same class in that the concentrating surface is largely without riffles, particularly the first section next to the feed box. The section at the tailings end of the table has very shallow riffles and also an increased downward slant. For giving the table the desired inclination, there are wedge adjustments controlled by a hand-wheel at two of the bases for the bearings, while the other three bases have threaded socket pins which are readily accessible.

The machine is driven by means of 14-in. tight and loose pulleys having a 4-in. driving face. The sharpness of stroke is regulated by means of an adjustable eccentric, the range of adjustment being never more than 90 deg., 45 deg. toward the table, or an equal turn in the opposite direction. The speed of the pulleys is from 285 to 300 r.p.m. The length of the stroke is regulated by raising or lowering a threaded hand-piece in the rocker arm. The shortest stroke on the No. 3 machine is usually found to be most effective.

Kelley Slag and Matte Casting Machine

BY FRED G. KELLEY*

A rocking-tray slag-casting plant for handling the rich slag from copper converters has been erected by the American Smelting and Refining Company at its Garfield smelter, Utah. The mechanical principles involved, as well as the method of operation, have been known for many years, but their application and combination for this purpose is entirely novel and the plant was erected only after rigid tests had been made with an experimental apparatus, and satisfactory results obtained.

There are eight converter stands in this plant, which when operated at full capacity will produce about 320 tons of

slag in each 24 hours; there is also some low-grade matte occasionally produced, which necessitated a capacity of 500 tons per 24 hours. This slag contains about 3½ per cent. copper, a corresponding proportion of gold and silver, and a large excess of iron, making its resmelting not only necessary for its metallic content, but also highly desirable for its fluxing qualities; in fact, the total value of the slag is often as much as \$20 and is seldom below \$10 per ton, while its favorable physical and chemical condition increases the smelting speed of a blast furnace by 10 to 20 per cent.

THE KELLEY MACHINE

Prior to the presentation of the plans of this apparatus, the management of the plant had determined to erect a system of three conveyers having heavy cast-iron molds, similar to the casting machine in use at the Washoe smelter. While this was known to be expensive to install and to operate, it offered the only method of handling the large tonnage of slag and matte. Upon receipt of the designs of my patented device, the company con-

*Mining engineer and metallurgist, Salt Lake City, Utah.

structed an experimental machine, and after demonstrating its efficiency, started the construction of a plant having twenty-four 10-ft. trays and a length of 270 ft., including the shell grid. This was completed in the latter part of February and has been in continuous operation since that time. The total cost of delivering the cold slag to the furnace bins is 11c. per ton, which figure will be much reduced when the plant is operated to its full capacity. The cost of the entire plant was about \$35,000, including all bins and tracks.

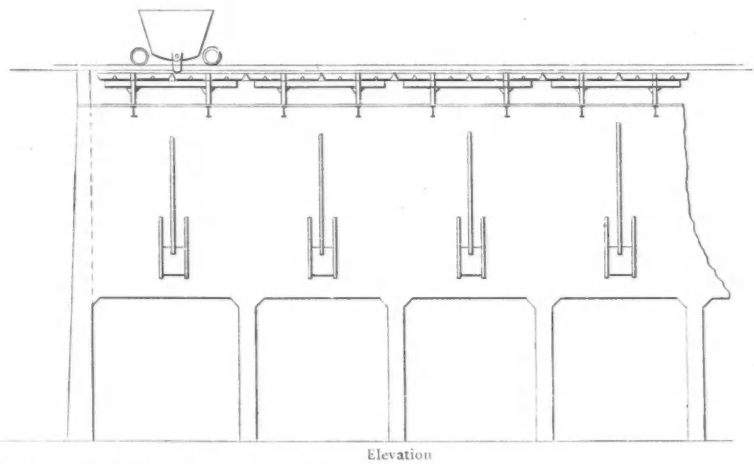
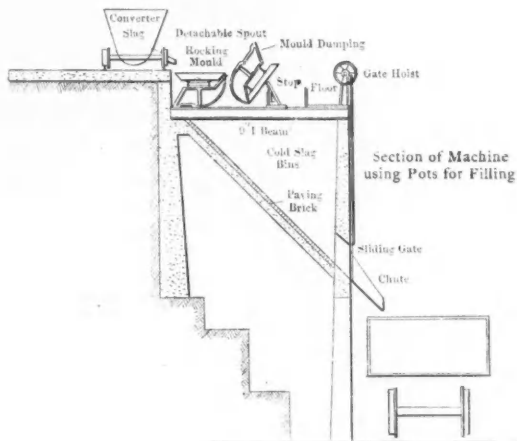
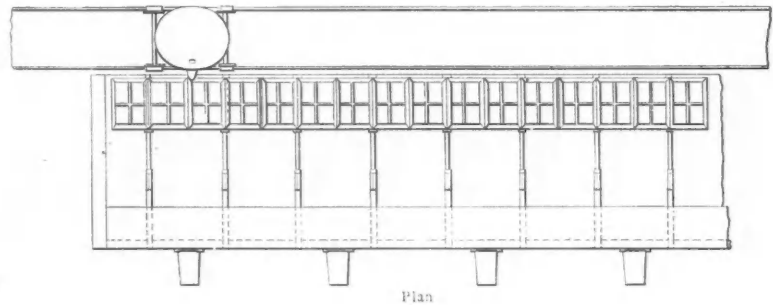
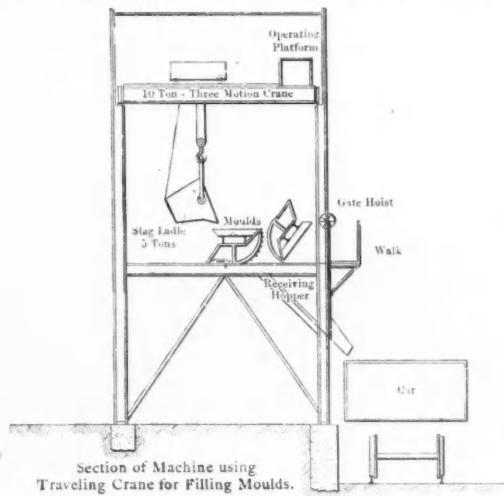
The unit tray consists of four cast-iron

It is mounted upon two horizontal beams, below which is a brick-lined steel bin for receiving and storing the cold material, from which the latter is drawn into railway cars.

The trays are mounted adjoining each other with just sufficient clearance for independent operation, the number required being 12 for the contents of a 10-ton slag pot. There are two complete sets of 12 trays each, which are used alternately, allowing ample time for cooling without the use of water. A third set is contemplated for a reserve in case of accident or for use when repairs are required.

The bowl is returned to the trucks, the hole is plugged, and the pot is ready for the next charge.

The slag remains in the molds until it has solidified, about 10 min. if sprayed with water and about 20 min. if no water is used; the latch of each tray is released, a slight push is given, and the molds tip in succession to the stop where the solidified cakes drop out. When relieved of the load the trays return automatically to the horizontal position, ready for the next charge. The molds receiving the first of the charge, which contains much matte, are sprayed with lime wash to



SECTIONS, PLAN AND ELEVATION, KELLEY SLAG CASTING MACHINE

molds fastened by cotters to a structural-steel frame, which in turn is rigidly bolted to two circular cast-iron rockers, having the line of their centers midway between the centers of gravity of the whole apparatus when it is empty and when it is filled with slag. This construction causes the molds to assume the normal horizontal position when empty and a dumping position when full and released. The tray is 4 ft. wide, 10 ft. long and 4 in. deep, and will contain 1600 lb. of slag. Each mold is divided into four compartments by ribs 2 in. high, thus producing cakes of convenient size.

METHOD OF OPERATION

The converter is poured into a ten-ton pot having a plugged hole on one side near the bottom and a spout extending clear of the rail. This pot is taken to the casting plant by a locomotive and is tapped by the attendant over the first mold. When the slag is flowing, the pot is drawn along the line of molds at a speed that insures proper filling, the flow being regulated by the bar of the tapper. When the pot is empty it is taken to a jib crane which lifts the bowl from the trucks and discharges the shell upon a grid, through which it passes to a bin.

prevent adhesion, and after dumping all small pieces of slag are swept from the beams so that no interference will occur in the next operation.

Two men on each shift attend to all of the operations of tapping, dumping and loading into cars; one man is employed a part of the time on the shell crane, and the man on the locomotive gives only a fraction of his time at the operation of casting. The labor cost is \$21 per 24 hours, in which time 275 tons of slag are handled.

It is yet too early to judge of the repair costs, but thus far no weak parts have developed.

Lining-up Timbers in Inclined Shafts

BY BENJAMIN H. CASE*

The main shafts of Burra Burra and London mines, at Ducktown, Tenn., are both sunk in the country rock with an inclination intended to be parallel to the dip of the orebodies. This inclination is 75 deg. in both cases, and the collars of the shafts are situated about 100 ft. from the footwall at the outcrop. The first levels are 175 ft. below the surface, and succeeding levels are driven at intervals of 100 feet.

The decomposed rock extends to a depth of about 75 ft., and the shafts are timbered with square sets and lagging to this depth. Below this, 10x10-in. sills are placed adjacent to the footwall and are supported by hitches cut in the rock at the end of the shaft. Forty-pound rails are fastened to the sills, which are connected by studdles under the rails; 8x10-in. sprags are wedged from hitches in the hanging-wall against the sills, and these act as dividers.

In each shaft there are two skip-ways, 6x6 ft. in the clear, and a ladder and pipe-way at the end, 4x6 ft. in the clear. The shafts in the solid rock vary in width from 6 to 7 ft. and are about 20 ft. long. The Burra Burra shaft has reached a depth of 700 ft., and the London shaft a depth of 560 ft., measured vertically.

Timber pentices below the skip-ways at the deepest level in each shaft were formerly built for the protection of the men in sinking while mining and hoisting were going on, but the practice now is to cut through the rock in the ladder compartment and leave a solid rock pentice beneath the skip-ways.

CARRYING THE LINE DOWN THE SHAFT

The center lines of the shafts are marked by copper plates set in the foot-wall sills at the collars and at each level. These plates are 3x4x½ in. thick, and have points punched in them to mark the center line. These lines are used for traversing into the mine workings, and the plates at the collars mark the zeros of coordinates for the underground surveys. This line is shown projected into one of the levels by $a-b$, Fig. 1. From the traverse line a secondary parallel line is located for sighting down the sinking compartment.

In order to locate the secondary line, the transit with an auxiliary top telescope is set up over the plate on the sill at the level from which sinking is intended. A sight is taken up the shaft, preferably to a large nail at the copper plate on the collar sill. The telescope is then reversed and a point is located in the roof of the crosscut on line at b , Fig. 1.

*Mining and civil engineer, Copperhill, Tenn.

The crosscut is driven with a width equal to the length of the shaft for about 35 ft. in order to provide room in the station for the handling of the waste hoisted through the sinking compartment. This allows room to establish a line 30 ft. long, which is parallel to the center line of the shaft. This arrangement is indicated in plan, at Fig. 1.

After the point b has been carefully placed on line, a right angle is turned toward the sinking compartment from a . There is a partition between the skipway and the sinking compartment, and it is necessary to cut a hole through this and sight at a plumb line. A point is thus located on the sill at c and permanently marked by a nail. It is most convenient to establish point c between the bucket skids. The horizontal distance, $a-c$, is now carefully measured; it is usually about six feet. The same distance is measured from b to d , normal to $a-b$ and point d is permanently established in the roof of the crosscut; $c-d$ is then used for locating the line down the sinking compartment.

SETTING THE SILLS BELOW THE PENTICE

When a timber pentice is used, it is a comparatively simple matter to set the first sill below the pentice. In this case the shaft is sunk about 25 ft. below the level and the hitches for the sill V , Fig. 2, are cut by lining and measuring from the sill at the level. The pentice is then built above these hitches. When a rock pentice is used it must be undercut from the sinking compartment, and the shaft opened out to its full cross-sectional area. The position for the hitch in the sinking-compartment end can be conveniently located, but that in the end under the pentice must be located by carrying the line to the bottom of the shaft and squaring off to the other end. This is done by the method I shall describe, with such modifications and additions as circumstances may require. For the sake of simplifying the description, I will assume that the hitches have been cut with ample room for shifting the timber in them, and that the timber has been placed in approximate position; it is then required to shift the timber to its correct position and wedge it.

There would not be sufficient head-room to cut hitches for the sill at V , Fig. 2, so the one immediately below it is the first one placed. The transit is set up over point c , which is located, say, 0.25 ft. back from the front edge of the sill. The height of the telescope axis above the top edge of the sill is measured and is found to be, say, 4½ ft. The auxiliary telescope, which is parallel to the main telescope, is 0.33 ft. from the latter. A sight is now taken under the waste bin to d and the telescope depressed until the proper inclination of the shaft, 75 deg., is read on the vertical circle. In order to sight down the shaft at this steep in-

clination we must use the auxiliary telescope, which is now parallel to the shaft's inclination and at a certain horizontal distance in front of the plane of the sills. From the data above given we calculate this as follows: $\tan. 15 \text{ deg.} \times 4.5 \text{ ft.} + 0.33 \text{ ft.} = 0.25 \text{ ft.} = 1.29 \text{ ft.}$; this is the distance $e-f$, Figs. 2 and 3. By having a short graduated rod held level against the timber at f , the correct position of the sill will be determined when this distance is read on the rod.

The next step is to establish a point on this line at the bottom of the shaft at g , Figs. 2 and 3. I use as a sight a bright-headed nail driven in a block, with a strong light shed upon the nail, preferably from an acetylene lamp. The block is shifted till the intersection of the cross hairs cuts the center of the nail.

The transit is now taken down the shaft and set up over g , and a sight taken up the shaft to c . A right angle is turned and a point set on line near the other end of the shaft at h , Fig. 3. The transit is set up over h and a foresight taken to g ; the telescope is elevated and leveled and a reading taken on a level rod held on g , which equals $g-p$. We will assume this to be 5 ft. A right angle is next turned toward the footwall of the shaft, and the telescopes elevated until the proper inclination of the shaft is read on the vertical circle. The line of sight of the auxiliary telescope of the instrument at h' , is now parallel to the shaft's inclination and at a certain additional distance from the plane of the sills over that at m . This distance is $c-i$, Fig. 2, and is computed as follows: $c-i = \tan. 15 \text{ deg.} \times 5 \text{ ft.} + 0.33 \text{ ft.} = 1.67 \text{ ft.}$, which added to $e-f$, gives us the distance $i-k$; this is 2.96 ft., Figs. 2 and 3. The sill at this end is correctly placed by moving it in the hitches until this distance is read on the rod held level at k with the graduated side down.

A PROPOSED MODIFICATION

There are two inconvenient features in the method I have attempted to describe, especially in setting timbers when the shaft has reached a considerable depth below the level. The first is that of the difficulty and danger encountered in carrying the transit up and down the rickety and shot-battered ladders, or in the bucket; the second is that of making two set-ups of the instrument on the bottom of the shaft, often covered with muck and debris, and sometimes having a sump of water at the only place a point can be conveniently located. These may both be obviated, when a depth of 50 ft. is reached, by establishing a point at right angles to the axis of the shaft on the first timber below the pentice, at the end farthest from the sinking compartment. Downward sights may then be taken at both ends of the shaft. It would, of course, be necessary to rig a platform at the end under the pentice, perhaps by hinging it to the sill and folding it back

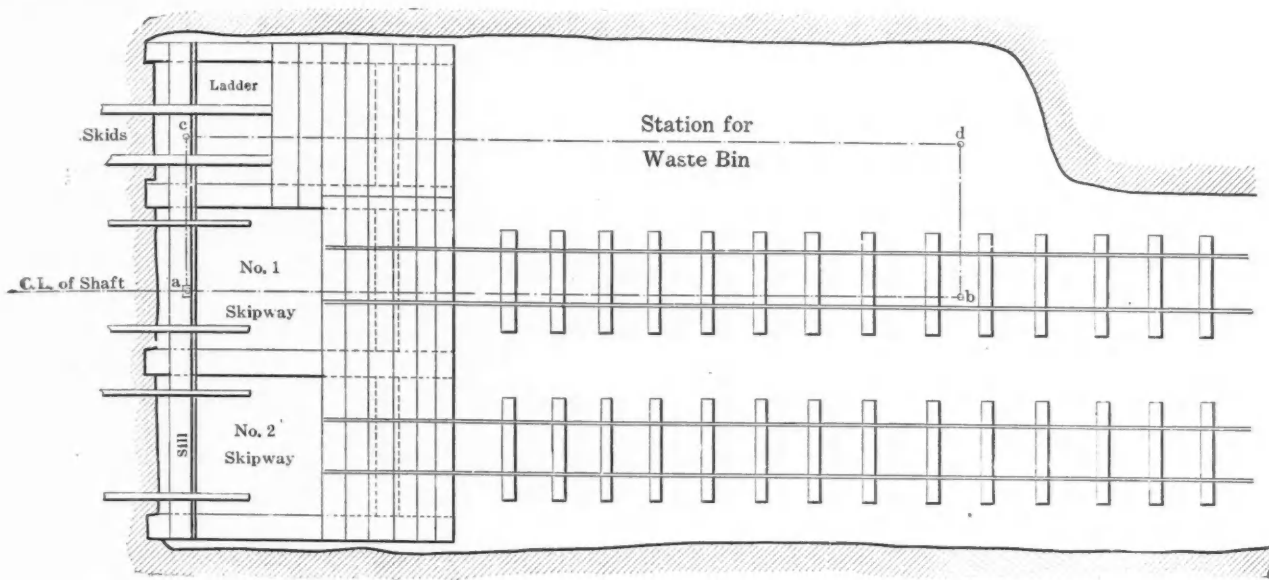


FIG. 1

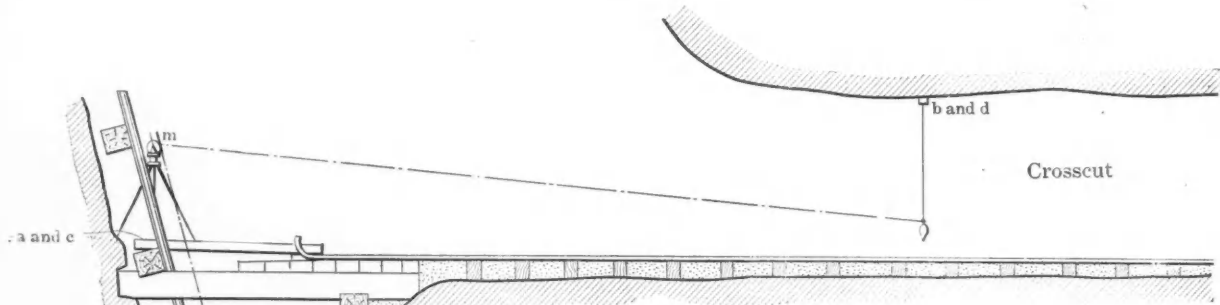


FIG. 2

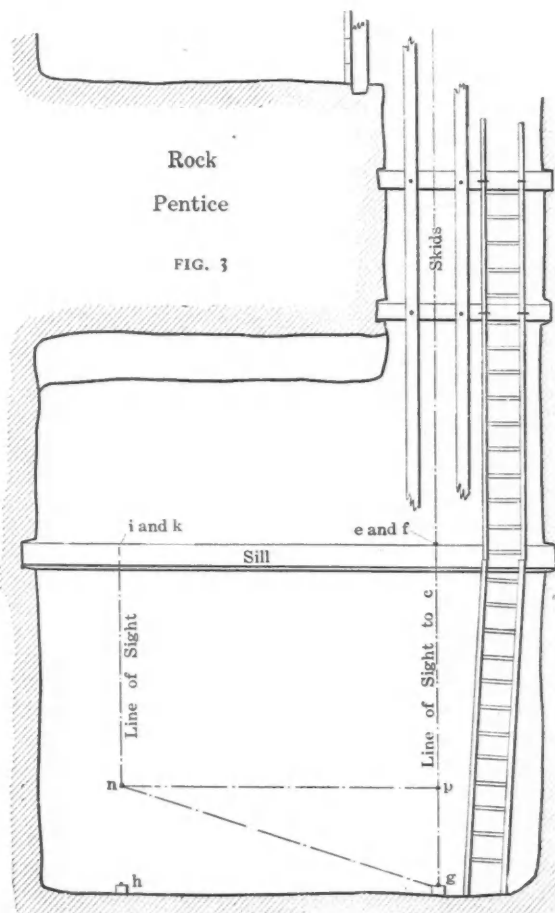


FIG. 3

against the footwall out of the way of the blasting when not in use. I intended to try this experiment, but sinking was discontinued before I had an opportunity to do so.

Timbers are frequently set in inclined shafts with the aid of a straight-edge and clinometer. This was previously the practice in the Ducktown shafts, but the planes of the foot walls became somewhat twisted in both shafts and the method was abandoned in favor of the one described. A combination of the two may be used to advantage, but the ordinary mine timberman will do better work if the surveyor will keep a check on him. The time required is well spent when the results achieved assure smooth and true skipways down the shaft.

The proper cant of the timbers may be obtained with a clinometer, or by taking readings on the rod at the top and bottom edges of the sill. The sills are placed at intervals of 5 ft. That shown in the diagram is 25 ft. below the sill at the level. The sills between must, of course, be set after the pentice has been removed upon reaching the next level with the sinking.

American Institute of Mining Engineers

A circular from the secretary's office, under date of Aug. 31, states that the 95th meeting of the Institute will be held at Chattanooga, Tenn., beginning Oct. 1. The change of place from Birmingham, Ala., was announced previously. The headquarters will be at the Hotel Patten.

Sessions for reading and discussions of papers will be held Thursday evening, Oct. 1; Friday morning and evening, Saturday morning and, if necessary, Saturday evening. While it is impossible to say when a given paper will be presented, the following provisional statement is probably correct:

On Thursday evening, besides the formal welcome of the Institute, important addresses, explaining the present industrial conditions of the South, are expected, and the address of John Hays Hammond, president of the Council of the Institute, on "Professional Ethics," will be delivered. On Friday morning, papers relating to iron and steel will be presented, especially new and hitherto unpublished records of practice with the Gayley dry-blast process. On Friday afternoon, papers on economic geology will be presented. On Saturday, papers on other branches of mining and metallurgy, especially the preliminary paper of Mr. Aldrich, on "The Treatment of the Gold Ores of Hog Mountain, Alabama." This arrangement is subject to such changes as the immediate situation developed at the meeting may require. At present, it can only be said that, as to actual oral presentation of papers, preference will be given:

(1) To those which have local interest; (2) to those of which the authors are present; and (3) to those which members present desire to discuss, and concerning which early previous notice of that desire has been given to the secretary. The following list of papers is provisionally announced:

A. IRON AND STEEL

1. Experience with the Gayley Dry Blast at the Warwick Iron and Steel Furnaces, Pottstown, Penn., by Edward B. Cook, Pottstown, Penn.
2. Experience with the Gayley Dry-Blast Process in the Blast Furnace and the Bessemer Converter, at the Works of the Illinois Steel Company, by Theodore W. Robinson, Chicago.
3. Mr. Gayley's Invention, by R. W. Raymond, New York.
4. Blast-Pressure at the Tuyeres and Inside the Furnace, by R. H. Sweetser, Columbus, Ohio.
5. An Unusual Blast-Furnace Product; and Nickel in Some Virginia Iron Ores, by Frank Firmstone, Easton, Penn.
6. The Relation of Slow Driving to Fuel Economy in Iron Blast-Furnace Practice, by John B. Miles, Philadelphia.
7. Report of the Institute Committee on Steel.

B. ECONOMIC GEOLOGY

8. A New Theory of the Genesis of Brown Hematite Ores, and a New Source of Sulphur Supply, by H. M. Chance, Philadelphia.
9. The Santa Rita Mining District, by John M. Sully, Silver City, N. M.
10. Clinton Iron Ores in the Birmingham District, Alabama, by Ernest F. Burchard, Washington.
11. The Clinton Iron-Ore Deposits of Stone Valley, Huntington Co., Penn., by J. J. Rutledge, Baltimore, Md.
12. The Clinton Iron-Ore Deposits of New York, by David H. Newland, Albany, N. Y.
13. Studies of Illinois Coals, by H. Foster Bain, director of State Geological Survey, Urbana, Ill.; Frank W. DeWolf, assistant State geologist; J. M. Lindgren, assistant chemist, Engineering Experiment station; Perry Barker, assistant chemist; George S. Rice, consulting engineer; J. M. Snodgrass, assistant engineer; H. C. Hoagland and A. Bement, consulting engineers; W. F. Wheeler, chemist, State Geological Survey; and C. K. Francis, research assistant in applied chemistry, University of Illinois.
14. Problems Connected with the Examination of and Report on Undeveloped Mineral Properties, by Charles Catlett, Staunton, Va.
15. The Distribution of the Elements in Igneous Rocks, by Henry S. Washington, New York.
16. Notes on Some Philippine Coal-Fields, by J. W. Dilworth, Philadelphia.

17. The Law of Fissures, by Blamey Stevens, Seattle, Wash.

C. MINING AND METALLURGY

18. Pressure-Fans *versus* Exhaust-Fans, by Audley H. Stow, Maybeury, W. Va.
19. Requirements of a Breathing Apparatus for Mining Use, by Walter E. Mingram, New York.
20. Sulphur Dioxide as an Agent in Fighting Mine Fires, by Walter O. Snelling, Washington.
21. The Ilsele Hütte Iron Mines at Peine, Germany, by Lucius W. Mayer, New York.
22. Gold Dredging in the Choco, Republic of Colombia, South America, by Henry G. Granger, New York.
23. The Silver Mines of Mexico, by Albert Bordeaux, Thonon-les-Bains, France.
24. The Management of Mining Operations, by Joseph MacDonald, Guanajuato, Mexico.
25. Modern Coal-Cutting Machinery, by George S. Rice, Chicago.
26. Development, Sampling and Ore Valuation of Gold Mines, by C. Baring Horwood, Johannesburg, South Africa, and Mungo Park, Glan Ceris, North Wales.
27. The Chinese on the Rand, by T. Lane Carter, Transvaal.
28. The Kafir Mine Laborers, by T. Lane Carter, Transvaal.
29. The Treatment of the Gold Ores of Hog Mountain, Alabama, by T. H. Aldrich, Jr., Birmingham, Ala.
30. The Mining and Milling of Silver-Lead and Zinc Ores at Pierrefitte Mines, France, by William W. Van Ness, London, England.
31. The Hardinge Conical Pebble Mill, by H. W. Hardinge, New York.
32. The Wilfley Table: II., by Robert H. Richards, Boston.
33. Investigation on Jigging, by Royal P. Jarvis, Knoxville, Tenn.
34. Sulphur in Gaseous Fuels, by F. Louis Grammer, Leesburg, Va.
35. Constitution of Copper Mattes and Copper-lead Mattes, by Charles H. Fulton, Rapid City, S. D.
36. Behavior of Calcium Sulphite at Elevated Temperatures with Various Fluxes, by H. O. Hofman and W. Mostowitsch, Boston.

LOCAL ARRANGEMENTS

The arrangements for entertainment, visits and other matters are in charge of the local committee at Chattanooga, of which H. S. Chamberlain is chairman.

