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The Southern Aluminium Co.

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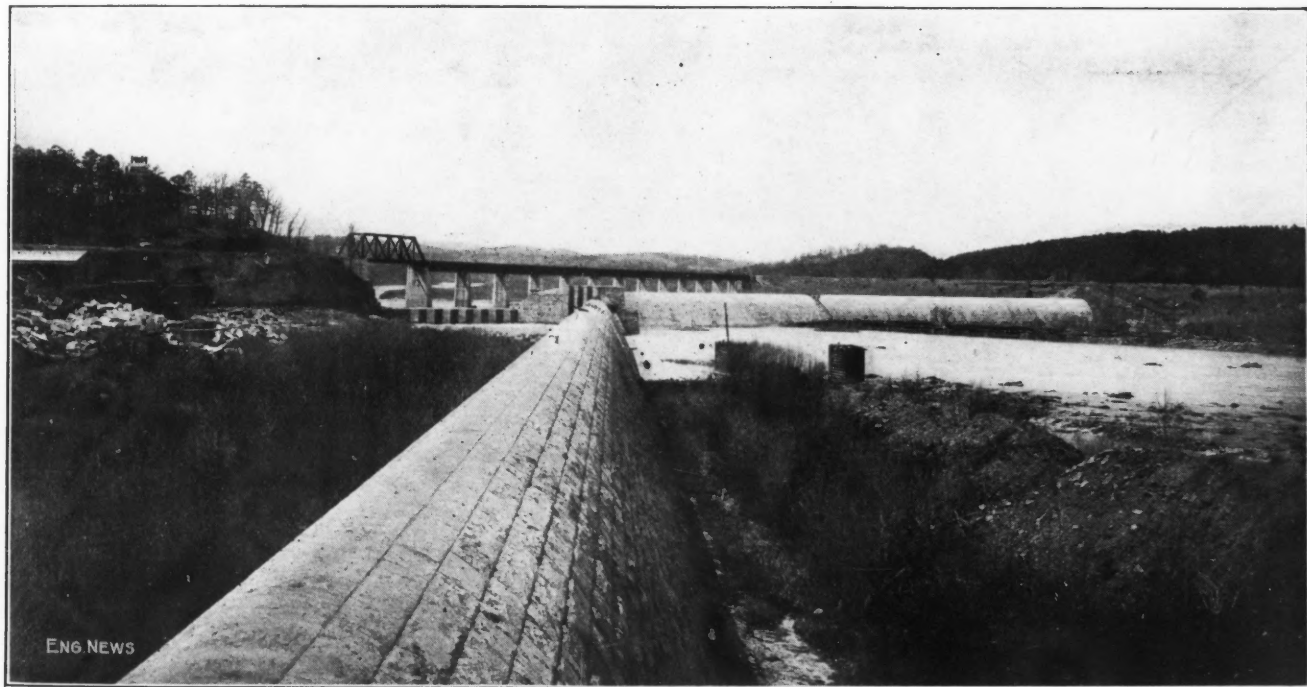
SYNOPSIS—A description of the status of the Southern Aluminium Co.'s construction work near Whitney, N. C., on which it is purposed to spend over \$10,000,000.

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Probably the most interesting development in the metallurgy of the minor metals at the present time is under way near Whitney, N. C., in the rising plant of the Southern Aluminium Co.

Here the Hardaway Contracting Co., under plans of the Southern Aluminium Co.'s engineers, is busy cutting a foundation setting down to solid bedrock, for a dam approximately 200 ft. high, about 1300 ft. long and 20 ft. thick at the top, and about 160 ft. thick at the bottom. The dam will swing in an arc, which will depart about 130 ft. from the chord.

This dam will possibly permit the development of over



OLD DAM OF THE NORTH CAROLINA ELECTRIC & POWER CO.

To be submerged when the basin of the new dam is full.

The Southern company purchased the partly finished dam of the North Carolina Electric & Power Co., which had in turn succeeded the embarrassed Whitney Reduction Co., an elegant granite-block structure in the Yadkin River, intending to complete it and carry the water through a long canal to the power house. However, after further examination it was found that the power would be insufficient for the company's needs, and a new site was chosen, about 5½ miles down the river, where the Yadkin narrows to only about 75 ft. in a channel of greenstone.

100,000 electrical horsepower in flood seasons, but about 45,000 is counted on as an average for regular working, about three times as much as the old North Carolina Electric dam would have permitted. It is interesting to note that about one-fifth the labor used in quarrying for the foundations for the dam is convict, and that the convicts are reported to be more efficient than the free laborers. It is also reported that they find this quarry labor more congenial than road work, although it has some danger in it.

This new dam will back up water in a basin covering approximately eight square miles, and will, at flood, com-

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pletely cover the old dam. While the engineering advantages of the new dam site are manifest, no one can fail to regret the scrapping of the old dam structure, representing the expenditure of about \$6,000,000.

There have been two diverging tunnels driven on the east side of the river in connection with this work, each 34 ft. high by 40 ft. wide, with only the country rock for a back. One tunnel is complete, the other is holed through, but some benchwork remains to be done. Through these tunnels the waters of the Yadkin River will be carried, while the central portion of the dam is completed. Later they will serve to carry the spillway water, as a cut along the mountain, which acts as a spillway, will be connected by means of wells with these tunnels. Part of this shaft work is already completed.