Consul-General Michael, of Calcutta, reports that the output of rubies in Burma during 1907 amounted to 2,128,368 trucks, valued in Magok books at \$577,325. The royalty revenue for the year was \$99,245. The market for rubies was fairly good the first of the year, falling away discouragingly toward the last of the year.

Jesus Maria and Flores Mills, Guanajuato

By Cyaniding the Silicious Gold-Silver Ore an Average Extraction of 86 Per Cent. Silver and 88 Per Cent. Gold Has Been Obtained

BY CLAUDE T. RICE

In this article I shall describe two of the mills in the Guanajuato district. As is well known the ore at Guanajuato contains gold and silver in sulphides, with a silicious gangue. The first of these mills, the Jesus Maria, is more typical of the early cyanide practice in the district for the ore is crushed in water. The other mill, that of the Guanajuato Reduction and Mines Company, is typical of the most modern practice at Guanajuato.

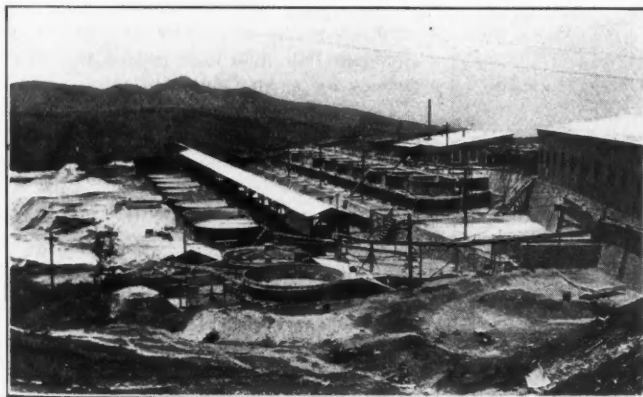
ments of the mill are unusually well lighted. This also enabled the erection of the mill with a minimum amount of grading. The mill is treating ore from the Jesus Maria mine and from the mine dump. The mine ore is worth, with silver at 53c. per oz., approximately \$9 per ton, 42 per cent. of the value being in silver. The mine dump ore is worth about \$4 per ton so that the ore now going to the mill is worth about \$6 per ton.

company was also considering the advantages of increasing the capacity of the plant and the extraction on the slimes by installing filter presses.

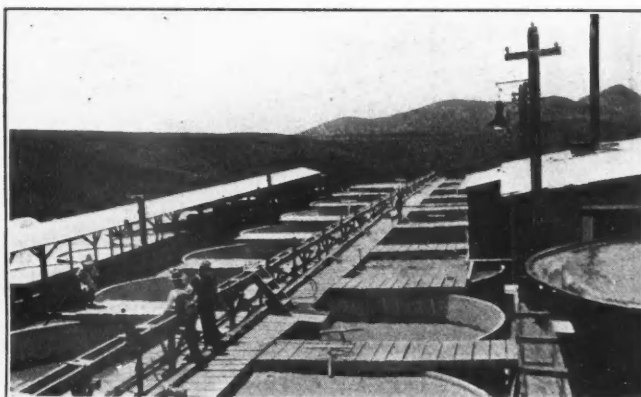
As this is the only mill in the La Luz section of the Guanajuato district, it was designed so as to be able to do custom work. Consequently the ore is dumped into two bins, one being intended for ore from the company's mines and the other for custom ore in case any is treated. As



THE JESUS MARIA MILL AT LA LUZ, GUANAJUATO



CYANIDE PLANT, JESUS MARIA MILL



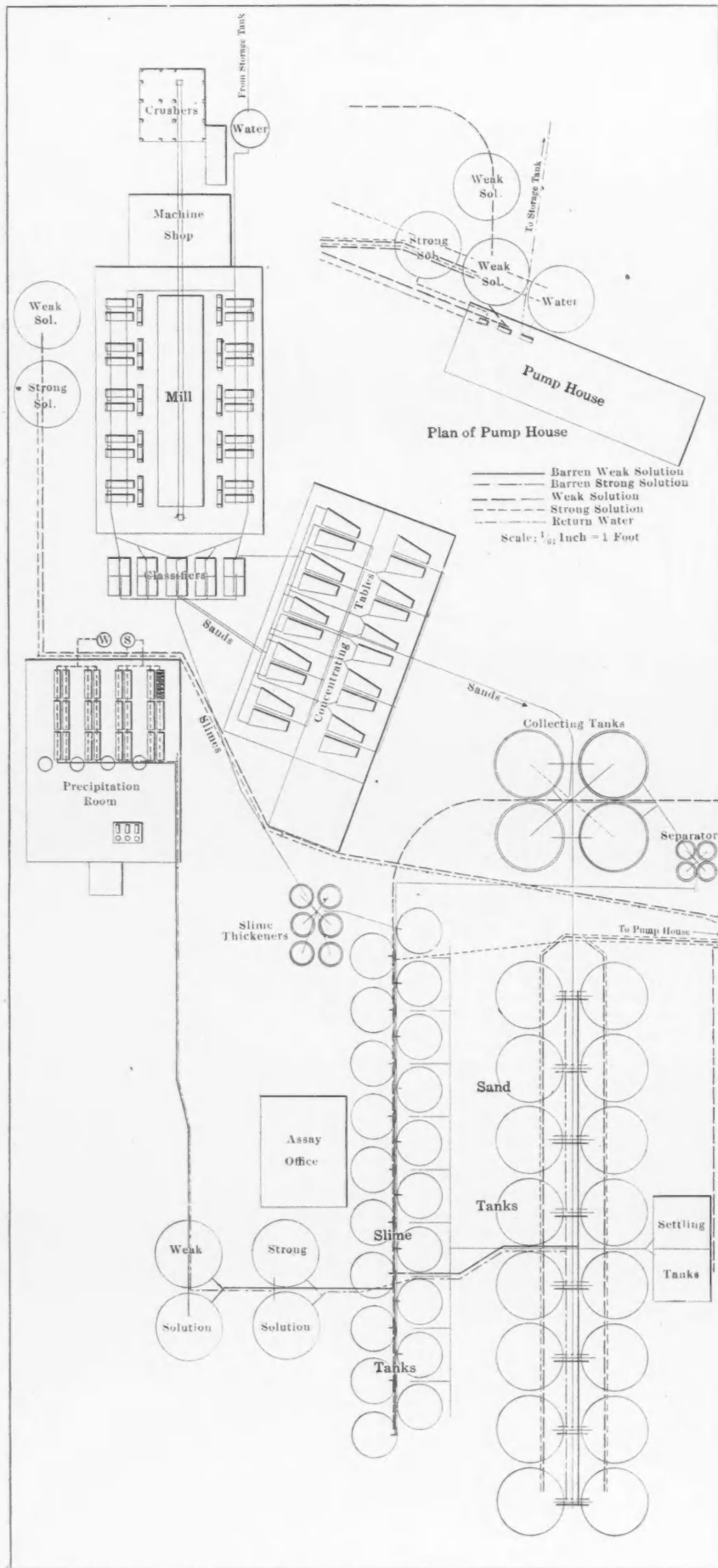
SLIME TANKS, JESUS MARIA MILL

THE JESUS MARIA MILL

The Jesus Maria mill, belonging to the Guanajuato Amalgamated Gold Mines Company, is situated at La Luz about six miles west of Guanajuato; it was designed by V. B. Sherrod. Work was begun in June, 1905 and the mill was completed early in 1906. The mill is unique in that it has a separate breaker house, separate battery house and separate concentrator plant. As a result the different depart-

This is the only mill in the district that is not crushing in cyanide solution, and it is also the only one using amalgamating plates, but the company is going to change soon to crushing in cyanide solution and then the plates will be discarded. The method of treatment was in a transitory stage at the time of my visit; more sand tanks were being installed and Dorr classifiers were being put in place to make a cleaner separation of sand and slime. The

yet the company has milled no custom ore. These bins feed to two No. 3 D Gates crushers where the ore is crushed to 1/4-in. size. A sample is taken from the discharge of each gyratory by a Snyder sampler that cuts out 1/5; this 1/5 then goes to a small sample crusher where it is re-crushed and elevated to a Vezin sampler which cuts out about 1/20 of the 1/5. The rejects from the sampler system and the broken rock from the two



PLAN OF JESUS MARIA MILL, GUANAJUATO

Gates crushers go to a 16-in. Robins belt conveyer, which carries the ore to a tripper that discharges into the 300-ton battery bin. The 100 stamps are arranged in two rows of 50 stamps each, placed back to back with the bin between. The ore is fed to the batteries by suspended Challenge feeders; the stamps weigh 1050 lb. and make 103 drops, 6 in. high, per minute in an Allis-Chalmers No. 120 mortar resting on a concrete mortar block; a 40-mesh screen is used on the batteries. The crushed ore flows over silver-plated copper plates. These plates have a grade of 1½ in. per foot, and are 11 ft. 4 in. long with 8 in. of riffles at the bottom to catch the quicksilver. To guard against loss of mercury or amalgam, crude mercury traps, made by nailing slats to strips of blanket, are also used in the launders that carry the pulp away from the plates.

The batteries are arranged in units of ten stamps. Two motors drive the 10 end stamps and four motors drive 20 stamps each, each set of 10 stamps being driven by a separate belt from the 20-stamp line shaft. Blanton fasteners are used on the cam shafts; the regular order of drop is used in the batteries.

The pulp from the batteries formerly went to large Dimmick classifiers where three sizes were made for concentration, but these Dimmick classifiers have now been replaced by Dorr classifiers so as to obtain a cleaner sand for leaching. The Dorr classifiers are doing fine work; the sands from the Dorr classifiers leach much faster than before and a better extraction is obtained. The overflow goes to thickeners while the underflow goes to the concentrators. In the launders in the concentrator room Hungarian riffles are used so as to catch any quicksilver or amalgam that may have passed the other devices for saving amalgam.

There are 20 No. 3 Wilfley tables in the concentrator building arranged in two terraces. The slimes separated on the Wilfley tables rejoin the sand going to the Dorr classifiers, while the middlings from the tables on the first terrace join the feed to the second-terrace tables and are concentrated. The middlings from the second-terrace tables are elevated and sent back to the first tables as a protection against carelessness on the part of the Mexican tablemen. The tailings from all the tables go to the sand plant for cyanide treatment.

About 40 per cent. of the extraction is made on the plates and concentrators, the plates furnishing about 30 per cent. of this. Not only gold, but also considerable silver is saved on the plates, showing that either considerable native silver or chlorides and bromides occur in the ore.

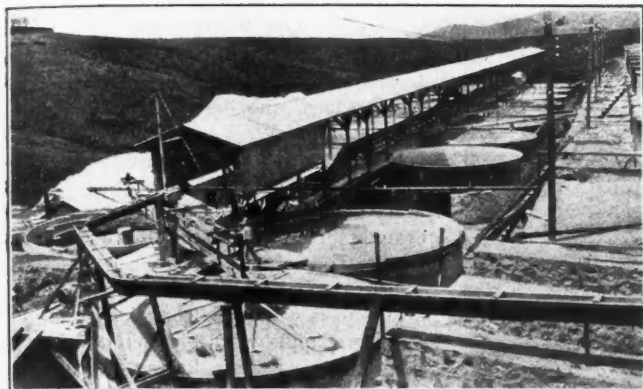
CYANIDE TREATMENT

The sand, which amounts to 62 per cent. of the total ore, is charged into one

of the four sand-collecting tanks by means of a Butters distributor. When the Dimmick classifiers were used, two air jets were necessary to keep the sand pulp in agitation in order to make a final separation of the sand and slime in the collecting tanks; the overflowing slime was pumped back to the four slime-thickening

more are being built), where it is discharged into one of the sand-treatment tanks by a Blaisdell tripper and stacker. These treatment tanks are discharged to cars, but a Jeffrey conveying system is soon to be installed to handle the residues from the sand tanks. The discharged sand contains about 16 per cent moisture.

draining, the sand is discharged. At present, owing to the fact that the crushing is not done in cyanide solution, no wash water is used, but as soon as crushing in cyanide solution begins a final water wash will be used on the sand. About 4 kg. of lime per ton of sand is added to the sand tanks, for 7 kg.



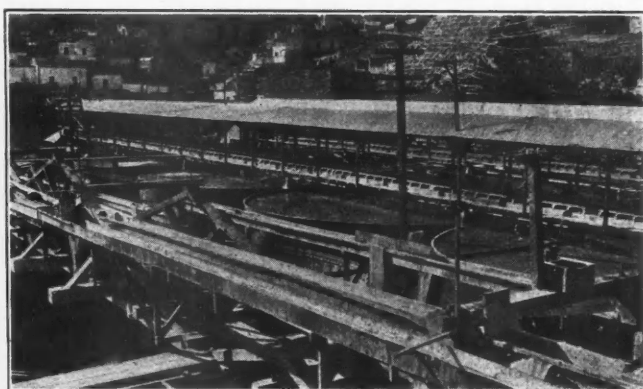
SAND TANKS, JESUS MARIA MILL



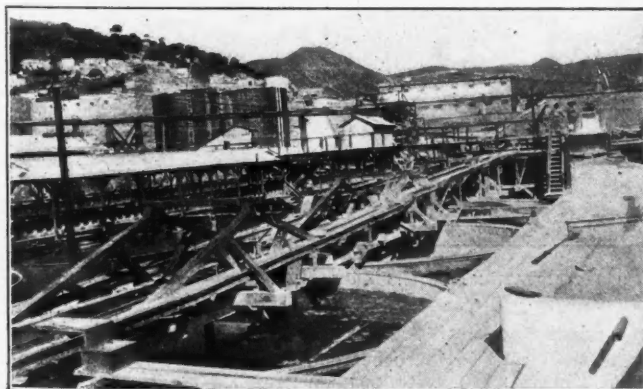
BLAISDELL STACKER AT WORK, JESUS MARIA MILL



GENERAL VIEW, BUSTOS MILL



SAND TANKS, FLORES MILL



PART OF SLIME TANKS, FLORES MILL



SLIME TANK IN AGITATION, FLORES MILL

cones. The sand-collecting tanks are 28x5 ft. deep, and hold about 90 tons of dry sand.

A collector is filled in 12 hours, after which it is allowed to drain for 12 hours; it is then discharged by shovel onto a 20-in. Robins belt conveyer, which raises the sand to the top of the 16 sand tanks (10

The strong solution used on the sand is made up with sodium cyanide to titrate 0.5 KCN. About six tons of solution are put on every four hours and allowed to drain. This treatment with strong solution lasts about five days; then continuous baths of weak solution titrating 0.1 KCN are added for two days; finally, after

of lime per ton of ore crushed is added at the battery. Lead acetate is also added to the solutions to prevent "fouling." The strong solution goes to the strong-solution zinc-boxes and the weak-solution baths to the weak-solution boxes. When the new sand tanks are in operation the time of the sand treatment

will be lengthened, and then possibly the strength of the strong solution will be reduced.

SLIME TREATMENT AT JESUS MARIA

The slime from the Dimmick classifiers goes to nine Callow thickening cones. The thickened slime flows to one of the 20 slime tanks, having cone bottoms; these are the only cone tanks in the Guanajuato district. The tanks are 20 ft. diameter, 5 ft. deep to the cone, and the slope of the cone is 45 deg. These cone tanks are arranged in two rows of 10 each, and are

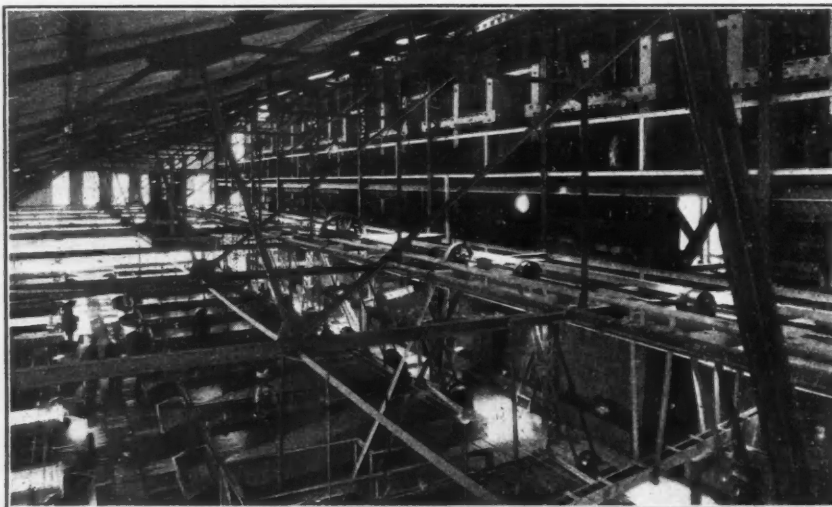
slime treatment. Sufficient lead acetate and 10 kg. of lime are added in order to protect the solution. The slime tanks take 12 hours to fill; then after the solution is made up the charge is agitated for 18 hours. The second agitation lasts six hours and the third wash four hours in solution titrating 0.1 KCN; each intervening settling-decanting period takes about eight hours. At present no water wash is used, but when the ore is crushed in cyanide solution, a final water wash will be given, and the agitation periods will be greatly lengthened.

is caught in a Perin filter-press having 24 frames 20 in. square and making 1-in. cakes. After being dried the precipitate is fluxed and melted in graphite crucibles, the first bars being remelted. About 360 tons of strong solution and 870 tons of weak solution per day are precipitated. The mill is crushing between 260 and 300 tons of ore per day.

THE BUSTOS MILL

The Bustos mill, belonging to the Guanajuato Reduction and Mines Company, which was designed by the manager, Charles W. Van Law, has the peculiar feature of having the mill and cyanide plant far apart. The Bustos mill is in a dry gulch near the mines; the cyanide plant, called the Flores mill, is on the Guanajuato river where there is sufficient water to carry away the tailings. The pulp is conveyed from the Bustos to the Flores mill by an 8-in. bell and spigot cast-iron pipe 5440 ft. long.

The mill when first started, March 1, 1906, had only 80 stamps but during the last year the capacity has been increased to 500 tons per day by adding 80 stamps, another Abbé tube mill, and more Witley and Johnston tables. The ore treated, since it comes at present mainly from the mine dumps, is low-grade, and is therefore hand picked both at the mine and at the mill. Women, paid 50 centavos per day, do this work; traveling belts are used in both cases.



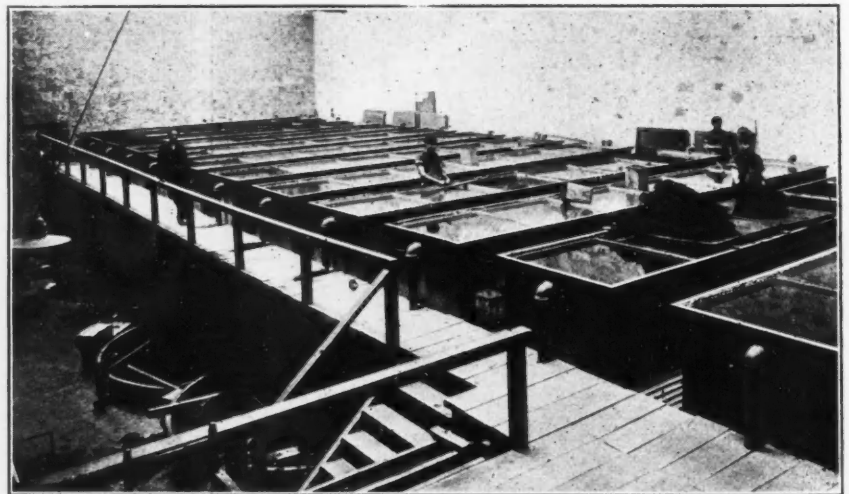
STAMPS AND CONCENTRATING TABLES, BUSTOS MILL

staggered so that the main 3-in. feed pipe passes just over the inside edge of all of them. This feed pipe fills the different tanks through branch pipes passing into a 10-in. charging tube extending down the side to the bottom of the cylinder, allowing a fairly clear overflow to be obtained while the tank is charging.

The slime is agitated by an air jet in the apex of the cone. A pressure of from 14 to 20 lb. per sq.in. is used for agitating these tanks and a good agitation is obtained. While the air is probably not so effectively used as in the high Pachuca tanks and the agitation is not so positive, still the large diameter of the tank allows of rapid settling and decantation so that complete dependence is not necessary on a filtering system as in the case of the Pachuca or more properly the Brown tank.

The overflow from the tank that is being charged is returned to the mill circulation. The slime, after its treatment which at present lasts 50 hours, is sent to large settlers 28 ft. deep whence it is discharged when it contains from 62 to 65 per cent. moisture. But as soon as the filter press is installed the settlers will be abandoned and the slime treatment lengthened to 75 hours.

As soon as the slime tank has received its charge, the strength of the solution is increased by adding sufficient sodium cyanide to make it titrate 0.1 KCN, the standard strength of solution used in the



PRECIPITATION ROOM, FLORES MILL

The strong solution and the washes from the sand tanks go to the strong-solution head tanks which feed through butterfly valves to 12 strong-solution zinc-boxes; the weak solution and the washes from the slime tanks go to the head tanks feeding to the six weak-solution zinc-boxes. Each of these precipitation boxes has seven compartments, 30x20x20 in. in size. The precipitate during a clean-up is washed through a 60-mesh screen so as to separate the short zinc which is returned to the boxes and placed between layers of the long zinc. The precipitate

The crushers are placed in a separate crusher house and the ore is conveyed by an inclined belt conveyer to the mill building, constructed entirely of steel. After being broken in a large gyratory crusher, the ore is hand picked, and then after passing over a grizzly is recrushed in another gyratory crusher to 1½-in. size. The ore is then conveyed by an inclined belt conveyer to the steel battery bins having a capacity of 2500 tons. The 160 stamps are arranged back to back with the bin between. The stamps, weighing 1050 lb., make 100 drops, 7½ in.

high, per minute; the mortar box is of the El Oro type and weighs 9000 lb. One-fourth of the batteries are using 20-mesh and the rest 26-mesh, No. 28 wire screens. The battery pulp, after going to settling cones to insure a thick feed, is concentrated on 32 tables all of which, with the exception of one Overstrom, are Wilfleys. The sand and middlings, amounting to 35 per cent. of the total tonnage, are recrushed in two Abbé tube mills fitted with silex linings and in which pebbles are used entirely for grinders, and then are reconcentrated upon 18 Johnston tables. The tailings then go to large cones, 20 ft. diam., where about one-half the solution (for crushing is done in solution containing 0.07 to 0.1 KCN) is removed as overflow and returned to the mill circulation, while the underflow is conveyed by the pipe-line, having a 2¼-per cent. grade, to the cyanide plant. In this pipe-line there is considerable agitation of the pulp in the solution; consequently there is some solution of the metals, especially in the case of the slime, during the passage through the pipe.

FLORES CYANIDE PLANT

The pulp from the pipe-line goes to two 8-ft. cones; the underflow from each of these large cones goes to four 4-ft. cones, where the pulp is separated into sand and slime. The sand is charged by a two-arm Butters-Mein distributor into one of three 40x8-ft. collecting tanks, having an ordinary filter bottom and slatted, central, overflow-box. The slime in the sand together with the finest sand is washed with a hose down the central box, and is then elevated by means of an air-lift pump to another series of cones where the slime and fine sand are reclassified. It takes about 36 hours to fill these tanks; they are allowed to drain 24 hours; then they are discharged onto the conveying belt which takes the sand to a Blaisdell tripper and stacker. This charges the sand into one of 15 leaching tanks, 40x8 ft. in size, having a capacity of 350 tons of dry sand. In these treatment tanks the sand is given a 20-day treatment under a 7½-ft. leaching column.

Once every 18 hours for 17 days the sand is given a bath of strong solution, titrating 0.4 per cent. KCN, the valves being closed for two hours after each bath to give good contact. At the end of that period the sand is given a continuous water wash for two days; finally, after the tank has drained for 24 hours so that the moisture is reduced to 13 per cent., the sand is sluiced out of the tanks.

The Blaisdell tripper works well. Two are used, one over each line of sand tanks. One of these is the original tripper designed at the plant and in operation before the company learned that the Blaisdell company manufactured an almost identical machine. The beaters on this

machine, operated through gears by the conveying belt, break up the sand and throw it into the tank; the only shoveling necessary is that required to level the



SEPARATING CONES AND SLIME COLLECTING TANK, FLORES MILL



SLIME TANK, CHARGING BOX; LAUNDRER USED FOR PUMP CIRCULATION; FLORES MILL

small pile of sand that forms in the center of the tank.

The slime from the classifiers flows to two of 13 slime tanks, 36x12 ft. in size,

having a capacity of 60 tons of dry slime. The slime flows into these tanks through a charging column consisting of an open-bottom box, 18 in. square, extending down two-thirds of the depth of the tank and inside of which is placed a perforated wooden box 10 in. square, having a tight bottom. This allows the bubbles of air which are the main cause of disturbance in the pulp to pass out between the two boxes without disturbing the settling.

The clear overflow from these tanks, during their 12 hours of charging, is pumped back to the mill circulation. After the slime-collecting tank is filled, about 6 in. of solution is decanted off; then the solution is made up to 0.14 per cent. KCN and agitation begins. The slime treatment lasts 72 hours.

Agitation is obtained by rotating arms and by means of a 6-in. Butters pump which takes the pulp from the bottom of the tank and delivers it to the top. A 1-in. air pipe is also used to aerate the solution during agitation. The pulp is diluted 6 to 1. The first agitation, during which most of the gold and silver is dissolved, lasts 12 hours; then the solution is settled and decanted for 16 hours. The second agitation lasts two hours; second settling and decantation, 12 hours. The third agitation, two hours; settling, decantation and discharging takes 14 hours. The pulp goes to one of three settling tanks, 18x22 ft. deep, where the slime is again settled and more solution decanted. This settled pulp, containing 66 per cent. moisture, is sent to the Butters filter. But since the filtering capacity of the plant is too small to handle all the pulp, one of the other deep tanks is used as a continuous settler; the third deep tank, fitted with cocoa-matting barriers, is used for clarifying decanted solution.

The Butters filter has 75 standard-size leaves; it makes 16 cakes and filters 160 tons of dry slime in 24 hours. Consequently, as has been said, some of the slime has to be discharged from the third settler without filtering. An 8-in. Butters pump is used in connection with the filter; all valves are quick-acting lever valves, so that the Mexican labor can operate them rapidly. The length of wash is 15 min., but the slime cake from the Butters filter assays only 5 grams silver per metric ton higher than the laboratory-washed slime; the cake assays 15 grams silver less per ton than the slime discharged from the settling tanks. The pulp discharged from the Butters filter contains 41 per cent. moisture, part of which, of course, is water from the wash.

The solutions are precipitated in 15 zinc-boxes each having six 4x4x3-ft. compartments; five of these are for strong and ten for weak solution. In cleaning up, the precipitate is washed through a 40-mesh screen, and the shorts put back between layers of shavings in the first compartments of the strong-solution boxes. The

slime goes to a Johnson filter-press where the cake is slightly dried by compressed air before the press is cleaned.