70,000-Kw. POWER HOUSE

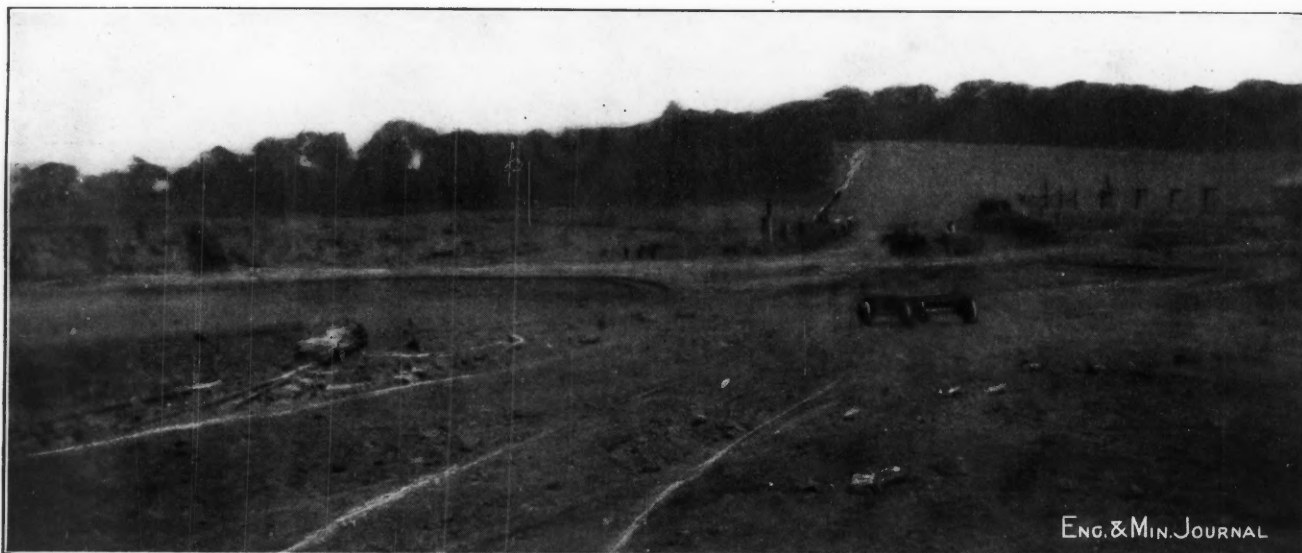
The power house, which will be 60x600 ft., will be just below the dam. Concrete is already being placed for the wheel pits. There will be seven turbine-driven, 10,000-kw., two spare 5000-kw. direct-current, and two 1000-

the bauxite, producing an acid sodium aluminate. The solution is then filter-pressed until completely clear, and diluted. Most of the alumina is hydrolyzed and thrown down. The dilute solution is then filtered on suction filters and the precipitate dried in any of the standard forms of rotary drier.

In this drying, most of the alumina goes off as fine dust, and it requires very effective dust chambers and centrifugal dust separators to avoid losing the alumina up the stack.

The dilute caustic-soda solution will be evaporated in multiple-effect apparatus, recausticized by calcium hydrate, and used on the next lot of bauxite.

It will be noted that this does not agree with the reports circulated last year that this company would use the Serpek process; that is, formation of aluminum nitride from bauxite, and decomposition of the nitride with formation of ammonia and alumina. While this method offers the great theoretical advantage of fixing nitrogen for use as a fertilizer, it has at no place been used on a large scale.



SITE OF THE ALUMINA PREPARATION PLANT

A site about 700x700 has been leveled. The fill for the high-line alumina-delivery track is shown in the right background.

kw. alternating-current units, the turbines from the S. Morgan-Smith Co., and the generators from the General Electric Company.

As it is the desire to transmit this current without the use of transformers, the alumina-reduction works is to be placed on a nearby hill, which is being leveled off by cutting away the crest and using the material to fill. This alumina-reduction house will be about 600x600 ft. and contain about 400 furnaces, the frames for which are already on the ground. The transmission line will consist of heavy rectangular aluminum rods carrying current at 500 amperes.

PREPARATION OF ALUMINUM BY BAYER PROCESS

The plant for the preparation of the pure alumina will be two miles away by rail from the reduction works. The pure alumina will be prepared from bauxite, by the Bayer process. This bauxite will probably be mostly imported from France in the beginning, although some domestic ore has been contracted for. In the Bayer process a concentrated solution of caustic soda is used to treat

It is, therefore, the intention to start in with a thoroughly tested commercial process, and then, after everything is running smoothly, to change over unit by unit to the Serpek process. It fortunately happens that most of the machinery used in the Bayer process can also be used in the Serpek process, and *vice versa*.

ELECTRODE MANUFACTURE

Near the foundations of the alumina plant the electrode factory, a building 100x200 ft., is rapidly nearing completion. The material for the electrodes is petroleum coke, which will be, together with the bauxite, delivered by a high-line railroad. The petroleum coke will be crushed and given a roast in retorts heated by producer gas, in order to drive off any residual oil. From the retorts it will go by conveyor to a cooling pile, then will be recrushed and go to Werner & Pfleiderer mixers, where it will be mixed with tar, after which the mixture will go to pan grinders.