This cake of precipitate, containing approximately 50 per cent. moisture, is mixed wet, so as to avoid dust losses, with a flux containing 15 parts borax, 12 parts soda, and 3 parts silica; no trouble from boiling over is experienced. A Morgan clay-lined crucible is used; this costs 5 pesos less than a graphite crucible, and it lasts 1½ times as long. The pots are poured directly into the bar molds; the bullion is not remelted as is done at the other mills at Guanajuato. Both on this account and because of not drying the precipitate before mixing, a considerable saving in fuel is made. In pouring, the bar mold is placed on top of the first cone, so that slag overflows from the mold into this cone which has a clay-plugged tap hole in its side. The slag is allowed to stand in this cone for about 10 min., during which time a 2-in. shell forms; then the tap hole is opened, and the molten slag from the interior allowed to run off. By experiment it has been found that the 2-in. shell contains nearly all the matte and fine shot, but to guard against loss this slag is saved. When 10 tons have accumulated, the slag is returned to the stamp mill. The shell of matte and shot as well as the button of bullion that has formed in the bottom of the pot are mixed with some subsequent charge. The bullion obtained assays 860 fine.

The mill, as has been said, is treating 500 tons of ore per day, but as 50 per cent. of the ore at present comes from old dumps the heads are low-grade. The pulp from the mill consists of about 240 tons slime and 260 tons sand per day.

The extraction obtained on the tables is not so high as at some of the other mills, for the concentrates contain only 28 per cent. of the silver and 31 per cent. of the gold in the ore. The total extraction obtained by concentration and cyanidation is 86 per cent. on the silver and 88 per cent. on the gold, this being the average for the four months ending June 1, 1908. The cyanide consumption is 860 grams of sodium cyanide per metric ton of ore, the cyanide consumption having been cut practically in half by crushing in solution and filtering the slime. The slime and sand discharged assay less than 30 grams silver per metric ton. The cost of milling and cyaniding, including all charges, is only 3.15 pesos per metric ton.

The zinc concentrates exported from New South Wales come mainly from the Broken Hill district; in 1907 these were valued at £536,620, this being a considerable increase over the production in 1906.

The production of antimonial lead in the United States during 1907 by lead refiners was 9614 tons, as compared with 10,120 tons in 1906.

The British Institution of Mining Engineers

SPECIAL CORRESPONDENCE

The Institution of Mining Engineers has been holding the annual meeting this week in Edinburgh. An important paper, entitled "Coal Dust to Date and its Treatment with Calcium Chloride," was read by Henry Hall, inspector of mines. He recommended the application of calcium chloride to roads in mines, preferring this method of laying dust to water sprinkling. The cost per 100 ft. over a width of 9 ft. would be about \$1.04. In the discussion it was suggested that salt might be used in place of calcium chloride to save expense, but Mr. Hall said that the useful effect of salt was only 10 per cent. as compared with 90 per cent. from using calcium chloride.

Another interesting paper was read by George Blake Walker on "The Practical Use and Value of Colliery Rescue Apparatus and the Organization of Rescue Corps in England." In order that rescue apparatus, which depended on chemical reactions, should be efficient, it was recommended that such apparatus should be frequently examined by independent officials, and should not be left to the mine staff who might get careless about keeping the apparatus in perfect order. The question as to whether the rescue corps should be raised from employees in a colliery or whether they should be specially organized to serve a district was also considered. Experience has shown that rescue apparatus used by trained men may be of the greatest value in cases of explosion or of fire in mines. What is now required is that rescue work shall not be left to amateurs, and that in every colliery or in every colliery district there shall be a trained body of men drilled to undertake this dangerous work; otherwise the number of victims in a disaster may be increased rather than diminished. The committee recommended that the headquarters of the Institution shall be moved from Newcastle to London. The society is mostly composed of coal-mining engineers and the removal of the headquarters from the coalfields must carry some disadvantages. It is, however, urged that important interests of the society, such for instance as those connected with legislation, would be better served by having the headquarters in the capital.

The Institution of Mining Engineers represents the coalfields of Scotland, the north of England and the Midlands, but the Welsh coalfields are not at present affiliated. The influence of the society would, of course, be far greater if it was representative of all the coal-mining districts instead of only a portion of them, and some scheme of amalgamation seems desirable in the interests of the industry. The Institution of Mining Engineers

must not be confused with the Institution of Mining and Metallurgy which embraces both coal and metalliferous mining engineers, but principally the latter. That institution has always had its headquarters in London.

Sault Ste. Marie Canal Traffic

The depression in the iron industry is reflected in a striking way in the water-carried traffic from Lake Superior. The official returns give the total freight passing through the Sault Ste. Marie canals for the season to Sept. 1 as follows, in short tons:

	1907.	1908.	Changes.
East-bound.....	25,608,655	13,778,509	D. 11,825,146
West-bound.....	7,922,733	6,493,395	D. 1,429,338
Total.....	33,526,388	20,271,904	D. 13,254,484

The decrease in east-bound freight was 46.2; in west-bound, 18; in the total traffic, 39.5 per cent. The number of vessel passages this year was 8333, showing an average cargo of 2434 tons. The mineral freights included in the totals were as follows, in net tons, except salt, which is given in barrels:

	1907.	1908.	Changes.
Coal.....	7,165,877	5,896,876	D. 1,269,001
Iron ore.....	22,485,323	11,767,874	D. 10,717,449
Pig and manuf. iron	187,908	186,275	D. 31,633
Copper.....	42,497	51,839	I. 9,349
Building stone.....	320	1,019	I. 692
Salt, bbl.....	276,267	339,056	I. 62,789

Iron ore was 58.1 per cent. of the total tonnage this year, and coal 29.1 per cent.; against 67.1 and 21.3 per cent., respectively, in 1907. The iron-ore traffic was the lightest for several years, being only a little over one-half of that reported last year.

Gold Mine of British India

The total output of the Kolar district in Mysore, India, in August was 43,766 oz. bullion, a decrease of 149 oz. from July. The monthly productions this year have shown only slight variations. For the eight months ended Aug. 31 the total was 350,244 oz. bullion in 1907, and 348,834 oz. in 1908; a decrease of 1410 oz. only. The bullion reported this year was equal to \$6,489,367, or 313,951 oz. fine gold. Nearly all the gold won in the Kolar field comes from five large mines, the August returns from which are: Mysore, 17,544 oz.; Champion Reef, 10,038; Ooregum, 6994; Nundydroog, 6961; Balaghat-Mysore, 2034. About 15 per cent. of the gold production was obtained by cyaniding tailings from the stamp mills.

An authority states that arsenical copper should never be heated above 750 deg. C. in any part of the rolling process, whereas ordinary refined oxidized copper with 0.1 to 0.2 per cent. oxygen can be heated to 900 deg. C. without injury.

Richards Pulsator Jigs and Classifiers

A New Principle in the Separation of Minerals, Employing Rapid Pulsations, in One Direction, of Water Delivered under Pressure

AN IMPORTANT DEVELOPMENT

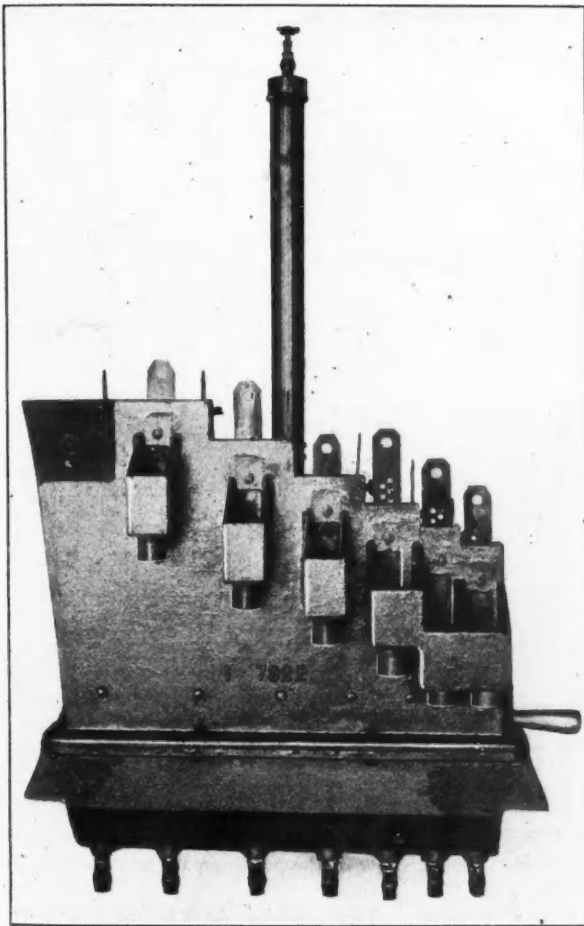
The Denver Engineering Works Company is placing upon the market new types of jigs and classifiers embodying an interesting and remarkably effective principle discovered by Prof. Robert H. Richards, of the Massachusetts Institute of Technology, author of "Ore Dressing." The principle is not fully explained by the manufacturers, but the separation of the mineral particles in the remarkably small space employed seems to be accomplished by means of rapid pulsations, without re-

space as compared with its capacity. The use of the peculiar pulsating current of water renders it possible to make a single square inch of screen surface do the work of 200 sq. in. of screen surface in the ordinary jig.

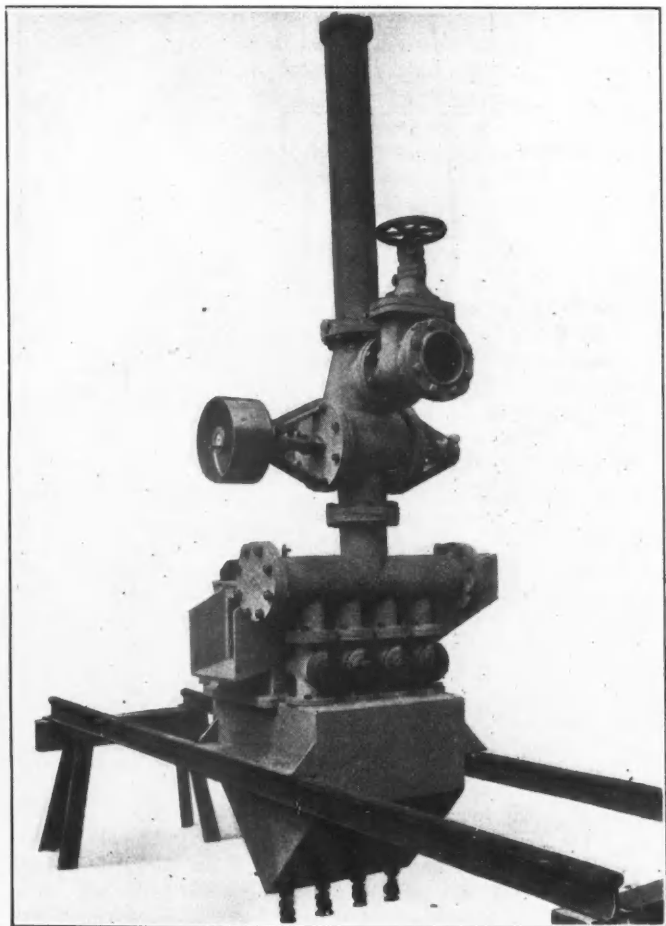
The 400-ton, four-compartment jig shown in the accompanying illustration occupies a floor space only 3x5 ft. The screen surface of the little machine which handles this enormous volume of mineral in 24 hours is only 6x14 in. in each

of this system of concentration will be described in a volume which will be issued as an appendix to "Ore Dressing."

Although very unlike the ordinary jig in appearance, Prof. Richards' machine is only a modification of the Harz jig retaining all the essential features. It has no plungers and eccentrics, but it employs pulsations through a bed resting upon a screen as in the ordinary machine, the character of the pulsations and the method of producing them being the



RICHARDS CLASSIFIER, INVERTED TYPE



RICHARDS JIG, SHOWING PULSATOR VALVE AND MANIFOLD

turn flow, produced by repeated interruption of a current of water under pressure.

The Richards pulsator jig is made entirely of iron and is so small in comparison with Harz machines of the same capacity that it has the appearance of a toy. It is not claimed that the new jig can do cleaner work than the ordinary jig, but it is claimed that it will use much less water and occupy a remarkably small

space of the four compartments. The 90-ton Richards jig has four screens each 4 in. square or a total of 64 sq. in.; Harz jigs of 90-ton capacity would have 24 screens, each 17x30 in. or a total of 12,000 sq. in. The water used in the new jig is about 1000 gal. per ton of mineral, while the ordinary Harz jigs require 4700 gal. per ton of ore treated.

The elaborate series of experiments which furnished data for the development

new feature. It has practically no hutch product, but its division into compartments, and its method of feed and discharge are the same as in the ordinary jig. Instead of the plungers which produce the pulsations upon the screen of the Harz jig, the Richards machine has a rotary valve of peculiar design which imparts pulsations to a current of water supplied under a head, for ordinary ore, of about 30 ft. Although its compartments

are so small the Richards jig carries twice the depth of bed employed in the ordinary jig. The usual depth of bed on the screen of a Harz jig is about 4 or 5 in.; the new jig carries from 8 to 12 in. of mineral, which is claimed to be a great advantage, obviating the necessity of frequent readjustment under varying conditions.

METHOD OF OPERATION

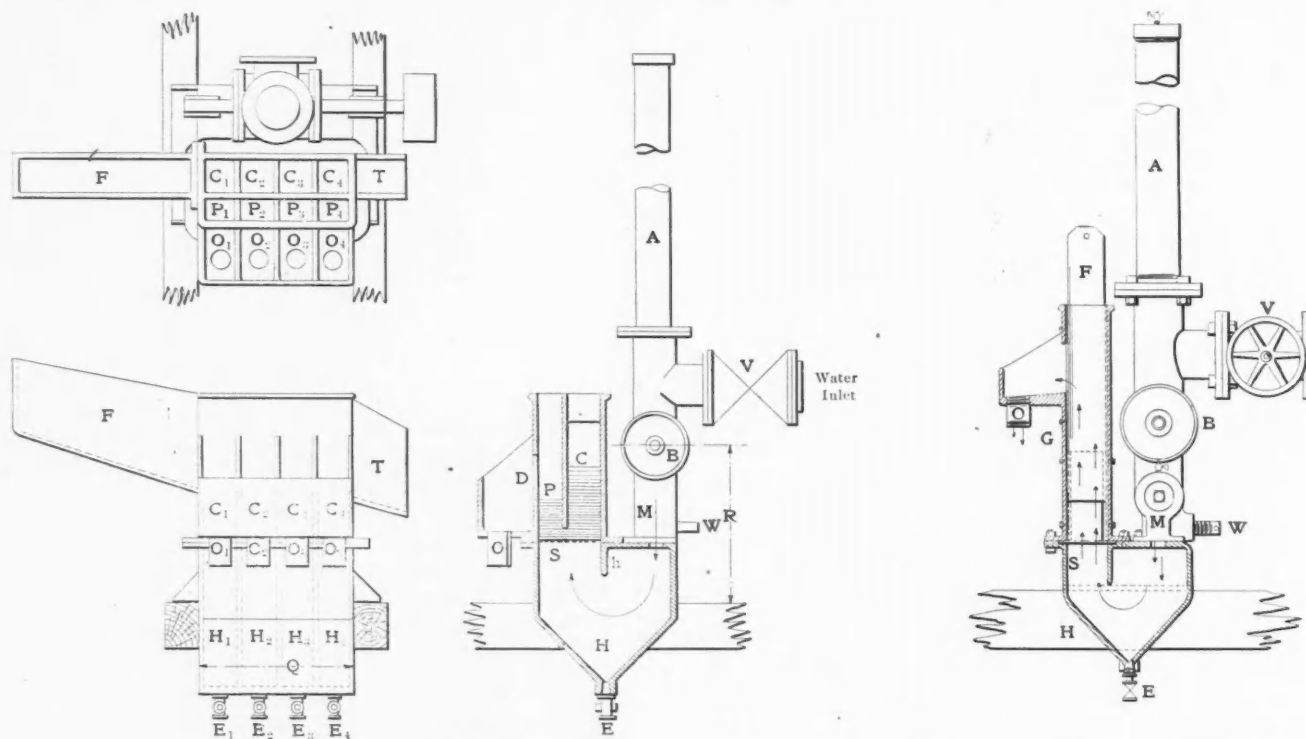
In the accompanying illustration showing the four-compartment 90-ton jig in plan, elevation and section, the hutch *H* has the usual form, and the screen *S* is placed as in the Harz jig. The dividing plate between the pocket *P* and the compartment *C* acts as a seal or gate for the concentrates. The opening *D* is adjustable by means of vertical sliding gates

suction or reverse impulse of water to cause a blinding of the screen and to undo the separation performed in the upstroke.

In general, the feed to the Richards pulsating jig should be screen-sized to the same ratio of maximum and minimum particles as for successful treatment in ordinary jigs. No exhaustive experiments have yet been made to determine the limits of sizing for the pulsating jigs. The 90-ton four-compartment jig, which has been in successful operation in one of the largest concentrating mills in Montana, is fed pulp not finer than one millimeter. It is believed that the smaller jigs will treat still smaller material but no trials on a commercial scale have been made. The maximum size treated in this jig is $\frac{4}{10}$ in. Material as coarse as 1

which the current velocity is lowest, and the heavier particles passing under gates from compartment to compartment and being discharged through side gates placed at successively lower elevations above the screen and bed.

It is the inverted type that embodies the most radical departure from the ordinary classifying apparatus. The pulsations in the current of hydraulic water are produced in the usual way by means of the pulsator valve. The pressure at which the water should be delivered depends upon the size and specific gravity of the particles of ore to be treated. A head of 30 ft. is required for copper ores carrying $2\frac{1}{2}$ -mm. grains, or for galena ores carrying 2-mm. grains, while a head of 15 ft. will suffice for ores in which the coarsest grains are 0.75 mm. in diameter (about 20-



RICHARDS JIG; PLAN, SECTION AND ELEVATION

VERTICAL SECTION, RICHARDS CLASSIFIER

to control the discharge. The manifold *M* distributes the water supplied through the valve *V* to the four compartments of the jig. The revolving pulsator valve *B* corresponds to the plunger of the ordinary machine. The screens are formed of two layers of brass-wire cloth, the lower one of four-mesh and the upper of 20-mesh cloth. The fineness of the screen prevents the separation of a hutch product except in unusual cases, all the concentrates being discharged through the side gates.

The pulp rushes through the small compartments at great speed, and the separation is effected in an incredibly short space of time. The relatively enormous capacity of the new jig is ascribed to the fact that the water pulsations are all in the same direction, upward through the screen. There is no

in. can be treated in the larger 9x14-in. jigs.

PULSATOR CLASSIFIERS

The Richards classifiers embody a more radical departure in principle from the conventional spitzkasten and cone than is the case with the new and the old jig. There are two types of the Richards classifier, both employing pulsations to effect hindered settling. In the direct type the pulp enters at the top of the series of compartments, the lighter particles being lifted over the separating diaphragms, and the velocity of the current being greatest at the feed end. The action is, therefore, similar to that of the spitzkasten except that the pulsations effect a more rapid separation. The inverted type employs a screen and bed, like a jig, the pulp being fed into the bottom of the chamber in

mesh). Below the rotary pulsator valve is a manifold *M* which distributes the water to the several compartments of the machine. Individual valves *W* control the flow of the pulsating current to each compartment.

The machine has a hutch extending below the feed spout and divided by transverse walls into several compartments. The pulsating stream of water passes through the hutch of each compartment upward through the screen. The length of each hutch compartment and corresponding classifying compartment is greater than that of any succeeding compartment, and the width of all compartments except the last is the same. Consequently the velocity of the pulsating stream of water will be relatively low at the first sieve and high at the last.

The dividing walls between the six

classifying compartments are provided with adjustable gates above the screen. The ore is fed into the feed hopper, which is also provided with a hutch and screen. Here it encounters a rising pulsating current of water which serves to agitate the ore, placing it in partial suspension and preventing clogging. From the feed hopper it passes below the gate into the first classifying compartment where it encounters a pulsating current rising slightly more rapidly than that in the hopper. This current further agitates the ore, lifts out and raises to the discharge opening the lightest particles. The heavier particles pass beneath the gate into the next compartment where the lifting power of the pulsating current is again stronger, removing the particles next in order in weight.

This process is repeated successively until in the last compartment only the heaviest particles remain. In case the ore contains particularly heavy particles the current in the last compartment may not be sufficient to lift all of the ore to the

used. Assuming that these two spitzkastens are set side by side, the comparison between the dimensions and weight and those of the Richards classifier would be as shown in the accompanying table:

In these figures the height of the air column on the Richards classifier is not included, since this portion of the machine occupies a space which would otherwise be unused.

The Richards pulsator classifier has already been adopted by about 20 well known companies, including the Boston & Montana Consolidated Copper and Silver Mining Company, Great Falls, Mont., the St. Joseph Lead Company, Flat River, Mo., and the Federal Mining and Smelting Company, Wallace, Idaho. Not only is a relatively great capacity claimed for the machine, but it is also said to effect a great increase in the capacity of vanners and tables treating the classified product. At one installation five reciprocating tables and one vanner are sufficient to handle daily 200 tons of ore crushed to pass 2½ mm. and classified by a Richards machine.

have been the custom on the Baltimore & Ohio to deliver such empty cars to the companies owning them, and not to count them in making up its assignment of cars to the various coal companies on its line. The Court of Appeals holds, in effect, that such a method constituted undue discrimination under the terms of the law. To make an equitable division, all cars handled must be counted, no matter what their ownership, and the distribution must be made *pro rata* to all the mines, on the same basis; no difference to be made to those mines owning their own cars.

Commenting on the requirements of the law for equal treatment and service, the decision says: "This is a wise provision, and in the absence of such legislation a common carrier could build up one class of shippers and utterly destroy and tear down another. The statute puts upon the carrier the plain duty of furnishing a fair and equal distribution of car facilities, and this duty cannot be evaded by the carrier claiming that it is not the owner of a portion of the cars carried over its lines.

"If a carrier by contractual arrangement operates individual cars belonging to mine owners such arrangement cannot relieve the carrier of the duty of furnishing equal facilities to all shippers similarly situated. To adopt any other rule would make it possible for wealthy mine owners to purchase car equipment and utilize car equipment to such an extent as to practically deprive other mine owners of means of transportation.

"The defendant mine owners insist that in the purchase of individual cars they have expended large amounts of money, which become a part of their investment, and should be treated as such, and it would be unfair to require a carrier to charge such cars against the percentage, but this is a matter which cannot be considered, inasmuch as the statute was not enacted for the purpose of promoting the interests of any one mine owner. There is nothing in the act prohibiting a carrier from making any arrangement it may choose regarding the ownership of cars operated on its lines, but the carrier cannot make such arrangements as will by indirection accomplish that which is in violation of the statute."

COMPARISON OF RICHARDS AND HARZ JIGS, CAPACITY 90 TONS PER DAY.

Type of Machine.	Number of Machines Required.	Floor Space.	Weight.	Water.	Number of Places to Lubricate.	Horse-power.	Screen Area.
Richards..	1 Single 4-Comp.	8 sq.ft.	1,500 lb.	80,000 gal.	1	1¼	64 sq.in.
Harz.....	3 Double 4-Comp.	530 sq.ft.	30,000 lb.	425,000 gal.	60	6	12,000 sq.in.

COMPARISON OF RICHARDS CLASSIFIER AND SPITZKASTEN FOR A DUTY OF 150 TONS PER 24 HOURS.

	No. of Products.	Total Weight.	Length Over all.	Height Over all.	Maximum Width Over all.	Maximum Fall: Feed to Lowest Delivery Point.
Richards Pulsator Classifier..	6	2,000 lb.	6 ft.	3½ ft.	2½ ft.	2 ft.
Spitzkasten.....	4	17,400 lb.	40 ft.	9 ft.	25 ft.	9¾ ft.

discharge opening. In this event a plug and spigot are used to remove the concentrates. All gates and discharge openings are adjustable. The sieve serves merely to support the bed of ore and to admit the rising current of water; it has no part in the classification. Particles of free mineral heavy enough to settle against the current and small enough to pass through the screen openings may find their way to the bottom of the hutch whence they may be drawn off through spigots. In general the number of particles which find their way through the screen are few and the hutch need not be drained oftener than once a day.

CAPACITY AND SIZE

The standard 4-in. six-compartment pulsator classifier has a capacity of 150 to 200 tons of ore in a properly thickened pulp per 24 hours. It delivers six different classes of product. Standard spitzkasten are seldom used for more than four different classes of discharge. One spitzkasten handling 150 tons would be of prohibitive size, and in practice two machines, each handling 75 tons per 24 hours would be

It is also claimed that the introduction of the classifier in this installation effected a reduction of the loss in the tailings of exactly one-half.

Coal Car Distribution and the Ownership of Coal Cars

A case of importance to many coal companies was decided by the United States Circuit Court of Appeals at Richmond, Va., Sept. 17. The complainant in the case, the Pitcairn Coal Company, brought charges against the Baltimore & Ohio Railroad Company of discrimination in the distribution of empty cars to coal mines on its line. The complaint was supported by the Interstate Commerce Commission, but its action was practically set aside by the district court, to which an appeal was taken. On further appeal the higher court now reverses that decision and supports the original charges of discrimination.

Stripped of its technicalities, the main point at issue related to the ownership of cars by coal companies. It appears to

West African Gold Production

The West African Chamber of Mines reports gold production in August at 25,195 oz. bullion, being 608 oz. more than in July, and 169 oz. more than in August, 1907. For the eight months ended Aug. 31 the total production was 194,385 oz. bullion in 1907, and 199,401 oz. in 1908; an increase of 5016 oz. The bullion reported this year was equal to \$3,871,450, or 187,298 oz. fine gold.

Operating a Nova Scotia Coal Mine

Rules Governing Shot-firing Are So Efficient, When Rigidly Enforced, that 150,000 Shots Have Been Fired without Causing an Accident

B Y H. E. C O L L *

Owing to the large number of seams worked, and the dips ranging from flat to 80 deg., no two mines in the Pictou county field are worked alike. We also find in each mine different methods of working the coal. This is due to local ridges and basins accompanied by pinches and rolls, which necessitates some modifications of the general method.

The highest bed worked in the field is the MacKay seam, from which the Nova Scotia Steel and Coal Company obtains 150 tons per day at the Marsh mine located about the center of the eastern section.

The next seam in the series is the one worked at the Vale mine, of the Acadia

field, in a southwesterly direction with an average grade of 6 degrees.

The coal is 3 ft. 6 in. high, and has practically no parting on either top or bottom. It is hard and tightly set, and contains no bands or impurities. The roof is flinty shale up to 2 ft. 6 in. thickness, and parts readily. Lying above this is a splinty shale, from 10 to 20 ft. in thickness. This crushes and squeezes on the least pressure from the upper strata, and as there is 700 ft. of cover on the dip workings, the pressure is considerable. Levels are driven off the main dip, to the left and right at intervals of 600 ft. When the levels are driven in 400 ft., the first balance is driven up directly on the rise of the coal, and

from there is hauled by horses in trips of six boxes, to the level landing.