After thorough mixing, this material will go to hydraulic presses, where the electrodes and the lining blocks



FOUR-FAMILY WORKMEN'S HOUSES IN THE MODEL TOWN OF BADIN



POWER-HOUSE EXCAVATION

LOWER PORTAL OF TUNNELS



SITE OF SOUTH ALUMINIUM CO.'S NEW DAM, LOOKING DOWNSTREAM
Tunnel portal at left, coffer-dam cribbing at right.

for the furnaces will be formed, after which the shapes will be baked in a neutral atmosphere at a bright-red heat, in straight-line, continuous kilns. A battery of coal-fired boilers will be installed to heat the tar preparatory to mixing, while the kilns will be producer-fired.

FURNACE BUILDING

In building up the furnaces, the steel shells, 5x9x2 ft. deep, are first lined with one layer of fireclay brick, after which the carbon lining is fitted in. This makes the hearth of the furnace about 4x8 ft., about 20 in. deep.

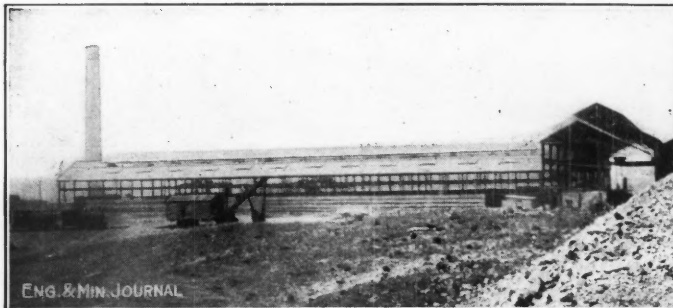
The furnaces will be open at the top, the electrodes,

contemplated, will the furnace be completely drained of aluminum.

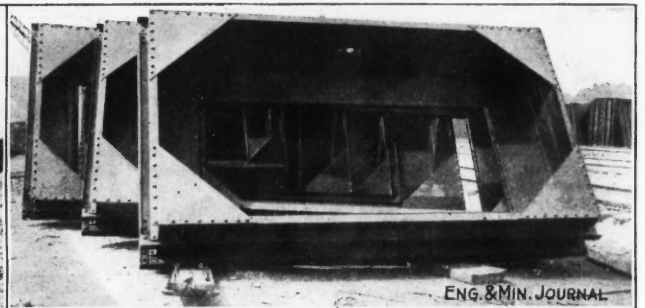
The anodes in this process are eaten away quickly by the oxygen set free from the electrolysis of the alumina. To prevent needless losses by atmospheric oxidation, the surface of the bath is usually kept covered with crushed coke or coal.

THE TOWN OF BADIN

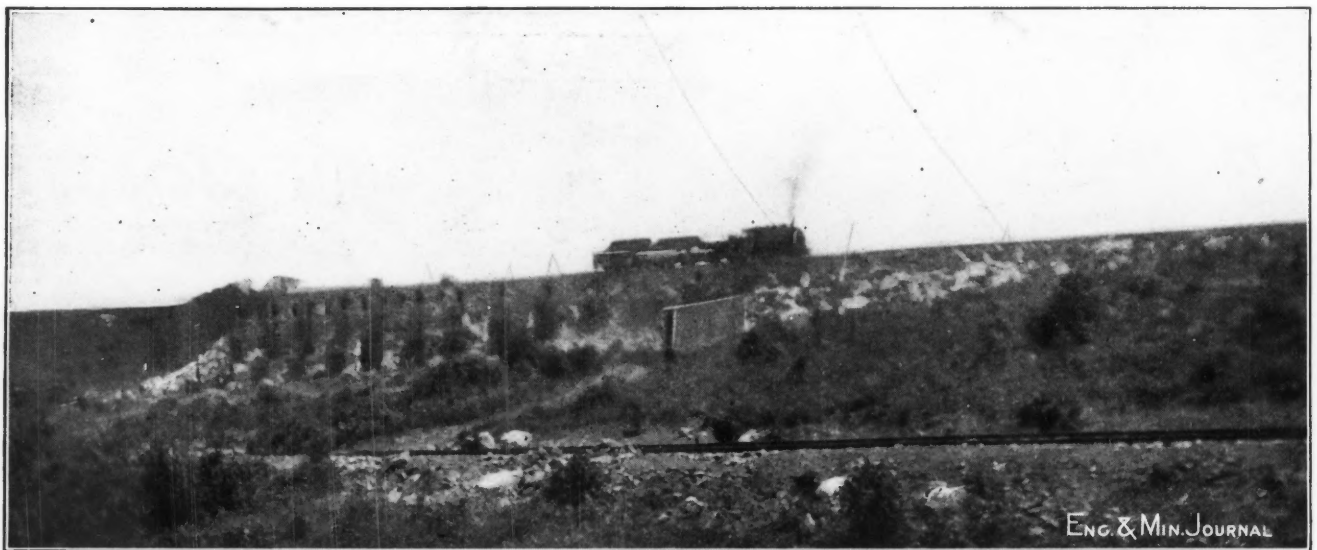
To accommodate the laborers the company is now erecting the model village of Badin, named for the president of the company. Designs call for 100 four-family dwell-



ELECTRODE FACTORY



FURNACE FRAMES



SITE OF THE FURNACE HOUSE

The top of a hill has been cut off, and the excavated material used to fill.

supported by struts, will enter from above, and will not come in contact with the lining at any point. No external heat will be used. The furnaces will be started as arc furnaces, and after they are in operation, the normal resistance of the furnace will keep the charge molten.