The diameter of the brake drum is dependent upon the length of the balance, angle of dip and weight of box to be handled. They are built up with segments of 3-in. spruce, having beveled edges so as to make close joints. In the center of the drum is a 3-in. hardwood flange which keeps the two ropes separated, and on the cage end of the drum is placed the brake band. The balance box has a 10-in. track gage, and is made of two 4x1-in. bars bent so as to form a carriage which carries sufficient cast-iron weights of 125 lb. each, to overbalance the empty box. The frame is mounted on 12-in. wheels so that



ALLAN SHAFT AND TIPPLE OF ACADIA COAL COMPANY, STELLARTON, NOVA SCOTIA

Coal Company, located at Thorburn; as these two seams are worked by the same methods a description of the latter will answer the purpose.

A slope was driven on the dip of the coal, at 29 deg. for the first 500 ft., and then flattening off until at 2400 ft. a local basin was reached and the main landing put in. As development continued, it became apparent that other basins existed to the right and left, and slopes were driven down to run this coal. That on the right-hand side is about worked out, but on the left side recent work has proved that this slope is on the main dip of the

bords or rooms are turned off and driven on 50-ft. centers. These bords are from 200 to 300 ft. deep, and as soon as driven in, the pillars are started back.

METHOD OF CONVEYING THE COAL

The coal is lowered to the level from the bords by a cage, which is balanced on a drum by a carriage containing sufficient weight to pull an empty box. The drum is controlled by a brake, operated by a boy. When the cage lands at a bord, the empty is shoved into the bord and turned over on its side and the loaded box pushed past onto the cage. The brakeholder lifts the brake and the cage lowers to the level, where the box is run into the turnout and

the weight travels very close to the rails.

The wagon, or, as it is locally termed, "box" used, weighs 750 lb. and holds 1540 lb. of coal. The level landing holds 12 loads, or two horse trips. On the main dip a pair of "Lidgerwood" 10x12-in. friction-drum engines operated by compressed air, haul the boxes in trips of 12, up to the main landing, a distance of 3000 ft. From here the boxes are hauled by horse 700 ft. to the main landing, where they are attached in trips of six to the main slope ropes. The main dip faces are now $1\frac{1}{8}$ miles from the slope mouth.

HOURS OF LABOR

All mine employees are lowered into

*Mining engineer with Acadia Coal Company, Ltd., Stellarton, Nova Scotia.

the mine between 6 and 6:50 a.m. Each "rake" takes eight minutes to land at the bottom of the slope. The average time the miners and loaders reach their faces and are ready to commence work is 7:15 a.m. Owing to the size of seam, method of mining and local conditions, the miner leaves but little coal from the previous day, so that by the time he gets the first box landed it is 8 o'clock.

Only one miner and loader work at each face, and they mine and load an average of four boxes in the morning and three in the afternoon. The miner quits about 2:30 p.m., leaving one box of coal for the loader to fill out and making his actual working time at the face 6¾ hours, and the loader's time, 7½ hours. During this time the miner cuts an average of 0.68 ton per hour, and the loader fills 0.61 ton per hour, making a total for the day's work of 4.6 tons of coal. Taking the average for 1907, the miner had an earning capacity of 34c. per hour, and the loader 22c. per hour.

which have convinced both management and miners that there is no comparison between the usage of black powder and a high explosive. The latter is used in an average charge of 6 oz., and is fired with a No. 6 low-tension detonator, by a battery placed in the nearest crosscut. A misshot is extremely rare, but when it does occur, the rules in force fully protect the miner. The powder has the following composition:

	Parts by Weight.	
	Maximum.	Minimum.
Nitrate of ammonia.....	82	78
Nitro-glycerin.....	11	9
Wood meal (dried at 100 deg. C.).....	10	8
Moisture.....	2½	1

The following regulations governing the use of explosives have been adopted by the Acadia Coal Company and have been approved by the Mines Department of Nova Scotia.

POWDER RULES

1. When a miner holding a shot-firer's certificate is given permission to fire his

shot after it fires, and if he should find that the shot has lighted a blower of gas, liberated a quantity of gas or disturbed the roof or timber and caused danger beyond his control, to either extinguish, repair, or make safe, he shall immediately notify some official at the time in charge of the mine or district in which he is working.

6. When a "bench" shot has been fired, the miner must immediately proceed to turn over the coal or load it out.

7. If the shot fails to go off, no person shall be permitted to enter to the working face, until such time as he receives permission from and is accompanied by the examiner of that section.

8. No holes shall be charged for a longer period than 30 min. before being fired.

9. If, owing to an insufficient charge of powder, a face shall be "hung up," all the coal to the depth of that shot must be mined out by hand-pick or machine, unless permission is given by the examiner of



THE VALE MINE OF THE ACADIA COAL COMPANY, THORBURN, NOVA SCOTIA

AMOUNT OF POWDER USED

Previous to this year, black powder has been used, the shots being fired by a squib. In January, a Government-permitted explosive was adopted after 6 months' experimenting with various explosives. The men made strong objection to any change as there was considerable difference in the price, but this was offset by the strength of the new explosive, and the result is shown by the following table:

	Black Powder.	New Explosive.
No. tons of coal per lb. explosive.....	1.424	3.09
No. tons of coal per wkg. face per day.....	4.938	4.60
Powder cost per ton of coal.....	12 cents	10½ cents

The difference in tonnage per working face was really due to more pillar work being done in 1907, thus reducing the amount of coal per pound of powder. The decrease in the cost per ton to the miner, together with the high increase in the factor of safety are the main features

own shots, before firing, he must carefully examine the place where the shot is to be placed, and if he discovers any noxious gases, defects in the roof, or danger from any other source, no shots must be fired until such danger is removed.

2. No shot must be fired until the face is either sheared, mined, or undercut, not less than 3 ft. deep, the full size of the place, or having an open end equal to the same, without special permission.

3. No shot must be fired when the borehole used for firing extends beyond such mining, shearing, undercutting, or open end. All holes found beyond such mining, shearing, or open end, will be termed fast shots.

4. No shot must be fired with the timbering at a greater distance from the working face than 8 ft., or closer if required by the management, or by a special permit that timbering may be a greater distance from the working face.

5. He must return immediately to each

that section to drill and fire another shot.

10. No miner or shot-firer shall leave any charged hole in his working face when quitting work for the day.

11. No person shall drill any hole in such manner that when fired it will be liable to shoot into either roof or bottom of the coal seam.

12. If a miner, at any time before or after firing a shot, finds that any timber requires to be set or replaced, he must not leave the place until such requirements are duly executed.

13. He shall also set sufficient hoisting props when required to do so, and to work his place in a safe and proper manner.

14. In firing shots with a battery, the wires shall be first connected to the fuse wire, and the connection to the battery shall be made only by the person who has made the connection to the fuse wire.

15. Every precaution must be taken to

insure each person being in a safe place before any shot shall be connected up to a battery.

16. No battery shall be tested or tried at any point outside of the lamp station.

17. No batteries shall be permitted to be used by any other than one holding shot-firer's papers.

18. No person shall be permitted to fire shots without permission from the examiner or official in charge of the mine.

Over 150,000 shots have been fired since these rules went into effect, and so far not one accident has occurred in connection with the use of explosives. These rules are rigidly enforced, and any violation is immediately followed by prosecution under the Mines Act.

LONGWALL

During the past year two sections each of 600 ft. length of face, have been laid out for longwall working, and it is the intention to substitute this method for the bord-and-pillar as soon as possible. The greatest difficulty is in getting the miners to work longwall as they are unfamiliar with the method and are not inclined to take up anything new. The work has progressed far enough to prove that the coal can be mined with one-half the present amount of powder, and all the coal extracted, instead of the 85 per cent. which they are now getting. The intention is to allow the roof to bend and rest on the packing and prevent any actual break. A straight face 60 ft. long is being worked on the strike line and gates placed every 30 ft. deliver to a balance. It will probably be found necessary to bring over a number of English longwall miners in order to get the method firmly established.

WATER

The mine water amounts to an average of 350,000 gal. per twenty-four hours. This is handled by a pair of 12 $\frac{3}{4}$ and 22 $\frac{3}{4}$ x7x24-in. Knowles compound duplex pumps; steam driven and located on the 1800-ft. level, where also is located the main dam or sump. Into this latter, the 200,000 gal. from the east sinking pump is discharged. This latter sinking pump is a Knowles single pump, 18x8x18 in., and discharges through a 3-in. line 2000 ft. long. On the west side sinking, a 6x3x9-in. Cameron pump is located at the No. 6 level and acts as a relay to a 6x4x10-in. Jeanesville sinking pump placed at the No. 8 level. This water amounts to 50,000 gal. per twenty-four hours, and is pumped 5000 ft. against a head of 450 ft. All the sinking pumps are operated by compressed air. It is proposed in the future to establish a main pumping plant at the No. 6 level and drain all the west side water to this point by means of an open ditch.

The plant would be operated by either compressed air or electricity and would

discharge through a borehole to the surface, against a 700-ft. head. There would be an immense saving in doing away with the long line, for at present over half the water is pumped more than a mile to the surface.

LIGHTS

Safety lamps of the Muessler type are in use, but a new equipment of the Ackroyd & Best safety lamps having a magnetic lock and electrically ignited, is being installed. Strict rules are in force governing the use of safety lamps, and violations are prosecuted under the Mines Act.

MINE OFFICIALS

The mine officials consist of a mine manager, underground manager, two overmen, examiner and three shot-firers, or eight officials for 300 mine employees, giving an output of 450 tons per day. At first sight, this number of officials seems excessive, but as they are held responsible for the discipline of the mine and performance of work in accordance with the rules and regulations, any less number could not give adequate protection to the men and the company. Two of these officials are on night shift. That this safeguarding pays is shown by the fact that there has not been a fatality in this mine during the past five years. The Vale mine, like others in the district, suffers from the loss of time by the employees, which constitutes at the present time the most serious drawback to the coal-mining industry.

During 1907 the average number of days worked per month, per employee was 20, while the average number of days worked per month, per miner was a little less than 19. In other words they lost a full week each month, or each month equaled a loss in tonnage of 2428 tons. For the year 1907, the pay-day drunks, picnics and fishing trips cost the Vale miners, in wages lost, over \$20,000 and meant a 25,000-ton loss in production to the company. While this is bad yet the men at this plant are not such heavy offenders as at many other plants in the Province.

SURFACE PLANT

The boiler plant consists of three 200-h.p. Sterling boilers and one 50-h.p. tubular boiler. They are hand-fired, using culm coal, the hoist of coal per ton burned averaging 7.75 tons. The hoisting engines are 16x36-in. Walker build, geared 2 to 1 to an 8-ft. diameter drum, which carries two 1-in. by 2800-ft. ropes. The trips are hoisted at an average speed of 1000 ft. per minute. Ventilation is furnished by a 28-ft. diameter Walker fan, direct connected to a 24x24-in. Walker engine, giving 40,000 cu.ft. of air per min. on a water gage of 3 in. Compressed air is furnished by an 18x20 $\frac{3}{4}$ x24-in. straight-line Ingersoll-Sergeant compressor. This machine

never stops except for about six hours on Sunday.

On the bankhead, the coal is dumped over a bar screen and the nut and culm are taken out. The lump travels over a belt 30 ft. long by 5 ft. wide, and is cleaned of all stone and refuse before dropping into the car. The mine has a fairly steady market for run-of-mine, lump and nut. The worst of the culm is consumed for power at the plant. A railroad, six miles long, owned by the coal company, connects with the Intercolonial railroad, at New Glasgow.

Mining Exhibit at the Franco-British Exposition

SPECIAL CORRESPONDENCE

Within the city limits of London, having a population of about five million people who can reach the gates for 6c. or less, and enter for 25c., is an exhibition which is remarkable for the sincerity with which it portrays existing conditions. The result is a daily attendance beyond all reasonable expectation. An enormous crowd daily visits the exhibits from English and French colonial possessions and becomes better acquainted with the natural wealth of these newer countries, especially their mineral resources. Algeria exhibits the products of her mines, clays, building and ornamental stones. Australia has a great building in which her mineral wealth is exhibited, including everything from historical gold nuggets to the common low-grade metalliferous ores. The materials used for structural work are also shown.

Canada holds the place of honor. The mineral collection is the one made for the St. Louis exposition, but it has been kept up to date and is spread out over twice the space occupied when exhibited in the United States. The gold exhibits from the Klondike and British Columbia are beautifully displayed and much effort has been used to show the later developments of low-grade copper ores on the west coast. Mica, asbestos, graphite and corundum are shown in all stages of preparation and here again is evidence of the importance, to a new country, of advertising its structural materials in order to show what each district can furnish in the way of valuable clays and stones. Finally, the section of fuels includes even exhibits of the peat developments near Toronto and illustrates the intelligent utilization of this material. Petroleum in Canada and discoveries of natural gas in British Columbia are illustrated by samples and diagrams. The exhibits tend to show a more general and a more intelligent use of the humbler minerals and the tendency to future exploitation west of the Canadian Rockies.

Colliery Notes

Safety lamps should indicate not only gas, but foul air. The use of lamps which go out when the atmosphere is foul should be made compulsory.

With a main- and tail-rope haulage it is convenient to have special lengtheners at different points in the mine to couple up the ropes in case of accident.

If deep shafts are sunk with their longer axis in the line of full dip, better results can be obtained in sinking, draining and securing the sides, especially in bad ground.

The percentage of coal, at present considered unrecoverable, and left in the ground in the various mining districts of the United States varies from 40 to 60 per cent.

The security of a winding rope may be increased to a great extent by giving the top end which passes through the drum-lagging two or three turns around the drum shaft.

Some of the advantages of steel for mine props are; (1) it is fire-proof; (2) it is available for all parts of the mine; (3) it occupies little room; (4) it will bear a pressure of sixteen hundred pounds to the square inch.

The coefficient of friction between a greased wire rope and a wood lagged drum is about 0.35, which means that the coil on the drum would enable a pull of 1 lb. to resist a strain of 9 lb.; two coils 9x9 lb.; three coils 9x9x9 lb.; and four coils 9x9x9x9, or 6561 pounds.

Corrosion and internal abrasion of winding ropes generally go together and are due to the neglect of proper cleaning and lubrication. The wires of a rope move slightly and rub against each other, and efficient lubrication is, therefore, just as necessary as it is in the case of the moving parts of a machine.

With wide drums where a number of connecting sockets have to come upon the drum, the rope often coils unevenly; if the sockets form a bulge and disturb the even laying of the rope, this may be overcome by a guide consisting of two upright spindles with rollers, between which the rope runs, mounted on a slide bar worked by hand.

When working longwall, where the roof is stronger than the floor, the roadways are likely to heave from the pressure of the roof on the pack walls. Great care must be exercised in this matter. The miner should be instructed to watch for any indications of heaving so as to be able to take prompt measures to prevent serious damage to the road.

It must not be forgotten that when superheated steam is used there will be greater expansion in the steam pipes, and provision must be made accordingly. This is owing to the higher temperature of the steam. Copper pipes must not be used. Copper with a tensile strength of 31 tons

at 62 deg. F. is reduced to 11 tons at 428 deg. F. and is quite unreliable for bends.

Where shafts are dry and the ground is strong, timber is the best medium for securing the sides of rectangular shafts. With good workmanship, and if treated with creosote or other preservative, such timber should last the whole life of a mine. Also the fixing of guides, ladders and platforms, power pipes and cables, the separation of compartments and wood bratticing are all easily accomplished in timbered shafts.

The principal advantages resulting from the use of machinery in the preparation of coke are, a direct saving per oven; the machine operates independent of weather conditions; reduction in the number of laborers at the plant; greater uniformity of product and more uniform operation of the plant; saving in time; saving of water and heat; the avoidance of black ends and the ability to handle any depth of charge.

While the strength of wire-wound steam hose is increased, this practice is not advisable since the rate of expansion of the hose and the wire is not the same and is apt to cause the wire to cut into the hose. The steam also heats the wire and makes the hose hard to handle. Cotton or marine covering put on loose, to permit the hose to expand, is the best steam-hose covering as it gives increased strength and is not heated by the steam.

Hygrometers should be used in dusty mines where sprinkling is practiced, to indicate the actual degree of saturation effected by the daily watering. The percentage of saturation may be the same throughout the workings, but as the weight of water vapor carried by the air in different parts of the mine varies in accord with the heat of the mine, the number of grains of water carried per cubic foot of air may vary from 4 to 13 grains.

Too much care cannot be exercised in the selection, design and application of rope cappings. An excellent capping is the forged-steel conical socket, in which the prepared end of the rope is secured by means of white metal. When properly and carefully made, this capping possesses a strength greater than the rope to which it is fitted; it must, however, be properly made. The Berk capping is also excellent as it can be taken apart at any time and the rope inspected right up to its actual extremity.

When unloading concrete, it should be dumped, not dropped, as the latter process is apt to separate the stones from the mortar. Concrete, if properly handled, can be dumped from some height without being harmed. A wooden or iron chute gives good results when conveying concrete from a height. It should be equipped with a gate at its lower end; behind this stopping the concrete remains until required, when the gate is opened and the

mixture slides out. Such a chute should also be provided with a portable frame so that it can be easily moved from place to place as the work demands.

In the matter of safeguarding the lives of its workmen the United States enjoys the unenviable reputation of being the most backward of the civilized nations. While the accident rate in the mines in Germany, Great Britain, France and Belgium has been considerably lessened with the increase of scientific knowledge, the same is not true of the United States. During 1906, 6891 men were killed or injured in the coal mines of the United States, the total number killed being 2061. Since 1889 no less than 22,840 men have been killed in colliery accidents. As many fatalities have occurred during the last six years as during the preceding eleven years, and while the rate per 1,000 employed varied in the years 1895-1899 from 2.34 to 2.98, in the period 1903-1906 it ranged between the limits of 3.14 and 3.53. Contrast these figures with the corresponding returns from European coal-producing countries showing the number of men killed for each 1000 employed:

France (1901-1905).....	0.91
Belgium (1902-1906).....	1.00
Great Britain (1902-1906).....	1.28
Prussia (1900-1906).....	3.30

Liveing's electrical indicator, an apparatus for the detection of firedamp, is much used in European mines and gives good results. It consists of a box containing a magnetic electrical machine, which, by turning a handle generates an electric current which flows to two spirals, placed one at each end of the box. One spiral is inclosed in a wire gauze with a glass at the end next the center of the box; the other is inclosed in glass. The box is filled with the mixture by means of openings placed in the top of the box. In the center of the box is placed a movable block with sloping surfaces, to which white paper is attached. A scale is placed from one of the spirals to the center of the box, and this is observed through a glass pane placed in the lid of the box. The principle of this apparatus depends on the combustion of the firedamp raising the temperature of a heated wire, thereby causing it to glow more brightly. The electric current is generated by rapidly turning a handle, and the spirals become heated to redness. The spiral inclosed by the wire gauze to which the mixture gains access, glows more brightly than the one at the opposite end of the box when firedamp is present. This brighter glow illuminates the sloping surface of the movable block more than the other side, and to make the two surfaces equally illuminated the block is drawn nearer to the spiral inclosed in the glass. The scale shows the distance the block has been moved, and indicates the percentage of firedamp. As little as one-quarter of one per cent. of firedamp has been detected by this apparatus.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the
Hill Publishing Company

JOHN A. HILL, PRES AND TREAS. ROBERT MCKEAN, Sec'y.

505 Pearl Street, New York.

London Office: 6 Boulevard Street, London, E. C., Eng.
CABLE ADDRESS "ENGINJOUR, N. Y."

Subscription, payable in advance, \$5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. \$6.50 in Canada.

To Foreign Countries, including postage, \$8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

September 5.....	12,000
September 12.....	9,500
September 19.....	9,500
September 26.....	9,800

None sent free regularly, no back numbers. Figures are live, net circulation.

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The Metal Markets

At the end of the third quarter of 1908 the metal markets offer no hope for the quick return of a high scale of prices that has all along been optimistically anticipated. Hope deferred maketh the heart sick, wherefore the situation is now accepted with more calm and resignation, although there are some who are still looking for a boom which is now scheduled to happen "after the election." The fact is that trade in nearly all industries is still suffering from the set-back that began in the early part of 1907. During the last summer, business has been on the upward course, but the improvement has been slow, very slow, and nothing like what the promoters of the recent boom in the stock market succeeded in making many persons believe. Manufacturers in most branches report a decided increase in inquiries, but not yet the materialization of much new business, though it is hoped that the latter is coming, and probably it is. Indeed, it has already been experienced in some lines of manufacture, and some idle works have been put in operation, but there are still large numbers of unemployed men in all of our cities and many other evidences that business is still slack.

With these conditions, it seems irrational to hope that the prices for the metals will soon return to points higher than the averages of recent years. Even now, the prices for copper, lead and spelter have risen so high above the nadirs of the autumn of 1907, that they are not very far below the averages of the last 10 years in each case. These three metals have been acting in much the same way, which, of course, is to be expected. They are consumed in substantially the same channels, and in each case large stocks of unsold metal had accumulated, which in each case also were for the most part held by strong hands. The record of the last six months in these metals has been fitful periods of strength and then recessions, the producers having plenty of the metals to sell and the consumers having no great avidity to buy continuously or in any great quantity. Consequently, copper, lead and spelter have fluctuated within a narrow range, and the outlook for the near future appears to be for a continuance of the same kind of a market.

The iron and steel markets are in very much the same condition as those for the

other metals. Consumers and manufacturers report an increase in business, but it is slow, and most of them still hesitate to buy material far ahead of their needs. The only conspicuous exception is found in the case of the agricultural implement makers, who are generally busy; and this seems to imply prosperity—or at least an absence of depression—among the farmers. The railroads have not bought, and are not yet buying, any material beyond what they need for immediate and urgent repairs. Building projects are increasing in number, but are very slow in reaching the contract stage; and many are held back in the expectation of lower prices. The very moderate cut in prices of finished steel made some months ago has had little effect on the market.

Eminent authorities in the trade have predicted several times a speedy return of business to "the normal level"—that is to the level reached in the early part of 1907. From time to time, however, the date for recovery has been put ahead, until now the prophets are divided between "after election" and "next year." Of course, exact statistics are not to be had; but the best opinion is that a general average of the condition of the iron and steel plants of the country would show that they are working to about 60 per cent. of their capacity, and that this is an improvement of about 10 per cent. since last March, when 50 per cent., or a little less, was the average.

The Temagami-Cobalt Mines, Limited

Last week we referred to the efforts of Julian Hawthorne, a well known literary gentleman, to sell the stock of a mining company, and printed a letter that he has been circulating. Since then a later circular letter by him has come to our attention. We enjoy this as a literary gem, but our admiration is tempered by the necessity for calling attention to the rules of the game, one of which is that the names of professional men should not be used without authority.

In his circular letter of Aug. 21, Mr. Hawthorne stated that his company hired professional experts, whose reports, directly or indirectly, led to offers to buy out the company on very tempting terms. "We could have sold Temagami again and again to these customers, and made

a fair fortune out of the deal," said Mr. Hawthorne.

In his later circular letter, Mr. Hawthorne begins, "It is evident that I should have been more explicit when I wrote you a few days ago. I happened to say, that various capitalists offered to buy us out. Several of my friends, noticing that paragraph, have written me, asking for details as to those intending purchasers and their offers. There seems to be no reason why I should withhold this information.

"We employed, for our samples and assays, the firm of Ricketts & Banks, of New York. They had no sooner got an insight into our property than they made so determined and persistent an effort to buy us out, that we had trouble in getting rid of them. * * *

"The largest mine operators in South Africa (and that is saying a good deal) are the Gold Fields Limited of London. W. F. Wilkinson, their mining engineer, who talks of 500-per cent. dividends without a change in his voice, visited Temagami at the instance of his people, and then came to us here and asked us what terms we would make for it. After some shuffling of the cards, he led his trump—anything in reason for a majority interest. We explained that we were playing another sort of game—and we parted with assurance of mutual esteem."

These ideas would look very well in a novel, but we fear that the professional mining man will not recognize the methods described. Ricketts & Banks, who can speak for themselves, as they do elsewhere in this issue, never made any examination of the property. They contemplated making such an examination in behalf of a client who had in view the purchase of an interest if the report were favorable; but the negotiations did not go so far as causing the examination to be made. If Mr. Hawthorne were under any misapprehension as to this when he drafted his second circular letter, he soon ceased to be, because he received direct information as to the facts. Of course, the signing of a lot of circular letters is purely mechanical, but there was a certain humor in addressing a letter under date of Sept. 17 to Dr. P. D. Ricketts, in which the misstatement as to his firm is made, in spite of the fact that the firm had brought the matter to Mr. Hawthorne's attention a fortnight previous, and requested a discontinuance of this circular letter.

As to W. F. Wilkinson, of London, we have not had time to communicate with him. However, we know Mr. Wilkinson as a canny engineer, and we have never heard him talk of 500-per cent. dividends without a change in his voice. He may be able to do so. Yet we doubt it, for we opine that if he could, he would now be rivaling Caruso on the operatic stage. Such a voice is not carelessly to be overlooked.

Mr. Hawthorne says he knows that he is going to make his fortune from his investment in this enterprise. He says that he has put into it all that he had. It is unwise to put all of the eggs in one basket, but we hope that the mine will come up to Mr. Hawthorne's fondest expectations. He says that, being an engineer and knowing something of mines, this one would stand for a \$20,000,000 capitalization. At the end of his letter it appears that all of this "much ado" pertains to the selling of about 40,000 shares at 40c. per share, or a total of \$16,000. For anything we know they may be dirt-cheap at the price, but certainly Mr. Hawthorne should refrain from the careless use of engineers' names, without seriously considering whether it would be doing an injustice.

The Emma Mine

An item of interest, recently communicated by our Salt Lake correspondent, pertains to the purchase by Jesse Knight, of Provo, of the old Emma mine, at Alta, in Little Cottonwood Cañon. This was one of the famous mines of Utah in its early days as a mining country, and was the subject of a spectacular sale to British capitalists, a colossal failure, and a sickening scandal, in which a formerly well known promoter, Baron Grant, figured prominently.

The Emma mine was discovered in 1870. The opening of its bonanza—"A lake of mineral of vast extent"—which yielded a clear profit of nearly \$120 per ton on shipments of ore to Swansea, "gave an impetus to mining in Utah that surpasses all other efforts made in that direction put together." The quotations are from a contemporaneous writer. During six months of the first year of its operation the Emma mine shipped 4200 tons of galena ore, averaging 35 per cent. lead and \$182 silver per ton. The mine was sold to an English company for £1,000,000, a price which was contemporane-

ously criticized as unjustified by the appearance of the mine, and was subsequently proved to be greatly in excess of the actual value.

The operation of many of the mines and smelting works in Utah was stopped in 1873 by the panic, from which all industries in the United States suffered. The British companies suffered the worst and most of them fell into serious financial difficulties. The Emma mine continued to be the largest shipper of ore from the Cottonwoods, but at the end of the year it was practically exhausted and never afterward was it of importance, except as a memory. It has been a hope in the Cottonwoods lasting to this day that someone would discover an ore deposit like the famous Emma bonanza. The latter was a pear-shape body of rich ore, which suddenly came to an end. One of the hypotheses was that it was the upper part of an ore shoot that had been cut off by a fault, and that future prospecting would find the continuation of the ore shoot thrown aside upon the other side of the fault. However, prospecting never so resulted, but apparently it was not done extensively or systematically.