Each furnace will take 20,000 amp. at 7 volts, which means, since the line voltage is to be about 500, that about 70 furnaces must be in series. The bath is to be the customary one of cryolite and alumina. It is stated that these baths do not become impure, and that only enough cryolite to overcome the small volatilization losses has to be added. The composition of the bath is regulated according to the electric resistance. Generally speaking, the lower the voltage the better the work. Tapping will be intermittent, and at no time, except when repairs are

ings, of which about 25 are already erected. These are frame buildings, with Johns-Manville tile roofing.

The town looks as though it would be healthful. It is out of the hookworm belt, there has so far been no typhoid fever, and the only trouble has been with a few cases of malaria, and, as always happens with any great crowd of colored laborers, some sporadic cases of smallpox.

The negro quarter is partly up, and consists of about 25 two-apartment cabins. The sewage system will care for both the white and colored quarters. In addition to this portion of the permanent town, already built, there are four large construction camps on various portions of the property.

In these preliminary works, the Southern Aluminium Co. has constructed about 20 miles of standard-gage rail-

road, six miles of which, leading into Whitney, are now leased to the Southern Ry., while 14 are operated by the company, which has two locomotives, in addition to a number furnished by the contractors. There is a small hydro-electric station, about 150 kw., for use of the Southern company in this work, but the contractors purchased power from the Southern Power Co., transmitted at 88,000 volts from Albemarle, and stepped down to 2300.

About 3000 kw. are used in the Ingersoll-Rand compressor plant, and in the concrete-mixing plant.

This plant crushes the rock from the tunnel and powerhouse excavations to 2 in. maximum. The crushed product is screened, and all from $\frac{1}{4}$ to 2 in. is used as stone, all from dust to $\frac{1}{4}$ in. is used as sand. The mixture used in the power house and dam is a 1:3:5, carried from the mixing plant in $2\frac{1}{2}$ -cu.yd. drop-bottom buckets. The mixing plant has a capacity of about 1500 cu.yd. per 10-hr. day.

The question naturally arises, why should a company using, at least to some extent, imported material, be placed so far from the seaboard. The answer is that in aluminum manufacture the power cost is so great that it is more economical to pay freight on bauxite and aluminum to and from a good water power, than to incur the capital charges, and line and transformer losses in shipping power to the bauxite. Three kilowatt-years produce about one ton of aluminum.

The capitalization of the Southern Aluminium Co. is \$6,000,000 of 7% preferred stock, and \$2,400,000 common, in addition to which a bond issue of \$7,000,000 was authorized by a meeting on June 2. The rate of interest on this issue has not yet been fixed, but is left at the discretion of the directors.

A further illustration of the work on the dam will be found in the "Photographs from the Field" pages of this week's JOURNAL. My thanks are due to L. Rozé, and to the Franco-American Club at Badin, for a most pleasant visit.



The Development Board for Alaska

In a report sent to the Senate and House committees on territories, Secretary Lane urges the creation of a "Development Board" to have complete control of the natural resources of Alaska, and makes a severe arraignment of the present red-tape methods in the administration of government affairs in that territory. Bills for the creation of boards or commissions to administer the government of Alaska, have been introduced in the Senate by Senator Chamberlain, of Oregon, and in the House by Delegate Wickersham, of Alaska. These bills differ only in detail, and the general purpose and scope of both is in accord with the recommendations of Secretary Lane.

The plan urged by the Secretary provides for a board of three members, appointed by the President and confirmed by the Senate, to have headquarters in Alaska, and to be charged with the general conduct of all government affairs there connected with the natural resources and development of the country.

In his recommendations, Secretary Lane says:

It is proposed and urged that the board should take over such authority now exercised by various departments and bureaus as may be necessary to give it supervision over practically the entire public domain and all the natural resources of Alaska, and control of such activities as are closely related

and essential to the development of the physical resources of the country. The board would do the work now done in Alaska by the General Land Office, the Forest Service, the Road Commission, the Bureau of Mines, the Bureau of Education and the Secretary of the Interior. It should take over a part of the work and authority of the Bureau of Fisheries.

Beginning at the shore line, the development board should have complete control of all governmental activities and interests connected with the development of industries and transportation and the settling of the country.

This should include the control of water powers, building and maintenance of roads and trails, and operation and rates of the railroads and telegraph lines. It should include protection and control of game, fur-bearing animals, public lands, mineral deposits, coal, oil, gas, hot springs, timber lands and timber.

Secretary Lane also urges that this board should take over the supervision of educational work among the Indians and natives, the reindeer industry, control of the surveyor-general's office, and the supervision, in coöperation with the Department of Agriculture, of agricultural experiments and demonstration work in the territory.

It is pointed out in the report that at present each of at least a score of government bureaus in Washington, divided among the various departments, has something to do with the government of Alaska, and that there is a vast amount of red tape and circumlocution in the administration of public affairs under this system. Instances are given in the report of delays of several years in the handling of uncomplicated land and other matters which should have been promptly disposed of.