The discovery of the conditions at the Emma mine has always appeared to us to be one of the most engaging problems for the modern mining geologist. We hope that Mr. Knight will secure the best expert that is available, and commission him to study the matter.

ALTHOUGH THE PRICE for spelter continues comparatively low, the value of zinc ore still rules at a level that deprives the smelters of profit. Upon this condition the miners are to be congratulated, inasmuch as the effect of adverse industrial conditions is thereby greatly tempered. The situation is not so comfortable to the smelters. Last week spelter sold at 4.65c., St. Louis, while the average base price for ore was \$37.50. The continuance of the extremely low margin between spelter and ore indicates that the low prices have cut off supplies of ore from the Rocky mountains and from Mexico, compelling the smelters to maintain the price for Joplin and Wisconsin ore in order to secure what they need. The Joplin output has held up surprisingly well during 1908 at prices materially less than \$40 for zinc ore and \$60 for lead ore. During the first 38 weeks, the average output was nearly 4750 tons per week.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Pyritic Origin of Iron Ore Deposits

I have read with much interest the article by H. Martyn Chance, in the JOURNAL of August 29, the gist of which seems to be that the great ore deposits of Lake Superior are derived from bisulphide of iron, and not, as heretofore supposed, from the bicarbonate.

If his supposition is correct, we should naturally expect various things, which we do not find, for instance, strontianite, gypsum and barytes, in enormous quantity, to account for the amount of sulphuric acid which has been formed. I look in vain in his article for one syllable as to the presence of sulphates in or near these great deposits.

If the iron deposits have been formed from the bisulphide of iron, from what was the bisulphide of iron formed? As Mr. Chance justly remarks, it is the commonly accepted belief among geologists and chemists, that the presence of bisulphide of iron in the interior of the earth implies the previous presence of organic matter, and, when the ore deposits are on such an immense scale as on the shores of Lake Superior, according to his theory, there must have been originally immense quantities of organic matter. Iron is one of the most universally distributed of the elements.

It is a curious fact that the specific gravity of the earth itself is approximately that of oxide of iron and it has been surmised that oxide of iron is the chief ingredient of its mass. This coincidence, of course, may be explained on other grounds, i.e., either that the interior of the earth is greatly compressed by the immense pressure, which very greatly exceeds anything that can be obtained experimentally on the surface of the earth, or that other elements, heavier than the average specific gravity of the crust of the earth, exist in larger percentage, at greater depths beneath the surface, far below human ken.

REDUCTION OF IRON

Be this as it may, we have reason to believe that various minerals containing iron, may be reduced by the action of organic matter, dissolved by meteoric waters in the form of ferrous bicarbonate, and carried away in solution until they meet some substance that causes their precipitation. One such substance appears to be coal. The so-called brasses, which so plentifully abound in coal are bisulphide of iron in

the triclinic form known as marcasite, and it may be conjectured that the sulphur is derived from the organic matter itself. Whether these deposits are formed directly from oxidation of ferrous bicarbonate, or indirectly by the previous precipitation of such in the form of sulphide, and by the oxidation of this sulphide we must presuppose a great amount of organic matter. We do know that organic matter exists, and was formed, at least as far back as the very beginning of the Silurian epoch; but the amount of organic matter to explain the presence of these immense bodies of iron ore, seems to me, in the light of our present knowledge, immensely greater, if we suppose that the iron is formed from the sulphide, than if we cling to the old theory that it was formed directly from the carbonate.

QUANTITY OF ORGANIC MATTER REQUIRED

We may reasonably conjecture that, had there never been any organic matter on the earth, all of the iron in the earth would be in the form of sesquioxide and its many combinations with other chemical substances. To reduce the sesquioxide to ferrous oxide requires but a very small portion of its weight in the shape of organic matter; for instance, two parts by weight of hydrogen, or six parts by weight of carbon, will reduce 160 parts by weight of ferric oxide to ferrous oxide.

Carbon and hydrogen make up together approximately half the weight of organic matter apart from the water which it contains. On the other hand, bisulphide of iron contains more sulphur than iron, whether in the form of pyrites, or marcasite, and the percentage of sulphur in organic matter is very small. The old theory presupposes the presence of an amount of organic matter considerably less than a tenth of that of the iron ore.

Mr. Chance's theory presupposes the presence of an amount of organic matter 40 or 50 times as great as the immense mass of iron ore that we find on Lake Superior. Under these circumstances, while not denying the probability that a portion of this iron ore was deposited from a solution of ferrous sulphate, it seems reasonable to suppose that by far the greater portion was deposited from a solution of ferrous bicarbonate.

The reactions that Mr. Chance gives to show the possible processes by which bisulphide of iron may be converted in the interior of the earth, or upon its surface, into sesquioxide or sesquihydrate, are interesting, and doubtless represent to a

certain extent, reactions which actually take place, but they do not give an adequate idea of the immense complexity of such reactions. As a matter of fact, there are present, besides the combinations here mentioned, a vast number of substances, which enter into the chemical processes by which iron oxide is deposited; for instance, carbonates of lime and of magnesium, and the great number of combinations of alumina.

WHAT HAS BECOME OF THE SULPHUR?

The free sulphuric acid, formed by the oxidation of bisulphide of iron, attacks to a greater or less degree almost all minerals, excepting silica, and forms sulphate of aluminum, sulphate of calcium, etc. Soluble sulphates, such as sulphate of alumina and calcium, might naturally be leached out of the rocks by meteoric waters, but it seems hardly likely that with such an immense formation of sulphuric acid we should not find somewhere great deposits of strontianite or heavy spar. The sulphate of calcium also is only slightly soluble and we should naturally expect some deposits of gypsum.

The carbonic-acid gas, which is the chief reagent that the old theory presupposes, is present in immense quantity in the atmosphere, constituting about one part in 2500 parts of the total volume of the atmosphere. In combination with organic matter, this acid can, in the lapse of time, reduce the iron to the ferrous condition, and dissolve the iron from the numerous minerals of which it is an ingredient, in the form of ferrous bicarbonate, and this solution when exposed to the air, gives off, in the first place, some carbonic-acid gas, and in the second place, absorbs oxygen from the air. This oxidizes the iron to the condition of sesquioxide, which has no affinity for carbonic-acid gas, and cannot, under ordinary conditions, at least, exist in chemical combination with it. Hence a solution of iron in carbonic-acid gas will deposit sesquihydrate of iron when exposed to the air, and this may subsequently, by pressure and heat, be converted into sesquioxide.

It seems, therefore, to me, that it will be needful to adduce more evidence than is contained in Mr. Chance's article, to prove to the satisfaction of the scientific world that the greater part of the Lake Superior iron ore has resulted from the oxidation of pyrites and not from the oxidation of ferrous bicarbonate.

GODFREY L. CABOT.

Boston, Mass., Aug. 31, 1908.

The Temagami-Cobalt Mines, Limited

The following correspondence may be of interest and we should like to have it appear, as we are constantly receiving letters from parties who are under the impression that we have examined and are familiar with the property of the Temagami-Cobalt Mines, Ltd.

New York, Sept. 4, 1908.

JULIAN HAWTHORNE, ESQ.,

Dear Sir: Our attention has been drawn by several parties, correspondents and clients of ours to whom you have written, to letters of yours embodying the following statement:

"We employed, for our samples and assays, the firm of Ricketts & Banks, of New York. They had no sooner got an insight into our property than they made so determined and persistent an effort to buy us out, that we had trouble in getting rid of them. They brought forward a capitalist—a member of the Tiffany firm—ready to pay a big sum down, and all the cash we needed for development—in return for a three-fifths interest in Temagami. We told them that we would consider no terms involving surrender by us of the control of the property; and when they found we meant it, they dropped out."

We presume this statement relates to certain negotiations undertaken by us at the request of Dr. Wm. J. Morton, which called for an investment of \$30,000 by a client of our firm in a property described to us by Dr. Morton, provided an examination of the property by us proved that the local conditions and ore values warranted such payment. Dr. Morton objected to our doing certain work necessary to enable us to thoroughly test the property and withdrew the proposition after we had arranged with our client to make such advance subject to our examination being sufficiently satisfactory; consequently the matter dropped.

If the statement in your letter above mentioned refers to the negotiations with Dr. Morton, we must say that it misrepresents the facts and casts a reflection on our professional integrity that we cannot and will not permit. Under these circumstances, we are compelled to write our friends and clients and inform them of the exact conditions involved and state that we know nothing of the property other than told us by the owner, and that all samples assayed by us were submitted by him. We are sending Dr. Morton a copy of this letter and must insist that the reference to us be at once withdrawn.

Yours very truly,

RICKETTS & BANKS.

We sent a copy of the above letter to Dr. Wm. J. Morton, and recited to him our only connection with the matter as stated therein. Dr. Morton replied: "I

entirely agree with you in the position you have taken. Your interest in the matter and your final decision were, as you say, to be based upon a personal examination by yourselves. I am sure Mr. Hawthorne has to this extent misapprehended the facts and I have written to him along the lines above outlined."

Finally we received the following letter from Mr. Hawthorne:

New York, Sept. 21, '08.

MESSRS. RICKETTS & BANKS,

Gentlemen: Upon my return to the city, I find your favor of the 4th instant.

Doctor Morton spoke to me of these negotiations. I mentioned them in an off-hand way in my letters, without seriously considering as to whether by mentioning your name, I would be really doing you an injustice. Let me assure you, this was not the intention. I could have easily gotten along without mentioning any names, and in order to avoid any criticism in this regard, I shall certainly be careful in the future.

It is hardly necessary to add that I shall eliminate the mention of your firm in any further correspondence.

Yours very truly,

JULIAN HAWTHORNE.

The above correspondence covers the matter so fully that no further statement from us appears to be necessary.

RICKETTS & BANKS.

New York, Sept. 22, 1908.

Sampling by Machine

Referring to John A. Church's communication in the JOURNAL of Aug. 29, p. 431, and to my communication to the JOURNAL, Aug. 15, p. 338, I wish to say that Mr. Church, apparently, has not read the latter article carefully.

He takes for granted that three mills are referred to in my table, whereas it is distinctly stated that there are only two mills, and that the sampling is compared in columns *A* and *B* and the assaying compared in columns *B* and *C*. Also the statement is made that the sampling machines, represented by columns *A* and *B* were both of the same type and had all of the improvements referred to.

Mr. Church omitted to read the whole of the opening paragraph of my article, for my intention was to refer him to sampling works in the Rocky Mountain region of the United States. There are several types of mechanical samplers used in the region referred to that are giving satisfaction. It would not be fair to describe one to the detriment of another, as most of them are of patented design and consequently the owners of the patents would feel aggrieved if severely criticized; they are the ones, also, who should laud their own products. This is the reason also why no particular description has been made of the Anaconda sampling

works (or the other one referred to) because being patented the owner of the patent is expected to advertise his own goods.

The description referred to (of the Anaconda Works) was not prepared for the purpose of giving technical details of the construction, but merely to save time in explaining the general features of the plant to non-technical visitors.

As to "questionable progress," and the article by Mr. Brunton, published in 1884 (*Trans. A. I. M. E.*, XIII, 1884-5, p. 645), I think Mr. Brunton should be called on to explain, but I will say this: At the time the article was written the standard method of sampling was the old "quartering" method.

In comparing sampling results the percentage of difference on low-grade ores is not a good criterion, as it exaggerates very greatly differences that would ordinarily be considered excellent checks.

I might add that each cut of the stream for sampling took out 20 per cent. at mills *A* and *B*.

E. P. MATHEWSON.

Anaconda, Mont., Sept. 11, 1908.

Errata

In Professor Howe's paper, on "The Shape of the Iron Blast Furnace," in the JOURNAL of Sept. 12, pp. 507 to 511, Fig. 3, No. 3, for Coignet read Coingt; page 511, second column, fifth paragraph, last line, for No. 6 read No. 7; Fig. 5, No. 14, for Glendon No. 4, 1862, read Glendon No. 4, 1868.

Transvaal Gold Production

The Transvaal returns for August make a new record. The total output for the month was 587,813 oz. fine gold, which was 3358 oz. more than in July, and 33,786 oz. more than in August of last year. For the eight months ended Aug. 31 the total was 4,226,470 oz. in 1907, and 4,572,225 oz.—or \$94,507,891—in 1908; an increase of 345,755 oz. this year.

The unskilled labor return shows that there were employed in the mines on Aug. 31 a total of 17,006 Chinese and 133,548 Kafirs. This was a decrease of 1407 Chinese, but an increase of 1209 Kafirs during the month. Over two-thirds of the Chinese employed in the Transvaal have been sent back since the anti-Chinese law was passed.

The best calculations for the prevention of creeps or squeezes in coal seams are only guesses in the end, but if careful thought is given to the depth from the surface, the crushing strength of the coal, the strength of the roof, the height of the coal, the crushing strength of the floor, and the character of the seam, flat or inclined, a possible disaster may be avoided.

New Publications

- SALPETER UND SEIN ERSATZ.** By Konrad W. Jurisch. Pp. 356, illustrated. 7x10 in.; paper, 10 marks. Leipzig, 1908: S. Hirzel.
- TRANSVAAL CHAMBER OF MINES EIGHTEENTH ANNUAL REPORT FOR THE YEAR 1907.** Pp. 551, illustrated. 7¼x10 in.; cloth. Johannesburg, So. Afr., 1908: The Transvaal Leader.
- GENERAL INDEX OF STAHL UND EISEN FOR THE YEARS 1881 TO 1906.** Prepared by Franz Liebetanz. Pp. 370. 7½x10½ in.; half leather. Dusseldorf, 1908: Stahl und Eisen.
- HIGH SPEED DYNAMO ELECTRIC MACHINERY.** By H. M. Hobart and A. G. Ellis. Pp. 526; illustrated. 6x9¼ in.; cloth, \$6. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.
- DIE BEDEUTUNG DER CHEMISCHEN TECHNIK FÜR DAS DEUTSCHE WIRTSCHAFTSLEBEN.** Vol. VIII. By Dr. H. Grossmann. Pp. 140. 6½x9½ in.; paper, 4.50 marks. Halle a. S., 1907: Wilhelm Knapp.
- BALDWIN ON HEATING; OR, STEAM HEATING FOR BUILDINGS REVISED.** By William J. Baldwin. Pp. 404; illustrated. 5x7½ in.; cloth, \$2.50. New York, 1908: John Wiley & Sons; London: Chapman & Hall, Ltd.
- MITTEILUNGEN AUS DEM EISENHÜTTENMANNISCHEN INSTITUT DER KÖNIGL. TECHN. HOCHSCHULE AACHEN.** Vol. I. By Prof. Dr. F. Wüst. Pp. 172, illustrated. 8x11 in.; paper, 12 marks. Halle a. S., 1908: Wilhelm Knapp.
- MITTEILUNGEN AUS DEM EISENHÜTTENMANNISCHEN INSTITUT DER KÖNIGL. TECHN. HOCHSCHULE AACHEN.** Vol. II. By Prof. Dr. F. Wüst. Pp. 172, illustrated. 8x11 in.; paper, 14 marks. Halle a. S., 1908: Wilhelm Knapp.
- WEST VIRGINIA ANNUAL REPORT OF THE DEPARTMENT OF MINES FOR THE YEAR ENDING JUNE 30, 1907.** By James W. Paul, Chief of the Department of Mines. Pp. 511. 6x9-in.; paper. Charleston, So. Car., 1908: Tribune Printing Company.
- THE IRON ORES OF THE IRON SPRINGS DISTRICT, SOUTHERN UTAH.** By C. K. Leith and E. C. Harder. Bulletin No. 338, United States Geological Survey. Pp. 102, illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.
- THE MINING INDUSTRY IN NORTH CAROLINA DURING 1906.** By Joseph Hyde Pratt. North Carolina Geological and Economic Survey. Economic Paper No. 14. Pp. 144; illustrated. 6½x10 in.; paper. Raleigh, 1907: E. M. Uzzell & Co.
- THE BUILDING MECHANICS' READY REFERENCE. CEMENT WORKERS' AND PLASTERERS' EDITION.** By H. G. Richey. Pp. 458; illustrated. 4¼x7 in.; leather, \$1.50. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.
- CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1907. Part I. Metals and Non-metals, except Fuels.** C. W. Hayes and Waldemar Lindgren, geologists in charge. Bulletin No. 340, United States Geological Survey. Pp. 482, illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.
- HINTS ON AMALGAMATION AND THE GENERAL CARE OF GOLD MILLS.** By W. J. Adams. Pp. 120, illustrated. 4¼x6¾ in.; leather, \$3. San Francisco, 1908: Mining and Scientific Press.
- Contents: General Process. Care of Quicksilver. Cleaning-up. Retorting and Melting. Concentration. Sampling. Conclusion. Addenda.
- FOURTH REPORT OF THE DIRECTOR OF THE SCIENCE DIVISION, INCLUDING THE SIXTY-FIRST REPORT OF THE STATE MUSEUM, THE TWENTY-SEVENTH REPORT OF THE STATE GEOLOGIST, AND THE REPORT OF THE STATE PALEONTOLOGIST FOR 1907.** Bulletin No. 428, University of the State of New York, Education Department, August 1, 1908. Pp. 203, illustrated. 6x9 in.; paper. Albany, 1908: University of the State of New York.
- A DICTIONARY OF SPANISH-AMERICAN MINING, METALLURGICAL AND APPLIED TERMS.** By Edward Halse. Pp. 379, illustrated. 5¼x7¾ in.; cloth, \$3.50. London, 1908; Charles Griddin & Co., Ltd. Philadelphia: J. B. Lippincott Company.
- This is the best book of its kind that we have seen. So far as we have examined its pages, we have found it thoroughly satisfactory. Its author is a distinguished mining engineer, who has had an extensive experience in Spanish-speaking countries, wherefore he was well qualified to produce the excellent book that he has done.
- SECOND REPORT ON THE WATER POWERS OF GEORGIA.** By B. M. Hall and M. R. Hall. Geological Survey of Georgia. Bulletin No. 16. Pp. 424; illustrated. 7x10 in.; cloth. Atlanta, Ga., 1908: The Franklin-Turner Company.
- This report, which was prepared by the Georgia Survey in conjunction with the United States Geological Survey, goes at length and with much detail into the topography and general geology of the water sheds and drainage basins of the State, the available power to be derived from the streams and rivers. Georgia is well provided with water powers, the utilization of which ought to be of material assistance in making it a great manufacturing State.
- PRACTICAL METALLURGY.** By Thomas Turner. Pp. 103; illustrated. 5¼x8 in.; cloth, \$1.25. London, 1908: Charles Griffin & Co., Ltd.; Philadelphia, J. B. Lippincott Company.
- Contents: Sampling and weighing. Metals and alloys. Oxidation and reduction. Examination of fireclay. Slags and fluxes. Examination of fuel. Iron ores. Determination of muffle temperatures. Silver, and silver assay. Assay of silver bullion. Assay of silver ores. Gold assay. Assay of gold ores. Properties of mercury. The micro-structure of metals. Iron and steel. Electro-metallurgy.
- This is rather a text-book on assaying than a treatise on metallurgy, and in view of the superfluity of more elaborate works upon the subject, this latest publication does not appear to serve any useful purpose, especially since it is of an unsatisfactory character.
- CANADA'S FERTILE NORTHLAND.** Edited by Capt. Ernest J. Chambers. Published by the Canadian Department of the Interior, Hon. Frank Oliver, Minister. Pp. 155, illustrated; accompanied by atlas. 6½x10 in.; cloth. Ottawa, 1908: Government Printing Bureau.
- This is a collection of evidence intended to show the possibilities of the northern part of Canada and its resources as an agricultural, lumbering and mining country. The region includes the northern portion of the provinces of Quebec, Ontario, Saskatchewan, Alberta and British Columbia, and the territories of Ungava, Mackenzie and the Yukon. Part of this territory has already become known from its mineral resources and developments; but a large part has hardly been explored. The report has gathered all available information, and is accompanied by a number of excellent maps.
- MOODY'S MANUAL OF RAILROADS AND CORPORATION SECURITIES.** Ninth annual number. 1908. Edited by Louis W. Holschuh. Pp. 2864; 6x9 in., cloth. New York: Moody Manual Company.
- This new edition of this manual, which has well earned its place as an authority on corporation statistics, appears with several improvements. Among these we note the increase in number of industrial reports; more extended accounts of bond issues; and especially numerous additions to the list of mining companies. The insertion of a number of maps is also a welcome feature. In every respect it is evident that great care has been taken in making the compilation of reports, and in presenting the condensed information in the best and clearest manner. An excellent feature is the completeness of the general index and its arrangement. The "Manual" in its previous editions has proved an exceedingly useful compilation, and the present edition is even better than its predecessors. The publishers have also made arrangements to issue a monthly guide as a supplement to the yearly volume, giving each month later information as it becomes accessible.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ALLOYS—Improvements in and Relating to Aluminum Alloys. Centralstelle für Wissenschaftlich-Technische Untersuchungen G.m.b.H., Noubabelsberg, near Berlin, Germany. (Brit. No. 26,322 of 1907.)

COAL AND COKE

COAL-WASHER and Ore-Concentrator. Alonzo C. Campbell, Asheville, N. C. (U. S. No. 898,314; Sept. 8, 1908.)

COKE-DRAWING APPARATUS. Fred H. Daniels, Axel F. Backlin, and Idoff Ecklund, Worcester, Mass., assignors to H. C. Frick Coke Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 893,453; July 14, 1908.)

COKE-OVEN. Mathew E. Rothberg, Pittsburg, Penn., assignor to The Coal and Coke By-Products Company, a Corporation of West Virginia. (U. S. No. 893,017; July 14, 1908.)

COPPER

ELECTROLYTIC COPPER—Method of Rendering Electrolytic Copper Homogeneous. Marcel A. Jullien and Emile L. Dessolle, Levallois-Perret, France. (U. S. No. 897,291; Sept. 1, 1908.)

GOLD AND SILVER

AMALGAMATOR. Benjamin F. Geigher, Los Angeles, Cal. (U. S. No. 897,975; Sept. 8, 1908.)

AMALGAMATOR. Eugene Stevens, Boulder, Colo. (U. S. No. 896,169; August 18, 1908.)

CYANIDATION—Improvements in the Recovery of Gold from Cyanide Solutions. Sherard O. Cowper-Coles, London. (Brit. No. 11,297 of 1907.)

ELECTROLYTIC RECOVERY—Apparatus for the Recovery of Precious Metals from Slimes, etc. Alphonsus J. Forget, Los Angeles, Cal. (U. S. No. 893,472; July 14, 1908.)

METALLURGICAL APPARATUS. William A. Merralls, San Francisco, Cal. (U. S. No. 898,415; Sept. 8, 1908.)

RECOVERY FROM SOLUTIONS—Method of Recovering Metal Values from Solutions. Wilbur A. Hendryx, Denver, Colo. (U. S. No. 893,581; July 14, 1908.)

STAMP-MILL—Rotary Stamp-Mill. Philip J. Lonergan, Denver, Colo. (U. S. No. 897,214; Aug. 25, 1908.)

STAMP-MILL. William A. Merralls, San Francisco, Cal. (U. S. No. 898,414; Sept. 8, 1908.)

IRON AND STEEL

BLAST-FURNACE—Furnace Bosh-Jacket and Bosh-Plate. Frank C. Roberts, Philadelphia, Penn. (U. S. No. 897,016; Aug. 25, 1908.)

BLAST-FURNACE GASES—Apparatus for Washing Iron Blast Furnace-Gases. Benjamin H. Thwaite, Westminster, London, England. (U. S. No. 896,175; August 18, 1908.)

BLAST-FURNACE OPERATION—Improved Means for Drawing Away Heat to Protect the Brickwork of Certain Parts of Blast-Furnaces. Lawrence F. Giers, Middleborough-on-Tees, Eng. (Brit. No. 13,456 of 1907.)

CHARGING APPARATUS for Blast-Furnaces. Martin J. Shannon, Steelton, Penn. (U. S. No. 898,071; Sept. 8, 1908.)

CHARGING APPARATUS for Blast-Furnaces. Martin J. Shannon, Steelton, Penn. (U. S. No. 898,012; Sept. 8, 1908.)

DRY-AIR BLAST—Method of Drying Air

for Blast-Furnaces. David T. Day, Washington, D. C. (U. S. No. 897,356; Sept. 1, 1908.)

FERRO-ALLOYS—Process of Producing Ferro-Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, Chicago, Ill., a Corporation of West Virginia. (U. S. No. 898,173; Sept. 8, 1908.)

SMELTING—Process of Smelting Iron. Marcus Ruthenburg, Philadelphia, Penn. (U. S. No. 898,068; Sept. 8, 1908.)

ZINC

RECUPERATIVE FURNACE. Nicholas L. Heinz, La Salle, Ill. (U. S. No. 898,410; Sept. 8, 1908.)

RECUPERATIVE SPELTER-FURNACE. Nicholas L. Heinz, La Salle, Ill. (U. S. No. 898,409; Sept. 8, 1908.)

MINING—GENERAL

BLASTING—Torch for Igniting Blast-Fuses. John Craighton, Deer Lodge, Mont. (U. S. No. 893,309; July 14, 1908.)

MINE SUPPORTS—An Improved Process or Device for Withdrawing the Supporting Timbers, Props or the Like, in Coal and Other Mines. Robert Mellor, Fenton, Eng. (Brit. No. 22,998 of 1907.)

ORE DRESSING

CONCENTRATING APPARATUS. Wilton E. Darrow, Sutter Creek, Cal. (U. S. No. 898,331; Sept. 8, 1908.)

DRY ORE-CONCENTRATOR. Frederick E. McKinley, Guthrie, Okla., assignor, by mesne assignments, to The Desert Gold Machine Company, Wichita, Kan., a Corporation of Arizona. (U. S. No. 897,223; Aug. 25, 1908.)

FILTER—Continuous Filter. Robert Schorr, San Francisco, Cal. (U. S. No. 893,104; July 14, 1908.)

FILTERING APPARATUS. Elisha J. White, Guanajuato, Mexico. (U. S. No. 894,414; July 28, 1908.)

FILTERING APPARATUS—Vacuum Filtering Apparatus. Charles Butters, Berkeley, Cal. (U. S. No. 896,360; August 18, 1908.)

FILTER-FRAME. Galen H. Clevenger, Palo Alto, Cal., assignor to The Butters Patent Vacuum Filter Company, Inc., a Corporation of Nevada. (U. S. No. 896,436; August 18, 1908.)

ORE-CONCENTRATOR. Emil Deister, Fort Wayne, Ind., assignor to The Deister Concentrator Company, a Corporation of Indiana. (U. S. No. 895,167; Aug. 4, 1908.)

ORE-CONCENTRATING TABLE. Emil Deister, Fort Wayne, Ind., assignor to The Deister Concentrator Company, a Corporation of Indiana. (U. S. No. 895,168; August 4, 1908.)