Extracts from the report follow:

Practically all the lands and natural resources of Alaska are still the property of the United States. Until now, we have only protected these riches against monopoly and waste, and the most cumbersome departmental machinery has sufficed. Heretofore we have done little more in Alaska than keep a few policemen stationed at closed doors, to prevent breaking and entering. Now that we are to open the doors, we need more than a police force. Mineral and other resources must be opened to use; the lands must be opened to settlement. There must be such administration of the laws as will give prompt and ready assistance, unhampered by red tape and unnecessary delays, to honest settlers, while protecting fully the rights of the nation against monopoly, fraud and waste.

We are to encourage the building of industries and commerce, and the making of homes and farms, in the new territory. To do this, we must plan and build systems of roads and trails, to connect the railroads, the seaports, towns and farms. We must plan the location of towns and provide facilities for settlement. Fuel and power must be made available for domestic and industrial uses. Revenues must be provided without discouragement to settlement and industry, and there should be no bar to efforts for simplifying and bettering taxation methods.

There must be new and simple machinery for the successful working out of this program. . . . The new policy is not to invite a few men to exploit the cream of Alaska's riches, but to develop all the resources and possibilities of the territory harmoniously, for the best interests of both the people who go to Alaska, and the people of the United States who own this great public domain.

Alaska's problems are largely peculiar to Alaska. Our present system of government there is heterologous. Instead of one government in Alaska we have a number, interlocked, overlapped, cumbersome and confusing.

There is a government of the forests, a government of the fisheries, one of the reindeer and natives, another of the cables and telegraphs. There is a government for certain public lands and forests, another for other lands and forests. Each of these governments is intent upon its own particular business, jealous of its own success and prerogative, and all are more or less unrelated and independent in their operation. Experience has demonstrated that efficient administration is best secured by centralizing responsibility and authority in the hands of a few men, who can be held to strict accountability for the results of their actions. The proposed development board for Alaska follows this modern and well tested plan for securing efficient administration.

There is one procedure for making homestead, mineral and other land entries within the National forests; another pro-

cedure for making such entries in lands outside the forest reserves. Water power and power sites within the forest reserves are leased and operated under permits from the Forest Service; there is question as to whether authority exists for disposal or leasing of water powers elsewhere in Alaska.

Vast areas in the forest reserves are entirely untimbered, but are held under the regulations of the Forest Service, while timbered lands in other sections are unprotected.

Mineral claims within the forest reserves must be investigated and approved by the Forest Service before the General Land Office may grant patents. Homesteads within the forest reserves are surveyed by the Forest Service without cost to the entryman. Homesteaders on unsurveyed land outside the forest reserves must pay for their own surveys.

Timber in the National forests is sold at auction, under rules and regulations of the Department of Agriculture. Timber on other public lands is sold under different rules and regulations, made by the Interior Department.

Roads and trails within the forest reserves are built by the Forest Service. Roads and trails outside these reserves are built by a commission of army officers.

The Secretary refers to the incongruity of the laws which distinguish between black and brown bears, although both may be born in the same litter, and to the protection of the giant brown bears on Kadiak Island, which are a menace to domestic animals and even human life.

The Secretary points out a provision of the present laws by which a percentage of the receipts from timber sales in National Forests must be used to build roads in the forests, and says that this money was spent last year in building a half mile of plank road in one place, and a mile of trail in another place. He comments:

The division of road funds and construction seems wholly useless and without justification. If roads are needed in the sections of country now within the forest reserves, they should be built without regard to the percentage of timber sales; if they are more needed elsewhere in the territory, it seems the height of absurdity to spend the money arbitrarily for constructing little patches of trails and boardwalks here and there in these reservations, just because they are forest reserves.

He notes that there are now only 862 miles of wagon roads, 617 miles of sled roads and 2166 miles of trails in all Alaska, for the construction and maintenance of which about \$2,600,000 has been spent. He urges that roads and trails are as essential to the opening of Alaska to settlement, as railroads, and that these roads for several years to come must be built by the government.

He discusses at length the cable and telegraph system in Alaska, now operated by the Signal Corps of the War Department, and proposes that this should be managed by the development board. This system comprises the ocean cable from Seattle to Sitka, which the Secretary says must soon be replaced with a new cable to cost about a million dollars, unless a way can be found for substituting wireless service for this cable. The present military telegraph system includes, besides the cable, 1064 miles of land lines and 10 wireless stations. These latter do not include the seven wireless stations in Alaska maintained by the Navy Department. The Secretary quotes figures to show that it costs about \$400,000 a year now to maintain and operate the cable and telegraph system, and that this service is about self-supporting, if the government business transacted is charged up at commercial rates. Referring to a demand in Alaska for lower telegraph rates, he says: "This demand should, of course, be considered seriously, as the experience of the Post Office is to the effect that reduction in rates makes for larger business and bigger revenues."

It is pointed out in the report that under present con-

ditions it is difficult to secure accurate information as to Alaskan revenues and disbursements, because they are handled by so many agencies. He advocates an Alaskan budget, in which all Alaska funds can be reported and accounted for on a single page. A detailed statement of Alaskan receipts and expenditures for 1913, not including those of the territorial government, is contained in the report, which shows that the receipts were \$802,614 and the expenditures \$5,029,980. The expenditures include \$314,051 for the Treasury Department, \$54,224 of the Navy Department, \$2,247,494 by the War Department, \$552,899 by the Post Office Department, and \$732,643 by the Department of Justice.