ORE-CRUSHING MACHINE. Frederick B. Pettengill, Burbank, Cal., assignor to Samuel L. Kistler, Los Angeles, Cal. (U. S. No. 893,540; July 14, 1908.)

ORE-DRIER. Daniel T. MacLeod, Merchantville, N. J. (U. S. No. 893,338; July 14, 1908.)

ORE-GROUNDING MILL. Charles D. Mc Lure, St. Louis, Mo. (U. S. No. 893,535; July 14, 1908.)

ORE SEPARATING or Concentrating Machine. Walter R. Lins, Philadelphia, Penn. (U. S. No. 898,119; Sept. 8, 1908.)

ORE-SEPARATOR. Joseph G. Evans, Baker City, Ore. (U. S. No. 896,978; Aug. 25, 1908.)

ORE TREATMENT—Apparatus for Treating Ores. Duncan N. Hood, New York, N. Y., assignor to Hood Process Company, a Corporation of Arizona. (U. S. No. 893,243; July 14, 1908.)

PULVERIZER—Machine for Pulverizing Ore. Frederick W. Thomson, Fort William, Ontario, Canada. (U. S. No. 896,954; Aug. 25, 1908.)

SEPARATOR—Hydraulic Separator and Classifier. Charles E. Seymour, Placerville, Cal., assignor of one-fourth to Lawrence E. King, Reno, Nev. (U. S. No. 896,471; August 18, 1908.)

SEPARATING-TABLE. Henry M. Sutton, Walter L. Steele and Edwin G. Steele, Dallas, Tex. (U. S. No. 898,020; Sept. 8, 1908.)

TREATING COMMUNITED SOLIDS with Liquids. Alfred Adair, Johannesburg, Transvaal. (U. S. No. 894,417; July 28, 1908.)

METALLURGY—GENERAL

CONVERTING PROCESS—Improvements in and Relating to Apparatus for Converting Metals. Richard Lewis Lloyd, Cananea, Mexico. (Brit. No. 15,963 of 1907.)

CONVERTING PROCESS—Improvements in and Relating to the Art of Converting Metals. Richard Lewis Lloyd, Cananea, Mexico. (Brit. No. 15,962 of 1907.)

EXTRACTION—Process of Extracting Metals from Ores. James H. Reid, Newark, N. J., assignor to Electric Smelters, Limited, Ottawa, Canada, a Corporation of Canada. (U. S. No. 896,245; August 18, 1908.)

FURNACE-PORT-COOLING MEANS. Frank E. Parks and Harry A. Deuel, Pueblo, Colo. (U. S. No. 896,937; August 25, 1908.)

SMELTING PROCESS. Alexander R. McKenzie, Great Falls, Mont. (U. S. No. 897,993; Sept. 8, 1908.)

MINING MACHINERY AND APPARATUS

CAISSON—Extension Mining-Caisson. Willis W. Beeson, Redwood City, Cal. (U. S. No. 898,174; Sept. 8, 1908.)

MINER'S CAP and Lamp. Lewis W. Cogswell and James D. Abel, Taylorville, Ill. (U. S. No. 897,588; Sept. 1, 1908.)

MINE PROPS—Improvements in and Relating to Adjustable Mining Props. Otto Nootbaar, Remscheid, Germany. (Brit. No. 6138 of 1908.)

MINING CARTRIDGES—Improvements in or Appertaining to Cartridges for Mining and Like Purposes. Edward Purcell and Samuel Purcell, Pontefract, Yorkshire, Eng. (Brit. No. 1384 of 1908.)

ROCK-DRILL. Robert H. Anderson, Germiston, Transvaal. (U. S. No. 897,336; Sept. 1, 1908.)

ROCK-DRILLING ENGINE—Gas-Operated Rock-Drilling Engine. Roland S. Trott, Denver, Colo. (U. S. No. 896,777; Aug. 25, 1908.)

ROCK-DRILLING MACHINES—Improvements in Rock-Drilling Machines. James E. H. Grose, Witwatersrand, Transvaal. (Brit. No. 22,636 of 1907.)

ROCK-DRILL-SHARPENING MACHINE. Charles H. Shaw, Denver, Colo. (U. S. No. 866,166; August 18, 1908.)

METALLURGICAL MACHINERY AND APPARATUS

DUST-ARRESTER and Sludger. Louis T. Sicka and John P. Collins, Butte, Mont., assignors of one-third to William M. Kirkpatrick, Butte, Mont. (U. S. No. 895,693; August 11, 1908.)

EXTRACTION—Apparatus for Extracting Metals from Ores. James H. Reid, Newark, N. J., assignor to Electric Smelters, Limited, Ottawa, Canada, a Corporation of Canada. (U. S. No. 896,413; August 18, 1908.)

GAS-FIRED FURNACES—Improvements in, or Relating to Gas-Fired Furnaces. Dr. Julius Bueb, Dessau, Germany. (Brit. No. 26,590 of 1907.)

LABORATORY APPARATUS—New or Improved Support for Laboratory Crucibles, Basins and the Like. George T. Holloway, London, W. C. (Brit. No. 12,787 of 1907.)

ROASTING-FURNACE. Arthur R. Wilfley, Denver, Colo. (U. S. No. 898,024; Sept. 8, 1908.)

ROASTING FURNACE—Furnace for Roasting Sulphide Ores. Hugo Petersen, Wilmersdorf, near Berlin, Germany. (Brit. No. 15,941 of 1907.)

ROTARY-RETORT FURNACE. John R. Moffitt, Denver, Colo. (U. S. No. 895,650; August 11, 1908.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

W. H. Cunningham, of Beaumont, Tex., has gone to Colombia, South America, to superintend drilling operations for oil there.

M. M. Sinclair, an Australian mining engineer, has been appointed manager of the Usutu tin mines in Swaziland, South Africa.

Harry A. Lee, mining engineer, of Denver, Colo., spent a short time in New York last week, leaving Sept. 17 for Salt Lake City.

Henry F. Lefevre, mining engineer, was recently in Virginia City, Nev., making some cyanide investigations at the Butters plant there.

A. P. Roach, recently with the Rio Bravo Oil Company, at Welch, La., has been appointed superintendent of the Imperial Oil Company, of California.

Edgar B. Van Osdel, of Spokane, Wash., has been appointed professor of chemistry in McMinville College, McMinville, Oregon, and has removed to that place.

Robert K. Painter has been appointed manager of the Benson Mines Company, at Benson Mines, St. Lawrence county, N. Y., and has taken charge of the mines.

Eric E. Watson, late general manager and metallurgist of the Queensland Smelting Company, has left Australia for London, where he intends to stay for some time.

B. B. Thayer, of the Amalgamated Copper Company, who has been making a periodical tour of inspection in the West, is expected to return to New York about Oct. 1.

L. A. McElroy, of Erie, Penn., is president of the Manitoba Rolling Mills Company, which has completed and started up a rolling mill at Winnipeg, the first in western Canada.

Chester Peck, recently of Everett, Penn., has been appointed superintendent of the Ivanhoe Furnace Company, of Ivanhoe, Va., to succeed J. W. Reese, who has resigned.

H. Koppers, inventor of the Koppers by-product coke oven, arrived at Joliet, Ill., recently, from England, to inspect the new coke plant of the Illinois Steel Company at that place.

Juan Felix Brandes has returned to Denver from a professional trip to California and Mexico and is proceeding to Europe, particularly London and Paris, where he will be until the end of the year.

Benedict Crowell, of the firm of Crowell & Murray, Cleveland, Ohio, who recently returned from an examination of

gold properties in Arizona, is now making an extensive examination of new copper properties in Ontario.

Allan Gibb, chief engineer for R. Williams & Co., of London, who is in charge of the developments of the great copper mines of Katanga, Africa, has arrived at New York, his purpose being to visit the important copper mining and smelting districts of the United States.

T. Lane Carter, of Johannesburg, Transvaal, was in New York this week. He expects to remain in the United States for about two months, visiting several of the leading mining districts. Mr. Carter is a well known American mining engineer, who has been on the Rand for many years.

E. C. Knight, a member of the Southern Department executive committee in charge of the Mexican smelting plants of the American Smelting and Refining Company, who for 12 years has been identified with the Guggenheim interests in Mexico, has resigned and will leave Mexico in October for Vancouver, B. C., where he has acquired an interest in the Vancouver Lumber Company, and where he will hereafter make his home.

Obituary

William J. Moorhead, of Pittsburg, died suddenly Sept. 9, while on a visit to Boston. He was born in 1839, and was for many years prominent in the iron trade. He was founder and head of the firm of Moorhead Brothers & Co., which was merged in the Jones & Laughlin Steel Company a few years ago.

Samuel J. Ritchie, of Akron, Ohio, died suddenly while on a visit to Charleston, W. Va., Sept. 19. He was connected with the first discovery of nickel in the Sudbury district in Ontario, and later was involved in extended litigation over the ownership of the property opened and operated by the Canadian Copper Company.

A. D. Gambell, one of the pioneer miners of Colorado, died recently. It is told of him that he first brought prominently into general notice, through an argument with Horace Greeley, the fact that gold had been discovered and was being actually mined in Colorado. Later Mr. Gambell went to Wyoming and there discovered and located a large iron-ore deposit.

Alfred Smith, who died in Kingston, Penn., Sept. 19, aged 58 years, was born in New York, but went to the anthracite country when a boy. Beginning as a miner, he rose to be general superintendent of the Wyoming Valley Coal Company. After holding that position over 20 years, he became district superintendent for the Delaware, Lackawanna & Western Company, holding that position until his death.

Nicholas Finn, who died at Leadville,

Colo., Sept. 18, was one of the pioneer operators in that district. He was born in Ireland, but came to the United States when a boy, living for some years in Syracuse, N. Y. He settled in Leadville in 1879 and with his partner established the Cummings & Finn smelting plant. He acquired much mining property in the district. In recent years he lost a large part of his property, though he still owned interests in several mines.

Societies and Technical Schools

Coke Oven and By-products Association—Steps are being taken to organize this association in England. It is to be composed of engineers, managers and owners of by-product coke ovens, and its object will be the discussion and solution of problems connected with such plants.

Colorado Mining Congress—The convention of Colorado mining men held this week in Denver, several subjects were ably dealt with: Professor George, State geologist, called the earnest attention of the meeting to what might be accomplished by the coöperation of Colorado mining men with the United States Geological Survey. An organizing committee was appointed whose province will be to do energetic work toward insuring a strong branch of the American Mining Congress, similar to those established in Bisbee, Spokane, Seattle and Salt Lake City; a committee was also appointed whose work will be to offset the energetic efforts of Salt Lake City to have the permanent headquarters of the American Mining Congress removed to that city. Resolutions were passed approving of the ideas of the officers of the American Mining Congress that a mining temple, to cost \$1,000,000, should be built. The proposition will probably go to the next State legislature, asking for an appropriation of \$250,000 as a starter for this much-needed building. It is unfortunately improbable that this will be granted, and it will then devolve upon the rich men of Colorado, all of whom, directly or indirectly, have derived their wealth from the mines, to assist substantially in erecting this building. That they will eventually wake up and do this is more than probable.

Strong resolutions were adopted, urging the importance of securing the headquarters of the mining congress for Denver, and stating the probability of its going to Salt Lake.

From the above it is apparent that some little feeling has entered into the competition, and though Denver has the great advantage of being selected by the Portland convention of the American Mining Congress as the home of the proposed temple, her citizens have so far apparently contented themselves with passing resolutions, while those of Salt Lake are coming down handsomely with the needed coin.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Salt Lake City, Denver, Butte and London

REVIEWS OF IMPORTANT EVENTS

San Francisco.

Sept. 16—The Gwin mine in Calaveras county, one of the famous old Mother Lode mines, has been closed down and the pumps have been removed. The mine will be allowed to fill with water, and all operations will cease. This mine yielded millions of dollars to the Gwin family in the early days of quartz mining, and finally, owing to a breakage of the pumps, filled with water, in which condition it lay for a number of years. Finally F. F. Thomas, the present president and manager, with David McClure, now the superintendent, organized a company to work it, and sunk a new vertical shaft for that purpose instead of trying to repair the old one. The company is called the Gwin Mine Development Company, of which J. J. Crawford, ex-State mineralogist, of California, is secretary. The operations were highly successful, and the property was equipped with a 100-stamp mill, compressors, and all suitable machinery. The production was large until about three years ago, since which time they have been prospecting, and during this period incurred some debts. On Aug. 24 the power company shut off the water. Some of the stockholders declined to pay further assessments, so the mine was closed down. The probability now is that an entire reorganization of the company will be effected and the debts paid. When this is done the mine will be pumped out and operations resumed. Other companies offer to furnish power.

On the Merced river, Merced county, not far from the Mariposa county line, a dredge company has commenced operations this month. The dredge is operated by electric power generated with the use of oil as fuel, the power plant being about two miles from the dredge, which is located on the Montgomery land about 1½ miles below the town of Snelling. The dredging company has acquired 400 acres of mining ground along the Merced river. This is the first practical attempt at gold dredging in that part of the State.

The City of Oroville, Butte county, has obtained an injunction from the Superior Court against the Indiana Gold Dredging Company to prevent the company from further depositing tailings in the river channel, and endangering the city during flood periods. The Feather river makes an abrupt turn just below Oroville, where it is from 800 to 1200 ft. wide, and the dredge company has piled up an embankment from 10 to 30 ft. high and 70 to 210 ft. in width, narrowing the river bed to

what the Oroville citizens consider about 300 ft. Oroville is building a levee to protect itself from such floods as occurred there in March, 1907, and it is thought the dredge embankment will cause the waters to cut out and undermine the levee. The dredge company has stopped work pending a settlement. The case has been transferred to the United States Court in San Francisco.

The Solano Wonder mine near Brownsville, Yuba county, discovered some months ago by "cow county" men, on patented land, owned by J. C. Campbell, and over which there was some litigation, continues—somewhat contrary to expectation—to yield well. When first found some phenomenally rich ore was taken out. A full crew of men has been engaged for some time sinking the shaft, and the vein continues in depth, and it looks now as if it would be a permanent mine carrying high values. No machinery has yet been installed, but the mine is free of water, so that shaft-sinking is easy.

Salt Lake City

Sept. 17—Options held by the Utah Consolidated Mining Company on lands near Tooele, Tooele county, expire on Sept. 30, and it is presumed, therefore, that the result of the negotiations which have been pending for some time for a 5-year extension of its smelter contract with the American Smelters Securities Company will have been known. Unless the contract is given new life, the Utah Consolidated will proceed with its plans to erect a smeltery of its own near Tooele; which would mean also that the smelter at Garfield would have another formidable competitor in the Utah field for custom ores. At the present time, the Utah Consolidated Company is shipping 800 tons of ore to the Garfield smeltery per day, under the provisions of a contract which originally was to have run for one year, but containing a clause making it optional with the mining company to keep it in force for two years, provided that within six months notice was served on the management of the smeltery for the additional time, which has been done. It is said that the contract has been taken on such a favorable basis to the mining company that the smeltery officials are not eager to renew it for the long term. However, it may be done to avoid the entrance of another competitor.

Newly acquired surface rights have cost

the Utah Copper Company, recently, \$17,500; the Puritan Gold and Copper Company receiving \$5000 and the Little Eddy Mining Company \$12,500, the property involved in the transaction being situated in Bingham. The area is to be utilized as a dumping place for overburden removed from the Bingham deposits of copper-bearing porphyry ore; also to provide room for additional trackage in contemplation of the enlargement of the Garfield concentrator to the capacity of 8000 tons per day. Work on the enlargements will probably begin early next year.

The new lead smeltery of the Tintic Smelting Company has been pronounced a success, and from the two furnaces 40 tons of bullion is being produced daily. The third furnace will go into commission in October.

Tintic mining companies have posted September dividends as follows: Colorado, \$120,000; Uncle Sam Consolidated, \$25,000; May Day, \$12,000.

Butte

Sept. 17—At the meeting of the stockholders of the Davis-Daly Estates Copper Company, held Sept. 5, to consider the reorganization offer of the Raborg syndicate, 319,000 shares out of 600,000 issued were represented and voted in favor of accepting the syndicate offer. This is but 53 per cent. of the stock, whereas the syndicate offer contemplated an acceptance by at least 65 per cent. It is stated, however, that the syndicate will waive the 65-per cent. vote which they were entitled to under the offer and carry out the contract, giving the dissenting stockholders one member on the board of directors of the new company.

After a shutdown of more than two weeks the coal miners of northern Wyoming employed in the mines at Carney, Monarch and Sheridan, returned to work yesterday pending the settlement of the strike. It is expected that the coal miners in the southern part of the State will also start work in a few days, thus temporarily averting labor troubles which threatened to affect seriously the mining industry in Butte and bring about a coal shortage.

The Montana Railway Commission, recently engaged in hearing complaints on ore-shipment rates, has rendered its first decision. The decision affects ore rates from points on the line of the Northern Pacific railway, the rates to Butte being reduced 36 per cent. and those to East Helena 17 per cent. As a result of this

decision the smelters at Butte and at Helena are put on an equal basis, removing the advantage formerly held by the East Helena smelter.

Denver

Sept. 18—Work in the tungsten mines of Boulder county, which was temporarily suspended owing to the low price of that metal, is being resumed, and the number of men employed shows a steady increase.

In the Cripple Creek district, the legality of taxation of non-producing mining property has been in dispute for five years, the same revolving around the question of what is meant by the word "locality" in that section of the State law governing the assessment of mining property, the owners of which claim very properly that the same valuation should not be placed on their non-productive ground as on that which is producing. If the property were taxed on a valuation based on the price it would bring at a forced sale, it would be fair, and there would be no kick coming from the owners. A test case has just been tried in which seven companies were the plaintiffs, the result being awaited by 60 other companies who, it is said, will bring similar actions. The judge decided against the defendant county commissioners, whose assessor levied the tax, and reduced the same from \$570 to \$118 per acre.

The El Paso Consolidated Gold Mining Company, which paid regular dividends up to the time the mine was flooded, has just declared a dividend of one cent per share, amounting to \$24,500, payable Sept. 25, the first dividend since June, 1907.

Two suits have been filed in the district court of Teller county by the Jennie Sample Consolidated Mining Company, of Cripple Creek, against Mrs. Cone, the owner of the Ophir claim. Damages are asked in the sum of \$125,000 for alleged illegal extraction of ore. Another suit of a similar title for \$200,000 brought by the same people, has been pending for some time, making a total of \$325,000 demanded.

In the two mines known as the Millionaire and the Smuggler, at Aspen, strikes of phenomenally rich and large bodies of silver-lead ore are reported. Details are not available at this writing.

In the Central City district, the old Buell mine is being unwatered by Colonel Martin, one of the chief owners. The property embraces about 5000 linear feet of veins, and was opened in 1871 at a point under Gregory street and gulch, in Central City, and at a depth of 100 ft., the first body of rich ore was struck. Several tons of this ore was sent across the water to Swansea at that time, and brought \$300 a ton in gold, and up to 1880 the property is said to have yielded \$800,000. The shaft, which is being unwatered, is about 600 ft. deep, and is situated near the entrance of the adit level, the mill be-

ing built over the shaft. A very large amount of ore ground will be available as soon as this important work is accomplished.

The arrangements for recommencing the drivage of the Newhouse tunnel are not yet completed, as some of the mine-owners who should come into this great unwatering scheme are still holding out, and have not agreed to the arrangement proposed by the tunnel manager. However, the Chamber of Commerce has taken up the matter, and is using its influence to persuade these people to act for the general welfare of the district, as well as their own, and it is probable that the great work of pushing the tunnel ahead will be commenced before the end of the year.

Toronto

Sept. 18—Since 1904 to date dividends aggregating \$6,061,520 have been paid by 13 Cobalt companies as follows: Nipissing, \$2,260,000; Temiskaming & Hudson Bay, \$937,266; Kerr Lake, \$750,000; Coniagas, \$680,000; McKinley-Darragh, \$354,346; Silver Queen, \$270,000; Buffalo, \$267,000; Crown Reserve, \$142,000; Tretthewey, \$120,908; Right of Way, \$105,000; Temiskaming, \$80,000; City of Cobalt, \$50,000; Foster, \$45,000; Total, \$6,061,520.

At the annual meeting of the Canadian Manufacturers' Association held at Montreal commencing, Sept. 15, an important step was taken toward the establishment of a national system of technical education.

The report of the Technical Education committee, presented by Dr. Morley Wickett, of Toronto, recommended the appointment, by the association, of a commission of three to visit the leading European countries and the United States, and inspect the principal industrial schools and technical colleges to gain an insight into their methods, subsequently familiarizing themselves with the industrial requirements of different Canadian localities and ascertaining how far these could be met by the adaptation of foreign methods. They would then be able to formulate a general system of industrial education. The cost of such a commission for two years was estimated at \$25,000, of which it was proposed that the association should provide \$5000, leaving the remainder to be raised by the provinces. The report was adopted and \$5000 voted toward the expense of the commission. Negotiations with the provincial governments for carrying the project into effect will be undertaken.

London

Sept. 11—The British Association has been holding its annual meeting during the past week in Dublin, and as usual a large number of papers dealing with every branch of science were presented. The work of the association is conducted in sections, of which the following is a

list: Mathematics and physics, chemistry, geology, zoology, geography, economic science and statistics, engineering, anthropology, physiology, botany, education, science. The president for the year was Dr. Francis Darwin, the distinguished botanist. Addresses were given by the presidents of the different sections among which that of Prof. John Joby, the president of the section devoted to geology, who took as his text "Uranium and Geology," was not the least important. Another valuable address of special interest to mining engineers was that given by Dugald Clark, whose subject was "Thermodynamics and the Internal Combustion Engine."

It was announced that the next meeting of the association would be held at Winnipeg, Manitoba, in 1909, with Prof. J. J. Thomson as president.

The report for the year 1907 of the Minerals Separation, Ltd., and the chairman's address give information as to the progress made with the flotation process that the company owns. The principal business has been conducted at Broken Hill, Australia, where not only the dumps but also the crude ore has been treated. At the Central mine one of the plants treated between November, 1907, and June, 1908, 100,000 tons of tailings producing somewhat over 36,000 tons of concentrates assaying 15.3 oz. silver, 11 per cent. lead and 45.1 per cent. zinc, with a recovery in marketable form and without any retreatment whatever of 73 per cent. of the silver, 66 per cent. of the lead and 83 per cent. of the zinc in the original material. The average cost of treatment is given at \$1.68 per ton made up as follows: Trimming 11.76c.; recrushing and grinding, 36.48c.; flotation process, 97.92c.; handling concentrates, 12.96c.; handling residues, 8.88c. The cost of a 250-ton per day unit, attached to a milling plant, for the treatment of tailings and slimes delivered direct (no further grinding machinery being necessary) is estimated at £6000. The estimate for a 250-ton per day plant to treat crude ore from the mine with crushing and regrinding machinery is £14,000. The company has also had operations in Bolivia where an attempt was made to treat a dump of tin ore by a dry-table process. This venture was, however, not successful. A considerable portion of the report is given up to discussing the question of patent rights and the litigation that has been and is still going on with the British Ore Concentration Syndicate and the Ore Concentration Company, which are interested in Elmore's patents. The action brought by the British Ore Concentration Syndicate was decided in favor of Minerals Separation, Ltd., and the plaintiffs have given notice of appeal to a higher court. A third action in which the company is involved is one attacking the Elmore vacuum process as an infringement of its patent. This action has still to be tried.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Republic Iron and Steel Company—Work at No. 1 iron mine, at Raimund, has been suspended pending improvements in the mine. A new heading will be driven, the whole mine will be re-timbered with creosoted timber, a steel tippie will be installed, as well as a large crusher. The improvements will require about 60 days to complete. It is understood that none of the men at work in the mines will be laid off, as the new mine at Spaulding has been started up and many of the men have been transferred to that mine.

Tennessee Coal, Iron and Railroad Company—It is announced that further improvements are to be made at the steel works at Ensley. Three new blast furnaces, each with a capacity of 100 tons per day, will be built to take the place of three of the old ones. A 600-ton mixer is to be installed in the steel works. Some minor improvements will also be made.

Arizona

GILA COUNTY

Miami—The stockholders of this company and the holders of rights subscribed for 83,000 shares of the new issue of stock, leaving 17,000 shares to be taken by the underwriters. It is explained that the reason why the entire 100,000 shares were not taken by the stockholders is that about a week before the closing of the subscription, the General Development Company, which holds 100,000 shares of Miami, voted to distribute the rights on this stock among its stockholders. Many of the latter were absent in Europe, and inasmuch as the rights could not be extended, in some cases they expired without the holders being able to subscribe. F. W. Estabrook, of Nashua, N. H., has been elected a director of the Miami company to represent the Boston interests, which now own about 250,000 shares.

GRAHAM COUNTY

Detroit Copper Mining Company—The damage suit of the Chase creek property holders against this company, of Morenci, is being tried at Tucson on change of venue from Graham county. The suit is to recover damages done by the breaking of the dam at the concentrator during a heavy rain. An enormous amount of water was thrown into Chase creek, and Clifton, a town four miles below Morenci,

and about 3000 ft. lower was flooded. The company is represented at the trial by C. E. Mills, Gus Hunt, superintendent of the concentrator, and Thomas Donahue, superintendent of the smelter.

California

AMADOR COUNTY

Bay State Mining Company—Unwatering of the shaft of this mine has lowered the water to 400 ft.

Amador Queen No. 2—Doyle & Thomas have taken a lease on this mine and a tunnel is being run in search of "pockets."

Mitchell—In this property, under bond to Mr. Crammer, ore of good grade has been found at 200 ft. depth.

BUTTE COUNTY

Banner—A body of high-grade ore is reported found in this mine, six miles from Oroville.

Big Blue Lead Mining Company—This company is ready to take up its options on the land, which means the beginning of operations on a large scale.

CALAVERAS COUNTY

Eazy Bird—Local men have started work on this mine at Mokelumne Hill, which has been idle for a year past. There is a 10-stamp mill on the property.

Middle Fork—A strike of high-grade ore has been made in this mine near the Carleton mine.

Newman—This old mine near West Point has been opened and the tunnels and shafts are being cleaned out and repaired.

EL DORADO COUNTY

Alpine—This mine near Georgetown, under bond to Wingfield & Nixon, of Nevada, has had a new steam hoist installed; a mill is being planned.

Big Cañon—A new steam-power plant has been installed at this property, with a view of unwatering the shaft.

FRESNO COUNTY

Sampson Flat District—At this camp, 45 miles east of Sanger, men have been set at work on the Delilah mine, under Supt. W. A. Macdonald. The Sampson mine, owned by Dr. Clow, is also being worked.

KERN COUNTY

Amalie District—At this place work has been resumed on the Amalie mine, and an entirely new reduction plant is to be in-

stalled. Minehaha is being worked on a royalty. At the Indian Tom mine, a horse-power arrastre is crushing ore.

MODOC COUNTY

Fort Bidwell Consolidated Mines Company—The Fort Bidwell and the Mountain View companies have consolidated under this name. Active work has commenced and a 5-stamp mill is to be erected.

NEVADA COUNTY

Birchville—At this mine, Graniteville, D. Medlin, superintendent, a 5-stamp mill is being erected.