"The large discrepancy on the debit side of the ledger," says the Secretary, "is by no means discouraging. There are many items of governmental expenditure that are not fairly chargeable to Alaska. Probably one-half or more of the present and past expenditures come under this head. The deficiency remaining is one that may easily be overcome. Alaska can be made self-supporting within a few years, as soon as conditions are created which will enable settlement and development, and produce revenues. So far, the government has done little, aside from the care of the seal herd, to bring returns. It is unreasonable to expect revenue from an undeveloped and unsettled country."

Silicosis Curable

The mine owners of the Witwatersrand and the Union Government maintain a sanatorium for miners suffering from phthisis. The buildings cost \$250,000, and an average of 50 patients are supported at a yearly cost of \$50,000. A close study is made of the disease of silicosis, which, unfortunately, is in most cases complicated by tuberculosis and ends in speedy death.

Regarding cases of simple silicosis, the medical superintendent writes: "Recent researches in the pathology of the disease reveal the important fact that the fibrous tissue, which is formed in the lungs as a result of irritation by the dust, and which is responsible for the hardening of the lungs and their impairment as respiratory organs, tends in time to become organized and permeated by newly formed blood vessels. As a result, the fibrous tissue is in part absorbed and the particles of silica are liberated and carried away in the blood stream. This process makes for a good prognosis in cases which (1) are no longer exposed to a dusty atmosphere; (2) are free from tuberculosis; (3) have no breaking down of the lungs; (4) are able to survive the period of heart strain which always accompanies any marked degree of silicosis. Thus it would appear that early cases of silicosis that are able to fulfill these conditions should be regarded as curable and more advanced cases should improve to a marked extent."

The moral is that miners affected should endeavor either to leave mining or to take periods of surface work.

The Annual Report of the Mansfeldsche Kupferschleifbauende Gewerkschaft, Eisleben, Prussia, states that in 1913 the company's copper mines yielded 20,300 tons refined copper as against 20,503 tons in 1912, and 111,023 kg. (3,569,389.45 oz. troy) of silver as against 112,651 kg. in 1912. The company's developed potash mines Ernstthal and New Mansfeld produced 1,211,743 quintals (metric cwt.) of carnallite. For the proper development of its "Sachsen" colliery in Westphalia the company authorized a loan of 15,000,000 marks.

The Burt Revolving Pressure Filter

By C. E. RHODES* AND A. B. MYERS†

SYNOPSIS—The Burt revolving pressure filter, which consists of a revolving steel shell lined with filter mats, is filter-pressing slime in the plant of the El Oro Mining & Railway Co., Ltd., at a cost of \$0.049 per ton. The filter revolves continuously, is simple in construction, and needs but a small crew to handle it. High extraction of the dissolved values is claimed, and the cake can be discharged with a moisture content of from 19 to 25 per cent.

The filter plant of the El Oro Mining & Railway Co., Ltd., consists of 14 Burt revolving pressure filters, 42 in. in diameter by 40 ft. long. Although run as two separate units, the filters are all under the same roof and attended by a single crew. Each unit consists of 7 filters, one 275-gal. pump, which is used to pump the filtrate to the mill storage tanks, and one 40-hp. motor. The filters revolve continuously except when shut down for repairs or for changing the filter mats, and one pump is always running, the other being used as a spare. In order to handle the filtrate from seven filters it would be necessary to run each pump about 14 out of the 24 hours, but as the units have a common sump, one pump runs continuously and the other only when necessary.

Each motor drives a line shaft, on which are pulleys 24 in. in diameter and 12 in. in face, connected by means of 12-in. belts to clutch pulleys 48 in. in diameter on countershafts at the heads of the filters. Each individual countershaft has a bevel pinion which engages a bevel gear bolted to the head of the filter. By throwing out the clutch any one filter may be stopped for repairs. It is necessary to have a pulley of large diameter with a wide face in order to avoid trouble from belt slippage while the filter is discharging. It was found that, with a normal load, an 8-in. belt gave sufficient contact for running the filter, but it was not sufficient for discharging it. This is due to the slow speed of the filter and the peak load, which occurs at this point in the operation. Ordinarily the filter takes from 3.7 to 4 hp., but for a period of one to two minutes, when beginning to discharge, the power necessary to revolve the filter increases to about 20 hp., and at this period the advantage of the large pulley and wide belt is realized. The power peak, Fig. 1, is due to the dry cake falling off as the filter revolves and being carried up on one side, thus producing the same effect as the pebble load in a tube mill. As soon as the fallen cake forms itself into a loaf and begins to discharge, the power again drops to normal. The filter makes 15 r.p.m. There is no special advantage in revolving it faster, while fewer revolutions would mean an increased time for discharging.

DESCRIPTION OF FILTER

The filter consists of a steel shell 42 in. in diameter by 40 ft. long, and is made to stand a pressure of 80 lb. per sq.in. The shell has butt straps on the outside and countersunk rivets on the inside, so as to present a

smooth surface to the filter mats, which form the internal lining of the cylinder.

The head or charge end of the filter consists of a cone-shaped casting terminating in a cylinder which is sustained by a trunnion bearing. All pulp and solutions enter the filter through a 3-in. pipe, which is connected to the cylinder by means of a packed gland. The pipe is also connected to a 6-in. pipe, which is the main feeder for all filters. Between the main feed pipe and the filter are all connections and valves for charging the filter, introducing the washes, regulating the air pressure and releasing the air.

The body of the filter consists of three sections of steel shell bolted together by flanges. One section is 20 ft. long while the other two are each 10 ft. long. Thirty feet from the head end of the filter and joining the last two sections, is riveted a large cast-steel riding ring, 5 ft.

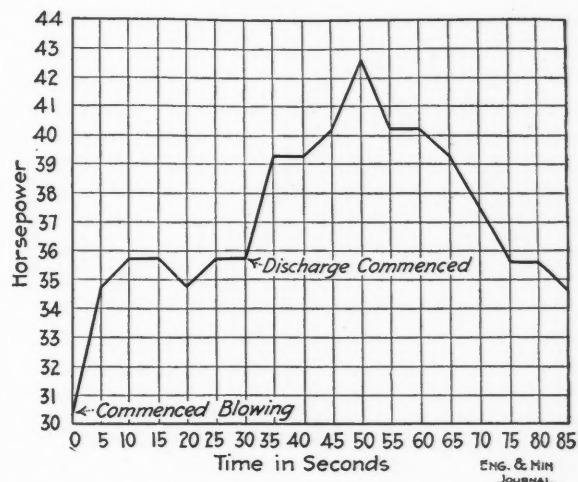


FIG. 1. POWER DIAGRAM OF BURT FILTER

6 in. in diameter with a 5-in. face, which runs upon two ordinary rollers, such as are used under tube mills. This forms the second bearing for the filter. The remaining 10 ft. of the shell, together with the discharge door, toggles, cast-iron cone, and cylinder for operating the door, overhang.

The mechanism for operating the door is worked by hydraulic pressure, but air can be used if so desired. The water cylinder is made in different sizes, depending upon the available pressure. At this plant a cylinder 10 in. in diameter is used with a pressure of 160 lb.

On the discharge end of the filter shell, Fig 2, is riveted a heavy flange with lugs, through which the slide rods pass and are held in place by nuts. On the flange there is a small projecting shoulder which embeds itself into a $\frac{3}{4}$ -in. round, soft-rubber gasket, fitted into an annular groove in the door. When the door is closed, the joint is made tight by means of this projecting shoulder and gasket.

The door is operated by a piston rod and head which work in the water cylinder. The other end of the piston rod, which passes through the door, is fitted with a large washer and nuts to pull the door

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†In charge experimental work, El Oro Mining & Ry. Co., El Oro, Mex.

open. The door slides on six 2-in. rods, compressing a heavy spring on each rod. The door and cone are both fitted with toggle connections, placed equidistant between the slide rods. On these connections six toggle levers are pinned, and extend toward the center or piston-rod. On the rod is placed a large cast-iron nut. When the door is closing, the ends of the six levers converge toward the piston-rod, their ends being in the path of travel of the large nut. The piston-rod slides through the door after it is shut and the large nut comes in contact with the converging ends of the levers and pushes them forward, thus straightening out the toggles and exerting an enormous pressure at six different points

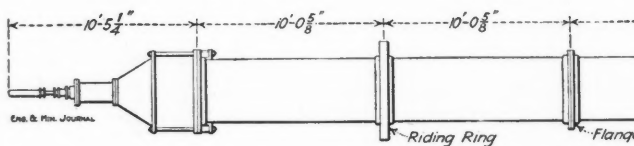
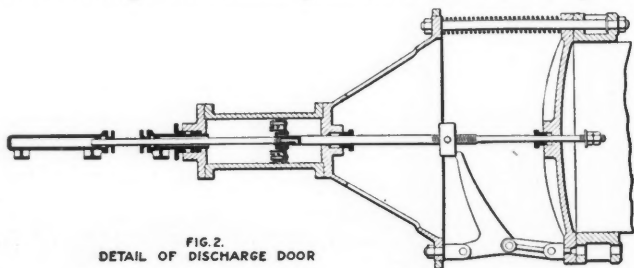


FIG. 3. PIPE CONNECTIONS

DETAILS OF FILTER CONSTRUCTION

on the door. This simple and powerful device is easily adjusted by moving the nut on the thread, on which it turns, and holding it in any given position by means of a setscrew.

The door is opened and closed by means of a four-way cock, which allows the water to enter on one side of the piston head, while discharging it from the other side. For opening the door, the water enters through the cast-iron water inlet passes through the tube and enters the cylinder through the opening in the piston rod. This forces the piston back, and exerts a pull on the nuts which opens the door, compresses the springs, and releases the levers of the toggles. The door is positive in action, has no small parts to get out of order and cannot easily be broken.