Bear River Consolidated Tunnel Company—This company having completed the 500 ft. of tunnel, now receives a full one-half interest in the six claims. The company will incorporate and put in the necessary machinery.

Sultana Group—The large station at a depth of 1300 ft. on the incline has been finished in the Prescott Hill shaft and the huge electric pump will now be put in place.

Ocean Star—This mine at Ormonde has been sold to San Francisco men, who will now develop it.

Compressor—Two large 10-drill compressors have been ordered by Supt. Samuel Colt, one for the Lecompton mine, at Nevada City, and the other for the Norambagua mine, Grass valley. The mines are being reopened.

PLACER COUNTY

Forest Hill Divide—The development in the Fletcher or Dardanelles mine at Last Chance, and the Paragon mine at Bath, are attracting attention to both the Forest Hill and Upper Divides.

PLUMAS COUNTY

Plumas-Eureka—This old mine at Johnsville has closed down on account of shortness of water supply with the exception of continuing the old Eureka Hill tunnel, with two shifts of miners.

Arcadia Group—This group, recently taken over by E. W. King, W. G. Devercux and W. H. Mader, is yielding a very high-grade ore.

SAN BERNARDINO COUNTY

Placers—Rich placer strikes on the northeast slope of Mount San Bernardino have excited the mining communities at Victorville and Hesperia.

Fremont—At this mine, 18 miles north-east of Barstow, a rich orebody has been

uncovered; an abundant supply of water is also furnished, a great item in that section.

SIERRA COUNTY

Howland Flat—The owners of El Oro Dredge Company are operating the Howland Flat mine at this place and have placed orders for a mill.

Bellevue—Twenty-two men are now breasting out high-grade gravel from this drift mine.

Buttes Saddle—At this mine, Sierra City, Chick & Aldrich, who have it under bond, have 14 men driving tunnels and repairing tramway.

SISKIYOU COUNTY

Black Bear—At this mine, Ben Daggett, superintendent, they are about to sink a new shaft to open up the old rich pay shoot known to exist in the property.

TRINITY COUNTY

Venecia Mining Company—This new incorporation has been found to work the Venecia mine in Eastman gulch.

Brown Bear—The recent rich find in the China tunnel of this property at Deadwood, is in virgin ground, and is expected to place the old mine again in the position of being a heavy producer.

TUOLUMNE COUNTY

Densmore—At this mine, Columbia, A. J. Crowell, superintendent, a new shaft is being sunk which will be put down to 300 ft. before drifting commences.

Seminole—This mine has been purchased by H. B. Lind and associates, who intend putting in a modern mill with concentrators.

YUBA COUNTY

Little Bessie—This mine at Browns valley has been bonded to J. C. Campbell and is to be reopened and thoroughly developed.

Colorado

LAKE COUNTY—LEADVILLE

Dinero Tunnel—At the beginning of the week the tunnel caught the outer edge of one of the veins. The vein matter shows considerable native silver mixed with the sulphides. The vein was caught a little more than 3400 ft. from the portal. The tunnel is being driven ahead to get to the other side of the vein and when this is accomplished it is likely that the management will develop it both sides before driving the tunnel ahead to the other vein. The tunnel has been working steadily for 18 months.

Huckleberry—The lessees started to sink a winze from the bottom of the tunnel level and had only reached a distance of 40 ft. when an excellent body of ore was caught; 20 ft. had been passed with the ore still in sight. The main body of

the ore runs \$40 per ton, but it has a rich streak which assays about \$150 per ton; this ore is being sacked.

Manhattan—This property, Willis gulch, is being developed by tunnel; a few days ago a vein 14 in. wide was caught, and is now being followed. The ore is free gold milling. The company will install a stamp mill in the spring.

Helena—The sinking of the Helena shaft, Iowa gulch, proceeds; at the 600-ft. mark several streaks of high-grade galena have been found, an indication that before the shaft reaches its objective point, 800 ft, the ore horizon will be caught.

Maumee—A 4-ft. body of ore was opened in the shaft, Mosquito range, during the week; it will average 2½ oz. gold per ton. The ore resembles that taken from the famous London mine, which is close to the Maumee. A good plant of machinery has been installed on the property and work will be continued throughout the winter.

Bix Six—Sufficient work has now been done on the recent strike, Breece hill, to prove that it is an ore shoot and not a pocket. The lessees are shipping steadily 30 tons daily and sacking the high-grade ore which still holds up to 37½ oz. gold per ton. This orebody is the same as that opened in the Penn a few years ago.

American—This property, Iowa gulch, is close to the Lilian and a few months ago was leased to Pasco and associates. A new shaft was started and at a depth of 75 ft. an excellent body of iron carbonates was opened; shipments are now going out regularly. When this iron orebody is sufficiently developed, it is the intention of the lessees to sink the shaft deeper.

SAN JUAN COUNTY

Bagley Funnel—This adit, in the Animas Forks district, has cut the Red Cloud vein at a distance of 4800 ft. from the entrance. Drifting is now being done on the vein, which is about 12 ft. wide.

Hamlet—Development work is showing good results, and the mill is to be started up soon.

Kittimac—The new mill building at this mine is nearly finished, and the machinery is beginning to arrive.

Georgia

BARTOW COUNTY

The mining of bauxite is to begin soon on a tract of 1500 acres recently bought by A. D. Greenfield, of Atlanta, Ga., and others. They intend also to put up a plant for the manufacture of alum and other products.

Indiana

State Senator Ralph W. Moss, of Clay county, has prepared a bill which he will introduce at the extraordinary session of

the Indiana Legislature. It provides for the repeal of the section of a law enacted by the last Legislature making it unlawful to use a drill more than 2½ in. in diameter. This regulation has been found to be unsatisfactory in the block coalfield. It is claimed that the block coal requires a heavier shot to do effective mining.

GREENE COUNTY

So serious has become the condition of the 2000 unemployed miners in the Linton field, that steps have been taken for their relief. It has been decided that the former rules of the miners' organization limiting the number of men to be employed, should be abandoned in behalf of the unemployed men who have been idle since March. It is the first time in the history of the organization that these rules have been abandoned, and the matter is one of great importance. Resolutions were unanimously adopted setting aside for the present former working conditions as to the number of places to be given them, and the number of turns in a room, for a limited time, and that men now idle shall be allowed to work with other men, when it is satisfactory to the man now at work.

VIGO COUNTY

George W. Purcell, commissioner of labor for Indiana has tendered his services in the Hudson mine dispute. The operators claim that an adjustment would be speedily reached if President Lewis would do his part. The issue is wholly between the National and district officers rather than a question between employers and employees. However, both operators and miners have agreed that any assistance rendered by Commissioner Purcell will be acceptable.

Michigan

COPPER

Lake—A station for the second level has been cut at a depth of 300 ft. from surface. Drifting to the south from the first level continues, and the drift is breasted in the same rich formation that has characterized it from the beginning.

Atlantic—Preparations are about completed for this company to begin small rock shipments to its mill. The south drift from the 13th level is opening up the same kind of ground that was disclosed in the level above and the two levels will be able to furnish a limited tonnage of a good grade of stamp rock. This, together with the revenue derived by leasing portions of its stamp mill will help the Atlantic company in its development work.

Quincy—The structural steel for the new shaft house on the site of No. 2 shaft has been erected, and the building is being sheathed. This shaft house will have embodied in it all the new devices for the

economical handling of rock, and will be the largest in the Lake district.

Adventure—Diamond drilling continues at this property, and a vertical hole is now being put down to intercept the various lodes encountered by the other drill holes. With this information at hand, some definite action in regard to sinking a new shaft to work these new finds will, in all probability, be taken.

Ojibway—The railway spur has been completed to the shaft sites of this property.

Michigan—In the drift from the 17th level of "A" shaft some rich ground has been encountered. Diamond drilling continues on the lands of this company, and some promising formations have been cut.

Hancock—This company has run into good ground in the crosscut from the 13th level toward the new shaft. Sinking continues at No. 2 shaft, which is down about 1250 ft., the formation being exceedingly hard, but showing some copper.

Calumet & Hecla—This company has discontinued all exploratory work in Ontonagon county for the present.

Montana

BUTTE DISTRICT

Anaconda Company—The hoisting engine from the Red Metal company's Cora mine is being moved to the Belmont mine of the Anaconda company, where it will be installed. The engine is good for 3000 ft. and was originally installed at the Granite Bimetallic mine at Phillipsburg.

British-Butte—The hull of the new 2500-cu.yd. Risdon gold dredge has been completed.

Butte & Ballaklava—The shaft has reached a depth of 940 ft. It is stated that sinking will continue to the 1000-ft. level, where more development work will be done.

FERGUS COUNTY

Gold Reef Mine—This property, owned by John A. Drake, is situated at Gilt Edge and is being worked by leasers. At the mine and mill a recent increase in the number of men employed brings the total up to 60. About 200 tons of ore are being extracted and treated daily.

JEFFERSON COUNTY

Baltimore Copper Mining Company—The company recently made final payment of \$17,000 to the heirs of the Mackey estate for their interest in a group of claims in the Boomerang district. The company has held the Baltimore mine under lease and bond for some time, but since the Butte and Anaconda smelters closed down a year ago little development work has been done on the property. Plans are now completed for the development of the property on an extensive scale.

LEWIS & CLARK COUNTY

Alfonso Lacasse, John Lacasse, Na-

oleon Lacasse, C. A. Davis and C. M. Van Leuvin, all of Missoula, have recently purchased a group of gold claims near York and expect to begin operations at once. The property is equipped with a hydro-electric plant, compressor plant and electric hoist.

Wolf Creek Mining Company—Several months ago a vein carrying good copper ore was encountered in a 40-ft. shaft on this property. The shaft was sunk primarily for the purpose of increasing the air supply. A long tunnel is now being run which it is expected will cut the vein at a point 200 ft. below the shaft. The tunnel has been driven a distance of 250 feet.

MISSOULA COUNTY

Cape Nome Mining Company—The shaft on this property has reached a depth of 500 ft. The vein has been cut on this level and drifting is in progress.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Production—The receipts from local producers this week amounted to 2552 tons valued at \$170,250. This is exclusive of 40 tons of concentrates retreated at the Kinkead mill valued at \$400 per ton and 35 tons of \$150 ore from the Great Western mine at Hornsilver. The Combination mill treated 560 tons of consolidated ores. The Western Ore Purchasing Company handled from the Mohawk Jumbo 26 tons; Engineers Lease 329 tons; Consolidated Assay Office 40 tons; Consolidated Red Top 61 tons; Rogers 6 tons; Florence Consolidated 58 tons; Kinkead concentrates 84 tons; Little Florence 99 tons; Volk-Florence dump 12 tons; The Nevada Goldfield Reduction Works treated the following ores: Combination Fraction 528 tons; Sandstorm 49 tons; Baby Florence 20 tons; Mohawk Jumbo 40 tons; Higginson 18 tons; Florence Annex 12 tons; Begole Syndicate 360 tons.

Florence Consolidated—The January lease on the Cornishman claim of the Florence has encountered ore on the 172-ft. level in the south drift. The vein is 9 ft. wide between walls and is all of a shipping grade. This lease was formerly operated by January Jones.

Florence Jumbo—This lease on the Florence, otherwise known as the Von Polenz lease, has installed a new electric hoist to handle the ore from the working level at the 355-ft. point. The old gasoline hoist will not be removed but will be used in case of accident.

Jumbo Consolidated—The crosscut on the 250-ft. level is now in 70 ft. It will be continued to the side line. Three shifts are at work sinking the shaft.

Baby Florence—This lease on the Florence Goldfield Company's ground has been extended by the parent company

from December 6, 1908, to February 6, 1909.

Gem Florence—The Florence Goldfield Company has given the Gem lease an extension of six months.

Zinn Florence—In the extension of the life of the Baby Florence lease for an additional 60 days, 50 ft. of ground was surrendered on the north end of the block to the Zinn Florence.

Lone Star—The old Truax lease on the Lone Star, which has been idle two years after producing \$19,000 of ore, has been taken over by the Goldfield Star Mining and Leasing Company which will at once begin active operations. The new lease runs until Jan. 1, 1910.

ESMERALDA COUNTY—HORNSILVER

Great Western—Arrangements have been made by the Great Western to have its low-grade ores treated at the Tonopah Belmont Development Company's mill at Miller's. The ore carries chiefly silver but a saving of 95 per cent. is guaranteed. A very satisfactory rate has been given by the railroad, but the wagon haul from Hornsilver to the railroad at Cuprite will cost \$6 per ton.

ESMERALDA COUNTY—CUPRITE

Sulphur Group—The sulphur group recently acquired by California parties is being vigorously developed. A trench 15 ft. wide and in places 16 ft. deep has been run 350 ft. across the deposit showing a high grade of sulphur all the way.

NYE COUNTY—TONOPAH

Output—The production of the Tonopah mines this week amounted to 6040 tons of ore of an estimated value of \$160,800, the shipping ore averaging \$60 per ton and the mill ore averaging \$25 per ton as follows: Tonopah Mining 3450 tons; Belmont, 750 tons; Montana Tonopah, 1000 tons; Midway, 100 tons; MacNamara, 250 tons; West End, 165 tons; Jim Butler, 200 tons; Tonopah Extension, 130 tons.

WHITE PINE COUNTY—ELY

Giroux Consolidated—The Alpha shaft has reached a depth of 1200 ft. and work of cutting a large station has begun. The winze from the 1100-ft. level is 90 ft. deep and is still in the orebody.

STOREY COUNTY—COMSTOCK

Ophir—Last week's production of the Ophir amounted to 124 cars of ore worth \$23.50 per ton from the 2100-ft. level and 338 cars from the 2200-ft. level worth \$30.23 per ton.

Crown Point—This mine at Gold Hill is being rehabilitated after a long idleness.

Yellow Jacket—The 1200-ft. level of the Yellow Jacket is being opened up for the first time. Between the 1100- and 1300-ft. levels is 200 ft. of virgin ground 956

ft. long. When the Crown Point struck bonanza ore in the early seventies the Yellow Jacket sunk to the 1300-ft. level and drifted to catch this shoot, which however, did not extend into the Yellow Jacket ground. This new ground contains a large amount of mill ore which will yield a profit with the present milling methods.

Ohio

COLUMBIANA COUNTY

West Point Coal and Coke Company—This company has nearly completed the preliminary work which it is doing at its new mine near Lisbon. The mine will begin producing coal in October.

Pennsylvania

BITUMINOUS COAL

Cresson & Clearfield—This company has let the contract for 125 coke ovens to Colangelo & Scudder, of Latrobe. They will be built at Frugality, in Cambria county.

Carnegie Coal Company—This company has bought a tract of 3000 acres of coal land in Washington township, Greene county, from J. V. Thompson and others. The land adjoins a tract recently bought by the Emerald Coke Company.

Emerald Coke Company—In addition to the lands recently noted as purchased, this company has bought 5000 acres in Washington, Morgan and Franklin townships in Greene county. The property acquired is in Buffs Creek valley, and adjoins the property of the Pittsburg-Buffalo company. It is considered an extension of the real Connellsville seam under the Monongahela river and into the southwestern counties of the State. Plans are being made for the development of the land. Julian Kennedy, of Pittsburg, is president of the company.

South Dakota

LAWRENCE COUNTY

Minnesota Mines Company—An addition to the treatment plant is to be made which will give a total capacity of nearly 150 tons daily. The present capacity is 80 tons.

Ohio Beaver Creek—G. W. Inglis has been appointed receiver to straighten out local tangles. It is expected that the company will not commence hydraulic work until spring.

Oro Hondo—J. W. Sparks, of Philadelphia has paid off the indebtedness in full and is about ready to resume work. Henry J. Mayham, of New York, originally promoted the company.

Lucky Strike—Work has been resumed on Elk creek. The 200-ft. shaft will be sunk another 100 ft. for the present and later to the 400-ft. level and 600 ft. of drift work will be prosecuted.

Tinton—Steady shipments are being

made to London of tin concentrates and the company is planning the erection of a smelter to treat the concentrates on the ground.

PENNINGTON COUNTY

Truax Group—The ground has been purchased by the Wolfstone company, of Leadville, and will be worked for its tungsten product. The Black Metal Company, of Boulder, Colo., was the seller.

Golden Summit—Men are at work preparing the shaft for widening and retimbering, after which it will be sunk deeper and the property operated jointly with the Gold Medal ground.

Forest City—The shaft is being unwatered and the Cleveland owners are going ahead with plans to work the ground at once, and mine the gold ore exposed.

Utah

BEAVER COUNTY

Horn Silver—This property is shipping to the Tintic smelter about 40 tons of lead ore per day.

King David—Next to the Newhouse Mines and Smelters Corporation, this company is conducting the most vigorous development campaign in Beaver county. A double compartment shaft is being sunk.

Utah-United Copper—This company was recently organized and absorbed the skylark Copper and Wasatch Mining and Milling companies. The management has outlined a vigorous development campaign and is installing steam hoisting equipment.

SALT LAKE COUNTY

Bingham Central Standard—An important body of lead ore has been opened in this property near the sidelines of the Bingham-New Haven mine. The ore carries lead, copper and some gold.

North Utah Mining—Negotiations have been practically concluded for the absorption of the New Red Wing, Vespasian-Hoogley and Butler-Liberal mines in Bingham.

Pittsburg Consolidated—Shareholders of this corporation have ratified a deal whereby the property of the Pioneer Consolidated Mining Company, in American Fork cañon has been absorbed. Development is being done through a tunnel. Considerable high-grade lead-silver ore has been shipped from these properties.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Sept. 12 were as follows: Cobalt Central, 49,290 lb.; City of Cobalt, 254,380; Drummond, 660,011; La Rose, 267,280; Nipissing, 304,100; Nova Scotia, 40,500; O'Brien, 257,680; Right of Way, 113,090; Temiskaming, 102,940. Total, 2,008,760 pounds.

Chambers-Ferland—Three shafts have been sunk and much surface work has been done. No. 1 shaft is down 100 ft., with drifts running north 65 ft. and south 53 ft. One stope has been carried 45 ft. in the north drift and another 25 ft. in the south drift. Seven tons of high-grade ore are sacked for shipment. Shaft No. 2 is down 100 ft. and a crosscut westward has been started at 80 ft. to tap a vein 40 ft. distant which is a continuation of a rich La Rose vein. Shaft No. 3 is down 22 ft. Veins 6 and 7, also La Rose veins, will be worked from this shaft.

Mexico

CHIHUAHUA

Carizo—It is reported at Chihuahua that M. G. Garner has recently made important gold discoveries near Carizo in the vicinity of the famous Lluvia de Oro mine. A number of denouncements have been recorded and development is under way.

Calera—This company is said to have closed a contract for the shipment of 6000 tons of zinc ore to the works of the United Zinc and Chemical Company, at Iola, Kan. The present output consists of about 4 cars of concentrates weekly.

Dolores—A recent bullion shipment marketed through the Banco Minero, Chihuahua, consisted of 84 bars, of a value of 146,000 pesos. The monthly bullion output of this company ranges from \$70,000 to \$90,000.

SONORA

Caracahui Mountain Copper Company—This company has installed a 40-h.p. hoisting plant and is enlarging its small prospect shaft to one of two compartments. The shaft will be continued to 500 ft. depth. The lode varies in width from 3 to 5 ft. and carries copper, gold and silver. Other properties in the district are showing increased activity.

Australia

NEW SOUTH WALES

Broken Hill Proprietary Company—This company reports for the half-year ended May 31 a production of 2,529,779 oz. silver and 36,140 tons of lead. In all, 262,165 tons of ore were treated by the concentration plant. The zinc concentration plant is doing well, turning out concentrates running 45 per cent. zinc. The company has made contracts with other Barrier range companies to buy 2000 tons of ore and concentrates weekly. The directors have decided, in view of the success of the present zinc plant, to put up a plant costing about £100,000, and having a capacity of 8000 tons of spelter yearly. The net profit of operations for the half-year was £22,776. The expenditures for new construction were £30,462 in all.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 23—The coal trade in the West continues slow, and no further improvement is manifest. Continued warm weather has held back domestic trade, and the demand for steam coal is no better. Lake trade shows no sign of the usual season-end rush, the upper Lake docks being apparently supplied with all they need, or very nearly so.

In the East the bituminous trade is quiet, as it has been for some time. Steam coal demand does not increase, and the Coastwise trade is dull for the season. Anthracite business is quiet, the warm weather having held back buyers of domestic supplies.

Throughout Pennsylvania, both in the anthracite and bituminous regions, the mines continue to be embarrassed by short water supplies resulting from the long drought.

The decision of the Court of Appeals in the car discrimination case, noted elsewhere, will be of importance to many coal companies.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Sept. 12, in short tons:

	1907.	1908.	Changes.
Anthracite.....	3,957,648	3,512,441	D. 445,207
Bituminous.....	27,155,938	22,657,420	D. 4,498,518
Coke.....	9,868,460	4,752,098	D. 5,116,362
Total.....	40,982,046	30,921,959	D. 10,060,087

Total decrease this year to date was 24.5 per cent.

Coal shipments, Southwestern Interstate Coal Operators' Association, six months ended June 30, short tons:

	1907.	1908.	Changes.
Missouri.....	1,378,169	1,010,121	D. 368,048
Kansas.....	3,104,682	2,156,708	D. 947,974
Arkansas.....	1,121,552	783,381	D. 338,171
Oklahoma.....	1,372,248	1,006,034	D. 366,214
Total.....	6,976,651	4,956,244	D. 2,020,407

The mines were idle this year in April and May, while the wage question was unsettled.

Coal receipts at Boston, eight months ended Aug. 31, reported by Chamber of Commerce:

	1907.	1908.	Changes.
Anthracite.....	1,401,282	1,148,876	D. 252,406
Bituminous.....	2,188,064	2,122,917	D. 65,147
Total domestic....	3,589,346	3,271,793	D. 317,553
Foreign.....	357,705	268,300	D. 89,405
Total.....	3,947,051	3,540,093	D. 406,958

The foreign coal is nearly all from Nova Scotia.

Shipments of Monongahela River Consolidated mines, nine months from Nov. 1 to July 31, short tons:

	1907.	1908.	Changes.
River coal.....	3,744,182	3,979,679	I. 235,497
Rail coal.....	1,442,478	1,018,450	D. 424,028
Total.....	5,186,660	4,998,129	D. 188,531

The total decrease, wholly in rail shipments, was 3.6 per cent.

Coal tonnage, Chesapeake & Ohio Railway, month of July, short tons:

	Coal.	Coke.	Total.
New River.....	536,240	14,912	551,152
Kanawha.....	405,095	1,472	406,567
Kentucky.....	19,210	.....	19,210
Connecting lines.....	16,202	5,965	22,167
Total.....	976,747	22,349	999,096
Total, 1907.....	938,758	40,393	979,151

Deliveries this year, to points west of mines, 508,977 tons coal, 13,543 coke; points east, 125,117 tons coal and 8306 coke; tidewater, 341,990 tons coal; anthracite to line points, 663 tons.

New York

ANTHRACITE

Sept. 23—In the hard-coal trade prepared sizes are quite active, but small steam sizes seem to be in sufficient supply to meet all demands. All-rail trade is taking considerable coal, but in New York harbor consumers are not taking as much as was expected.

Schedule prices are \$4.75 for broken, and \$5 for egg, stove and chestnut. Steam-size prices are unchanged: Pea, \$3.25@3.50; buckwheat, \$2.35@2.50; buckwheat No. 2, or rice, \$1.60@2; barley, \$1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

The situation has not improved and business is extremely dull. The demand is spasmodic and no steady change for the better is expected in the trade. Dealers are at a loss to account for the indifference shown by consumers in the shoal-water ports who are usually calling vigorously for coal at this time.

New York harbor trade is practically at a standstill and ordinary grades of coal are selling at \$2.40@2.45 with better grades offered at \$2.50@2.60. Cars are in good supply, but transportation from mines to tide is slow.

In the Coastwise trade small vessels continue scarce and it is noted that a number of large vessels have chartered for South American ports. Freight rates seem a little firmer, but no change of importance has taken place. Rates for large vessels from Philadelphia are: Boston,

Salem and Portland, 50@55c.; Lynn, 60@65c.; Portsmouth and Bath, 60@65c.; Newburyport, Gardiner and Bangor, 65@70c.; Saco, 90c.@\$1; Providence, New Bedford and the Sound, 45@50c. per ton.

Birmingham

Sept. 21—The coal production shows a good improvement over the past week's output. Despite the fact that a number of coal miners are leaving the district, having fears that their applications for work might be turned down, a large number of men are going to work. Every ton of coal that is being mined in this State is being used as quickly as it can be loaded. So far the railroads have given prompt handling of the product. The Tennessee Coal, Iron and Railroad Company, the largest coal-producing concern in the district, has every one of its mines in operation again.

Commercial coal companies have succeeded in securing some large orders to be delivered during the fall. Inquiries are in hand. There will be some further development in the State this year and early in the coming spring. The Little Cahaba Coal Company has purchased adjoining properties, taking over the Coleanor company. The transaction involves a working mine and several hundred acres of good coal lands. The State of Alabama recently disposed of some of its coal-land acreage, the money realized going to the university fund.

Chicago

Sept. 22—Warm weather continues to oppress the coal market, which remains fairly firm but does not progress. Steam coals are quiet and domestic business depends on the weather. Anthracite is dull, the movement in country trade being very light.

Illinois and Indiana coals show a fairly even demand, all sizes, well distributed over Chicago territory. The steam trade runs a little more to fine coals than a week ago. Lump and egg bring \$1.75@2.50; run-of-mine, \$1.50@1.75; screenings \$1.25@1.45, for car-lots. The supply is large and leads to some sacrifice sales to escape demurrage.

Smokeless brings \$4.05@4.30 for lump, which continues scarce, and \$3.30@3.45 for run-of-mine, which is in large supply. Hocking is quiet at \$3.15 and Younghigheny on contracts is steady at \$2.90@3.10 for ¾-in. lump. There is said to be considerable free anthracite in the market, at slightly cut prices.

Indianapolis

Sept. 21—The last week has emphasized the slowness of recovery which has characterized the coal business during the past six months. Operators say it is not safe to judge the immediate future by the dullness of the past week. The present conditions have been helped by unprecedented warm weather and the continued drought throughout the country. Several mines have been closed down for lack of water to run the machinery. The railroads and lake vessels are experiencing some trouble—the first on account of scarcity of water for their engines and the latter on account of smoke and fog on the lakes occasioned by forest fires. It is expected that the demand from the Northwest will be brisk the last week of September since it is customary on Oct. 1 to advance prices at the mines.

Pittsburg

Sept. 22—The drought has completely tied up the river coal mines and the railroad mines are handicapped to a certain extent. Fully 85 per cent. of the railroad mines in the Pittsburg district are running, but the bulk of the product is going to Lake ports for northwestern shipment. Prices remain on the basis of \$1.15 per ton for mine-run coal at the mine. Slack has improved owing to the increased demand from the mills and quotations are from 60@70c. per ton. The Pickands-Magee Coal and Coke Company announced this week the absorption of the Crown Coal Company, of Toronto, Ontario. The company will use the yards of this concern as a distributing point for coal and coke. William McComb, of Pittsburg, is in charge of the new interest. A Canadian charter has been applied for and when it is received officers will be elected.

Connellsville Coke—There is no change in prices. Foundry coke on contract is \$1.65@1.85, but these prices can be shaded for prompt shipment. Foundry coke is firm at \$2.10@2.25 at oven. Some fair contracts were received this week. The *Courier* gives production for the week in both fields at 195,974 tons. The shipments were 7817 cars, as follows: To Pittsburg, 3091; to points west of Pittsburg, 4343; to points east of Connellsville, 383 cars.

Foreign Coal Trade

German Coal Production—Coal production in Germany, seven months ended July 31, metric tons:

	1907.	1908.	Changes.
Coal	82,358,080	85,906,847	I. 3,548,767
Brown coal.....	34,967,329	37,649,385	I. 2,682,056
Total mined...	117,325,409	123,556,232	I. 6,230,823
Coke made.....	12,519,546	12,398,053	D. 121,493
Briquets made...	9,206,438	10,388,395	I. 1,181,957

Of the briquets reported this year 8,074,922 tons were made of brown coal, or lignite.

German Coal Trade—Imports and exports of fuel in Germany, seven months ended July 31, metric tons:

	1907.	1908.	Changes
Imports:			
Coal.....	7,213,152	6,552,707	D. 660,445
Brown coal.....	5,178,135	5,078,517	D. 99,618
Total coal.....	12,391,287	11,631,224	D. 760,063
Coke.....	304,890	314,525	I. 9,635
Briquets.....	101,191	107,359	I. 6,168
Exports:			
Coal.....	11,253,163	11,463,981	I. 210,818
Brown coal.....	11,468	15,578	I. 4,110
Total coal.....	11,264,631	11,479,559	I. 214,928
Coke.....	2,145,484	2,113,090	D. 32,394
Briquets.....	670,474	924,459	I. 253,985

Coke exports this year included 11,352 tons to the United States.

Austrian Coal Production—Coal production in Austria, half-year ended June 30, metric tons:

	Coal.	Brown Coal.	Total.
Coal mined.....	6,990,299	13,478,409	20,468,708
Coke made.....	946,154	18,079	964,233
Briquets made.....	72,416	95,305	167,721

Production in the second quarter of the year was considerably less than in the first quarter.

Spanish Coal Imports—Imports of coal into Spain, seven months ended July 31, were 1,120,655 metric tons, a decrease of 16,453 tons from last year. Imports of coke, 171,658 tons, an increase of 28,767 tons.

Coal in Chile—The Sociedad Nacional de Minería reports the consumption of coal in Chile, during the last five years, as follows, in metric tons:

Year.	Foreign.	Domestic.
1903.....	797,634	51,000
1904.....	822,471	61,624
1905.....	1,179,068	673,927
1906.....	1,019,834	932,488
1907.....	1,489,154	832,612

The State railways of Chile consume annually from 350,000 to 400,000 metric tons of coal of which about one-half is imported.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Sept. 12: Best Welsh steam, \$3.84; seconds, \$3.60; thirds, \$3.36; dry coals, \$3.66; best Monmouthshire, \$3.36; seconds, \$3.18; best small steam, \$1.98; seconds, \$1.74. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Sept. 23—The iron and steel markets have been somewhat irregular. In some quarters there is evident a disposition to hold back both new orders and specifications on contracts; on the other hand more business is reported in the West, and jobbers have shown more disposition to fill up their stocks, which have been low for some time. Railroad orders are still held back, but there is more inclination to contract for structural steel. In this line there are current reports of shading on prices, which it is impossible to verify. Fabricating companies, however, have taken orders at a price

which seems to imply material at a cost less than present nominal prices.

Pig-iron selling has been slow, and most of it in small quantities for this year's delivery. There are inquiries for 1909 delivery, but sellers are not disposed to take present prices, and very few orders have been placed. The Southern furnaces are the best sold up, and therefore are the firmest on prices.

Birmingham

Sept. 21—There is a fairly good demand for iron. One of the larger companies in the district reports being out of the market entirely as far as deliveries are concerned for this year, except to protect some regular customers. Quotations are firm, the average price being around \$13 per ton, No. 2 foundry. Some sales, small lots immediate delivery, have been made at a better price, while some larger orders with plenty of time for delivery have been accepted under the \$13 rate.

The Woodstock Iron Company has blown in its large furnace at Anniston. The Sloss-Sheffield company will have its Philadelphia furnace at Florence ready by the end of this week, it is expected, and a week or two later may be ready with the Lady Ensley furnace at Sheffield. The Tennessee company will have a couple of iron-makers ready for operation by October.

All contracts for iron are being filled just as quickly as possible. The railroads are adding to their forces in order to handle the improving traffic in both iron and raw material.

Baltimore

Sept. 21—Exports for the past week included 1259 tons tinplate bars to Liverpool, and 601,027 lb. tin scrap to Rotterdam.

Chicago

Sept. 22—Sales of pig iron are mainly for small amounts but the flow of orders is steady. The open quotations of \$16.50 for Northern and \$12.50 for Southern No. 2 iron do not stimulate the average buyer to further contracts than his needs for the rest of the year will warrant, except in a few cases. Nor are sellers anxious to go into 1909 business to any extent, both sides appearing to be willing to wait for political developments in November. Northern sells for \$16.50@17 and Southern for \$12.50@13 Birmingham (\$16.85@17.35 Chicago), bringing the two practically on a parity, the lower prices obtaining on this year's business and the higher on 1909 contracts.

In iron and steel products the tone of the market is stronger, the demand for railroad supplies and structural materials being moderately good and other lines showing a beginning of recovery from summer dullness. Coke remains quiet at \$4.90 for first-class Connellsville.

Cleveland

Sept. 21—The Lake trade does not improve as the season draws toward its close. The coal trade is quiet, and there are no indications of the rush which usually comes at the end of the season. Ore trade is still limited, and unless there is more call for shipments to furnaces, the docks will be unable to store more ore. Contract tonnage is more than sufficient to take care of the shipments, and there is no call for wild boats.

Philadelphia

Sept. 23—The pig-iron market seems to have lapsed into dullness again. Small orders come in, but the large buyers have evidently made up their minds to wait until after election before placing contracts for next year. Makers are not chasing up 1909 orders at present quotations, and buyers are not disposed to go higher as yet. The only people who want much iron just now are the cast-pipe makers, and they want low-priced irons for the most part. The effort to stop shaded prices is not altogether successful. Two furnaces in this territory are arranging to go into blast soon, and others would like to, but are not clear as to prospects. No. 2X foundry may be quoted around \$16.50@16.75; No. 2 plain, 25c. lower. Basic, for which there is some inquiry, can be had at about \$15.50, with forge about the same.

Steel Billets—Orders, which showed a little better last week, have dropped off again. Quotations are unchanged, and rumors of concessions are not heard.

Bars—Store trade is fair, and there are small orders. The mills would like to see some large ones, but do not get them.

Sheets—Demand is better in a small way, but no large requirements are coming forward.

Plates—There is less call for plates and the market is not so good. Small tonnages for early delivery are the rule everywhere. There is a lot of talk about cutting prices, and some of it is probably true.

Structural Material—Some bridge orders in this territory have come in. The local building requirements are small as yet. There is talk of some large orders, but they are held back till the future is clearer, apparently. Everybody seems to have the Wall Street scare and to be waiting.

Scrap—Heavy melting scrap is wanted, but dealers and buyers are at odds about prices. Other kinds are quiet.

Pittsburg

Sept. 22—There has been but little change in the situation. Some new business has been placed and there are indications of large transactions before the end of the month. The National Tube

Company is operating 68 per cent. of its capacity. In nearly all lines of finished products there has been an increase and there are no indications of a decline, although some consumers have shown a disposition to hold off a little longer. The Republic Iron and Steel Company started its Bessemer steel plant on Sunday night and this week is operating about 65 per cent. of its capacity. The Carnegie Steel Company has put on some additional mills at its Homestead works and is operating a larger percentage of its capacity than at any time this year. All the plants of the Steel Corporation in the Pittsburg district, including the American Steel and Wire Company, the American Sheet and Tin Plate Company and the American Bridge Company are running on about the same basis as last week, a trifle over 50 per cent.

Pig Iron—The market continues dull, with no buying of large tonnages. The Massillon Iron and Steel Company, which was in the market last week for 4500 tons of Nos. 2, 3 and 4 foundry iron, has closed for the entire tonnage for October delivery at a price based on \$14.50, Valley furnace, for No. 2. The Marion Steam Shovel Company closed for 4000 tons of basic iron for delivery next month. Other sales have been for small lots and there were few of them. Prices today for early delivery are as follows: Standard bessemer, \$15; malleable bessemer, \$14.75; basic, \$14.50; No. 2 foundry, \$14.50; gray forge, \$13.50, all at Valley furnace, with 90c. added for Pittsburg delivery. Of the 19 merchant blast furnaces in the valleys, 10 are in operation this week. The stocks of bessemer and basic reported a week ago at 60,000 tons have increased to 65,350 tons.

Steel—A few odd lots of billets were sold within the past few days at the regular price of \$25, Pittsburg. Merchant-steel bars remain at 1.40c. and iron bars the same. At the bi-monthly examination of the sales sheets under the Amalgamated Association scale the average price of iron bars for the past two months was 1.30c. and as a result the pay of the puddlers was cut 1 1/2c. to \$5.25 per ton. Plates remain firm at 1.60c.

Sheets—The sheet market continues to improve and more mills are in operation. Prices unchanged, black sheets 2.50c. and galvanized 3.55c. for No. 28 gage.

Ferro-Manganese—The market is unchanged; 80 per cent. ferro for prompt shipment is \$45@46, Pittsburg.

Foreign Trade in Iron and Steel

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for the seven months ended July 31, are valued by the Bureau of Statistics of the Department of Commerce and Labor at \$111,813,066 in 1907 and \$93,200,401 in 1908; a decrease of

\$18,612,665. Leading items of export for the seven months, in long tons:

	1907.	1908.	Changes.
Pig Iron.....	48,035	23,069	D. 24,966
Billets, ingots & blooms	54,269	72,150	I. 17,881
Bars.....	57,965	29,964	D. 28,001
Rails.....	180,720	111,179	D. 69,541
Sheets and plates.....	77,636	56,395	D. 21,441
Structural steel.....	76,928	71,501	D. 5,427
Wire.....	89,727	81,301	D. 8,426
Nails and spikes.....	34,966	23,254	D. 11,712

Decreases are shown in all items except billets, ingots and blooms.

Iron and Steel Imports—Imports of iron and steel, including machinery, from the United States for the seven months ended July 31 are valued at \$25,402,464 in 1907, and \$11,993,105 in 1908; a decrease of \$13,409,359. Leading items of import for the seven months, long tons:

	1907.	1908.	Changes.
Pig iron.....	385,854	51,741	D. 334,113
Scrap.....	16,700	3,002	D. 13,698
Ingots, blooms, etc.....	9,089	5,647	D. 3,442
Bars.....	22,933	13,344	D. 9,589
Wire-rods.....	10,591	6,406	D. 4,185
Tin-plates.....	39,715	44,183	I. 4,468

The only increase shown here was that in tinplates. The largest decrease was in pig iron.

Iron Ore Movement—Exports and imports of iron ore in the United States for the seven months ended July 31 are reported as follows, in long tons:

	1907.	1908.	Changes.
Exports.....	73,370	96,187	I. 22,817
Imports.....	726,432	377,833	D. 348,599

Imports of manganese ore for the seven months, 112,819 tons in 1907, and 118,632 tons in 1908; increase, 5813 tons.

Foreign Iron Trade

German Iron Ore Trade—Imports and exports of iron ore in Germany, six months ended June 30, metric tons:

	1907.	1908.	Changes.
Imports.....	3,910,240	3,320,683	D. 589,557
Exports.....	2,014,968	1,675,128	D. 339,840
Excess, imports..	1,895,272	1,645,555	D. 249,717

Imports of manganese ore, 174,547 tons in 1907, and 180,092 in 1908; exports, 1862 tons in 1907, and 1006 in 1908. Net imports this year, 178,230 tons.

British Iron-ore Imports—Imports of iron ore into Great Britain for the eight months ended Aug. 31 were 5,416,301 long tons in 1907, and 3,914,460 tons in 1908; a decrease of 1,501,841 tons, or 27.7 per cent. Of the imports this year 2,902,011 tons, or 74.1 per cent. of the whole, were from Spain.

British Iron Trade—Exports of iron and steel and their products from Great Britain for the seven months ended July 31 valued by Board of Trade returns as follows:

	1907.	1908.	Changes.
Iron and Steel.....	£28,008,825	£22,435,335	D. £5,568,490
Machinery.....	18,050,407	18,545,714	I. 495,307
New Ships.....	6,231,759	5,682,009	D. 549,750
Total.....	£52,289,991	£46,643,058	D. £5,646,933

Total quantities of iron and steel, 3,167,204 tons in 1907, and 2,437,952 in 1908; decrease, 729,252 tons. Exports of pig iron to the United States this year

The quantity of Banka tin to be offered by auction in Holland in 1909 has been fixed at 180,000 pikuls.

Lead—There has been little demand during this week and some lots in second hands have been pressed for sale, and in consequence prices have declined somewhat. The close is 4.47½@4.50 New York. Missouri brands at St. Louis are quoted at 4.32½@4.35c.

The London market is a trifle lower and closes with Spanish lead at £13 1s. 3d. and English lead at £13 3s. 9d.

Spelter—A fair business has been done in this metal at slightly lower prices. At the close we quote 4.60@4.62½c. St. Louis, and 4.75@4.77½c. New York.

Abroad, the market continues strong, and at the close good ordinaries are quoted at £19 12s. 6d. and specials at £19 17s. 6d. per ton.

Zinc Sheets—Base price is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

German Zinc Trade—Paul Speier, Breslau, reports imports and exports of spelter and zinc products in Germany for the seven months ended July 31, in metric tons:

	Imports.		Exports.	
	1907.	1908.	1907.	1908.
Spelter.....	18,210	15,702	36,472	37,072
Zinc sheets.....	74	224	10,825	9,447
Zinc scrap.....	656	904	4,017	3,188
Zinc dust.....	530	672	1,313	1,435
Zinc pigments.....	4,745	4,388	15,959	14,928
Zinc ore.....	101,312	106,874	18,880	17,920

Zinc pigments include zinc-white and zinc sulphide.

Other Metals

Antimony—The market, both in New York and abroad is weak, and there is considerable pressure to sell. Quotations are 8@8¼c. for Cookson's, 7¾@8c. for Hallett's, and 7¾@7½c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, \$1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 40@50c., New York.

Quicksilver—New York price is \$43 per flask for large lots; small orders depend on size and conditions. San Francisco nominal, about \$42 for domestic orders, and \$40 for export. London price is £8 2s. 6d. per flask, with £8 quoted from second hands.

Platinum—Offers of metal continue to be made at \$17.50@19. The principal dealers, however, continue to quote \$22.50 for hard platinum, \$20 for ordinary, \$16 for scrap. It is understood that only limited quantities are to be had at the lower prices.

Missouri Ore Market

Joplin, Mo., Sept. 19—The highest price paid for ore was \$40, on a base price of \$38 per ton of 60 per cent. zinc, medium and lower grades grading down to a \$37 base price. The demand has been apparently strong, yet the shipment is decreased, a result of the withdrawal from the market of several thousand tons, which is being held for a further advance in price. The average price, all grades, is \$34.78. The highest price paid for lead ore was for mineral loaded from last week's purchase, which sold at \$58, while the highest offering of this week was \$57, and the week-end market was without strength at \$56. The average price, all grades, was \$55.92 per ton. Zinc silicates dropped to a base price of \$19 per ton of 40 per cent. zinc, but one bin registered 49 per cent. and brought \$28 per ton.

Shipments of zinc and lead ore from the district for week ended Sept. 19:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,922,210	239,670	\$59,429
Joplin.....	2,350,540	397,090	54,802
Galena.....	773,270	172,710	18,841
Alba-Neck.....	615,070	6,900	11,263
Spurgeon.....	495,370	58,240	9,301
Aurora.....	486,850	9,000	8,161
Miami.....	410,760	124,510	8,951
Prosperity.....	189,330	114,640	6,668
Badger.....	313,297	22,140	6,593
Granby.....	430,000	16,000	5,460
Duenweg.....	171,520	94,340	5,064
Carthage.....	153,320	.....	2,813
Quapaw.....	184,760	.....	2,771
Zincite.....	85,700	.....	1,585
Cave Springs.....	63,540	.....	1,144
Sarcozie.....	59,390	.....	1,068
Playter.....	58,760	.....	999
Carl Junction.....	39,600	3,830	859
Totals.....	9,803,220	1,259,070	\$205,772

33 weeks.....360,961,120 55,370,990 \$7,616,64
Zinc value, the week, \$170,571; 33 weeks, \$6,082,496
Lead value, the week, 35,201; 33 weeks, 1,534,149

Average prices of ores in the Joplin market by months have been, per short ton, as follows:

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January.....	\$46.90	\$37.60	\$45.84	\$35.56	\$83.58	\$46.88
February.....	48.30	36.63	47.11	34.92	84.58	49.72
March.....	49.75	36.19	48.66	34.19	82.75	49.90
April.....	49.25	35.40	48.24	34.08	79.76	52.47
May.....	46.90	34.19	45.98	35.39	79.56	56.05
June.....	47.00	33.06	44.82	32.07	73.66	60.48
July.....	46.80	34.55	45.79	31.67	58.18	59.90
August.....	44.56	36.53	43.22	33.42	59.54	60.34
September.....	41.00	.....	40.11	.....	53.52	.....
October.....	41.75	.....	39.83	.....	51.40	.....
November.....	38.60	.....	35.19	.....	43.40	.....
December.....	31.50	.....	30.87	.....	37.71	.....
Year.....	\$44.36	.....	\$43.68	.....	\$68.90	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Wisconsin Ore Market

Platteville, Wis., Sept. 19—The highest price paid this week for zinc ore was \$38, on a basis of \$37.50 per ton of 60 per cent. zinc. The highest price paid for

lead ore was \$58 per ton. Shipments for week ended Sept. 19 were:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Cuba City.....	1,483,940	.....	.....
Hazel Green.....	424,390	.....	.....
Benton.....	301,310	63,390	.....
Platteville.....	284,000	45,200	334,000
Galena.....	176,000	.....	.....
Days Siding.....	151,800	.....	.....
Livingston.....	80,000	.....	.....
Strawbridge.....	70,000	24,000	.....
Highland.....	443,600	.....	.....
Linden.....	119,600	.....	.....
Total.....	3,534,640	132,590	334,000
Year to Sept. 19.....	70,926,501	7,943,935	1,652,204

In addition to the above there was shipped to the Joplin Separator Works, at Galena, 163,950 lb. zinc concentrates.

Chemicals

New York, Sept. 23—The market, as a whole, is steady and prices are firm. The volume of business has not increased except in spots. The feature of the week was an advance in the price of bleaching powder. Other heavy chemicals show no change.

Copper Sulphate—Demand steady and prices unchanged at \$4.65 per 100 lb. for carloads and up to \$4.90 for smaller lots.

Nitrate of Soda—The market is easy and consumers are inclined to hold off. Quotations are 2.25c. for spot and delivery in 1908 and 1909. It is reported that offerings have been made at lower prices for prompt delivery.

Mining Stocks

New York, Sept. 23—The week on the Stock Exchange began badly with a general break in prices, nominally because of an unfavorable political outlook, involving possible further anti-corporation legislation. With one or two slight reactions the downward movement continued, culminating on Sept. 22 with a wild market and very heavy sales at still declining prices. The close of the day, however, was marked by an upward reaction, amounting to several points for the more active stocks.

The market has had all the marks of a movement chiefly professional, and the public has not been concerned to any great extent. The object of the movement is not altogether clear, but it looks as if large operators had concluded that quotations were too high, and had decided on a break, hoping to bring in outside buyers at lower prices. Political effect, also, may have been considered.

The Curb was also excited and irregular, following the lead of the Exchange. Prices are generally lower, the copper shares leading in the movement.

Talk of possible gold exports to Europe—which did not materialize—had little effect. There was \$500,000 gold sent to Argentina on London orders, and \$1,000,000 to Canada.

27,212 tons, a decrease of 327,869 tons. Imports of iron and steel, and of machinery into Great Britain for the seven months were:

	1907.	1908.	Changes.
Iron and steel. £	3,915,314	£ 4,336,487	I. £ 421,173
Machinery.....	3,249,747	3,080,301	D. 169,446
Total.....	£ 7,165,061	£ 7,416,788	I. £ 251,727

The total quantities of iron and steel were 501,868 tons in 1907, and 608,347 in 1908; an increase of 106,479 tons.

Imports of iron ores into Great Britain, seven months ended July 31, were 4,722,503 long tons in 1907, and 3,467,235 in 1908; decrease, 1,255,268 tons. Of the imports this year 2,055,071 tons were from Spain.

Petroleum Exports

Exports of mineral oils from the United States, eight months ended Aug. 31, in gallons:

	1907.	1908.
Crude.....	56,595,682	55,783,722
Naphtha.....	18,080,614	22,021,855
Illuminating.....	550,752,908	711,063,831
Lubricating.....	97,652,288	91,484,175
Residuum.....	47,449,039	45,708,728
Total.....	770,530,526	926,082,311

Paraffin is included in lubricating oils. The total exports this year show an increase of 155,531,785 gal., or 20.2 per cent.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Sept. 23.

At all U. S. Ports in August and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1908..	\$ 6,597,101	\$ 4,257,255	Exp. \$ 2,339,846
" 1907..	4,596,879	3,223,772	" 1,373,107
Year 1908..	64,960,348	33,614,330	" 31,346,018
" 1907..	48,375,977	28,103,201	" 20,272,776
Silver:			
Aug. 1908..	4,130,853	3,194,426	Exp. 936,427
" 1907..	6,748,085	4,882,622	" 1,865,463
Year 1908..	34,576,144	27,376,355	" 7,200,789
" 1907..	41,922,336	30,665,458	" 11,256,878

Exports of specie from New York week ended Sept. 19: Gold, none; silver, \$507,682, nearly all to London. Imports: Gold, \$105,944, from Japan and the West Indies; silver, \$90,586, from Australia, Mexico and Central America.

Foreign trade of the United States, eight months ended Aug. 31, valued by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1907.	1908.
Exports.....	\$1,196,270,374	\$1,091,408,803
Imports.....	1,001,707,119	700,138,794
Excess, exports.....	\$ 194,563,255	\$ 391,270,009
Add excess of exports, silver.....		7,200,789
Add excess of exports, gold.....		31,346,018
Total export balance.....		\$ 429,816,816

Gold and silver movement in detail is given in the table at the head of this column.

Specie holdings of the leading banks of

the world, Sept. 19, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York.....			\$323,694,900
England.....	\$191,920,460		191,920,460
France.....	645,918,325	\$180,052,045	825,970,370
Germany.....	201,940,000	83,545,000	285,485,000
Spain.....	78,560,000	170,110,000	248,670,000
Netherlands.....	38,842,500	19,767,500	58,610,000
Belgium.....	20,100,000	10,050,000	30,150,000
Italy.....	185,590,000	22,500,000	208,090,000
Russia.....	581,895,000	39,535,000	621,430,000
Aust.-Hungary.....	239,205,000	65,745,000	304,950,000
Sweden.....	20,405,000		20,405,000
Norway.....	8,655,000		8,655,000
Switzerland.....	22,780,000		22,780,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.

Sept.	Sterling Exchange.	Silver.		Sept.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
17	4.8675	52 1/4	24 1/2	21	4.8640	52 1/2	24 1/2
18	4.8675	52	24	22	4.8670	52	24
19	4.8635	52	24	23	4.8670	52	24

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Silver closes at 24d. in London. No substantial improvement in silver can be accomplished until the stocks in London and the East are absorbed. These stocks are considered rather large at the present time.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Sept. 10:

	1907.	1908.	Changes.
India.....	£8,710,764	£6,458,533	D. £2,252,231
China.....		516,400	I. 516,400
Straits.....	598,700	90,510	D. 508,190
Total.....	£9,309,464	£7,065,443	D. £2,244,021

Receipts for the week, £6000 from Chile, £7000 from the West Indies, £115,500 from New York; £128,500 in all. Exports, £10,100 to India.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

Sept.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
17	13 1/2 @13 1/2	13 1/2 @13 1/2	60 1/2	28 1/2	4.47 1/2	4.77 1/2	4.62 1/2 @4.65
18	13 1/2 @13 1/2	13 1/2 @13 1/2	59 1/2	28 1/2	4.47 1/2	4.77 1/2	4.62 1/2 @4.65
19	13 1/2 @13 1/2	13 1/2 @13 1/2	59 1/2	28 1/2	4.47 1/2	4.77 1/2	4.62 1/2 @4.65
21	13 1/2 @13 1/2	13 1/2 @13 1/2	59 1/2	28 1/2	4.47 1/2	4.75	4.60 @4.62 1/2
22	13 1/2 @13 1/2	13 1/2 @13 1/2	59 1/2	28 1/2	4.47 1/2	4.75	4.60 @4.62 1/2
23	13 1/2 @13 1/2	13 1/2 @13 1/2	59 1/2	28 1/2	4.47 1/2	4.75	4.60 @4.62 1/2

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The dullness which was so strongly manifested during the week ending with Sept. 16 has been even more pronounced since then. Transactions, both for domestic and for foreign accounts, have been confined to small lots, ordinarily considered retail business, and resales by second hands. The big selling agencies have been generally holding aloof, not merely waiting for consumers to meet their views, but rather waiting for them to come forward with the intention of buying at any price. In spite of all allurements, however, they have continued to be conspicuous by their absence. The demand being so insignificant, the offering of very small lots has made an impression, under which the market has sagged. The close is easy at 13 3/4 @ 13 1/2 c. for Lake, and 13 1/2 @ 13 1/4 c. for electrolytic in ingots, cakes and wirebars. The average for casting during the week has been about 13c., the market being 12 7/8 @ 13c. at the close, which was easy.

The market for standard copper in London has been weak, in sympathy with the decline in our stock market here, and closes at £1 lower than last week, with £59 11s. 3d. for spot and £60 8s. 9d. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s. @ £63 10s.; strong sheets, £74 10s. @ £75 10s.

Exports of copper from New York and Philadelphia for the week were 5721 long tons. Exports from Baltimore, as reported by our special correspondent, were 1846 tons.

Manufactured Copper—Sheets, cold-rolled, 19c. per lb.; hot-rolled, 18c. Copper wire, 15 1/4 c. base; carload lots at mill.

Tin—The London market has remained very steady throughout the week, the variations between high and low not exceeding 15s. The close is cabled as steady at £130 10s. for spot, £132 for three months.

In the domestic market a little more interest was shown on the part of buyers, but actual business has been of small proportions. At the close spot tin can be bought at about 28 3/4 cents.

Arrivals of Bolivian tin ores, concentrates and metal in Europe, reduced to metal equivalent, for the eight months ended Aug. 31 were 11,587 tons in 1907, and 11,914 in 1908; an increase of 327 tons.