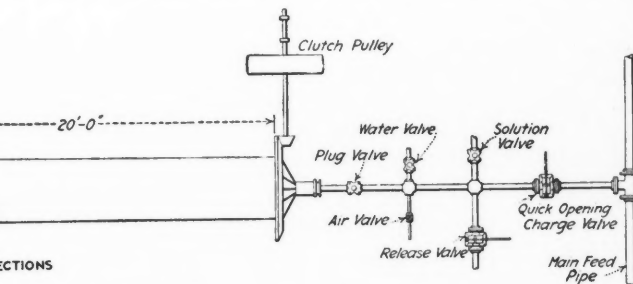
INTERIOR OF FILTER AND CONSTRUCTION OF MATS

An inside view of the filter before lining shows a steel shell, pierced at regular intervals by holes, there being four sets of five holes each for the filter mats. Besides these, there are also the holes for the bolts which hold the angle irons in place. When the mats are in position the cylinder is lined throughout with canvas, held in place by short pieces of angle iron set diagonally to the long axis of the filter, shown in Fig. 7.

The mats are simple in construction. Two pieces of special filter cloth, 10 ft. 6 in. long by 28 in. wide, are sewn as shown in Fig. 4 and sewing being represented by dash lines. The latest filters are fitted with mats 5 ft. long instead of 10 ft. This is a decided improvement as the smaller mats are easier to handle and less liable to be torn in handling.

The cloths are first sewed lengthwise to form the bags for the six corrugated boards, the ends and one side at

the middle being left open. The corrugated boards, which are 1/2 in. by 8 in. by 4 ft. 9 in., are then slipped between the cloths, through the openings at the ends, and a wrought-iron plate with a pipe nipple attached is slipped into the opening left at one side. The nipple extends through a hole cut in the center of the top canvas. The ends of the cloths and the opening in the side are then sewed up and the mat is ready for use. The iron plate, as shown in Fig. 4, consists of a piece of iron 3/8x2 1/2x6 in. bent to conform to the inner surface of the cylinder and is drilled and threaded in the center to receive a 1-in. nipple. Over the plate is placed a 1/2-in. mesh wire screen, the latter being a trifle larger than the former and having the edges doubled under the coarse screen and the corners soldered to it. The screens serve to keep the canvas from being forced down over the opening of the nipple, and by thus keeping the opening clear allows the filtered solution to run down the corrugated boards and out



through the nipple. In order to make a tight connection between the iron plate and the shell of the cylinder, a rubber washer is placed between the iron plate and the filter cloth, and another washer made of old filter cloths is placed between the shell and mat. These washers are drawn up tight by a nut, which is screwed

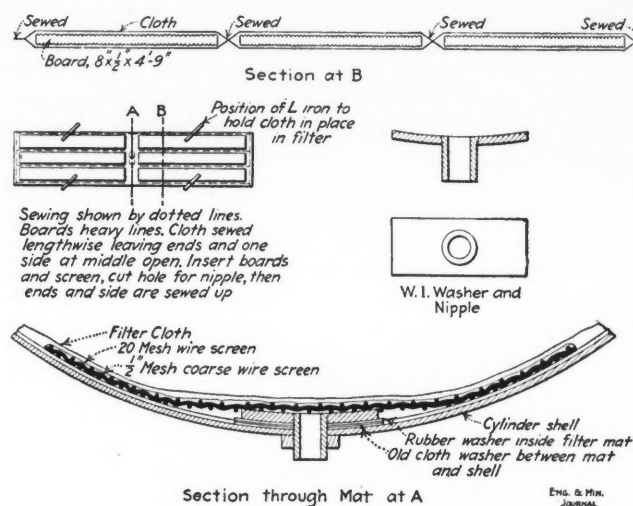


FIG. 4. DETAILS OF FILTER MAT

over the projecting end of the nipple on the outside of the shell. The 2x2-in. angle irons are placed at an acute angle to the long axis of the filter, thus forming a spiral which aids in working out the slime loaf. The angle irons are held in place by bolts with nuts on the outside of the shell, and each iron extends diagonally over the two adjoining filter mats and holds them firmly in place.

CYCLE OF OPERATION

The charge for the filters is delivered from three dewatering tanks placed at an elevation of 73 ft. above the filters. Each filter is charged by opening the quick-opening valve, Fig. 3, in the 3-in. line and leaving some open until the pressure gage registers about 45 lb. This pressure is due to the compression of the air in the cylinder by the inflowing charge. A lower head than 73 ft. can be used, or in case the necessary elevation is not available, the filter can be charged by a pump. At this plant the average time to charge a filter is five minutes, which charge will give a cake of from 4 to 4½ in. This thickness has been found to be the best for this pulp.

After the filter has been charged, the air valve is slightly opened in order to keep the pressure up to 45 or 50 lb. If a much lower pressure is used the time of the cycle is much lengthened.

As soon as the charge enters the filter, the solution begins to trickle out through the discharge nipple, increas-

the wash has entered, the valve is closed and the pressure again increased and kept at 45 to 50 lb. until the filter blows again. This operation is repeated as many times as desired, depending upon the number of washes given.

At this plant the plan of letting off about half the pressure and forcing in the wash with compressed air was tried. This seems to give a better distribution of the wash as it forms a spray, which reaches from the head to the discharge end of the filter. After the last wash begins to blow, the filter is discharged, by first releasing the air and then opening the door. If the pressure were not released before opening the door, the rubber gasket, used to make the joint tight, would be blown out. As soon as the pressure is released the cake begins to fall from the mat and to form a loaf in the bottom arc of the cylinder. At this stage, with an all-slime loaf, a small amount of water is added so that the falling cake will not stick to the mat, but will form a slippery loaf and slide out the discharge end. Here is when the advan-

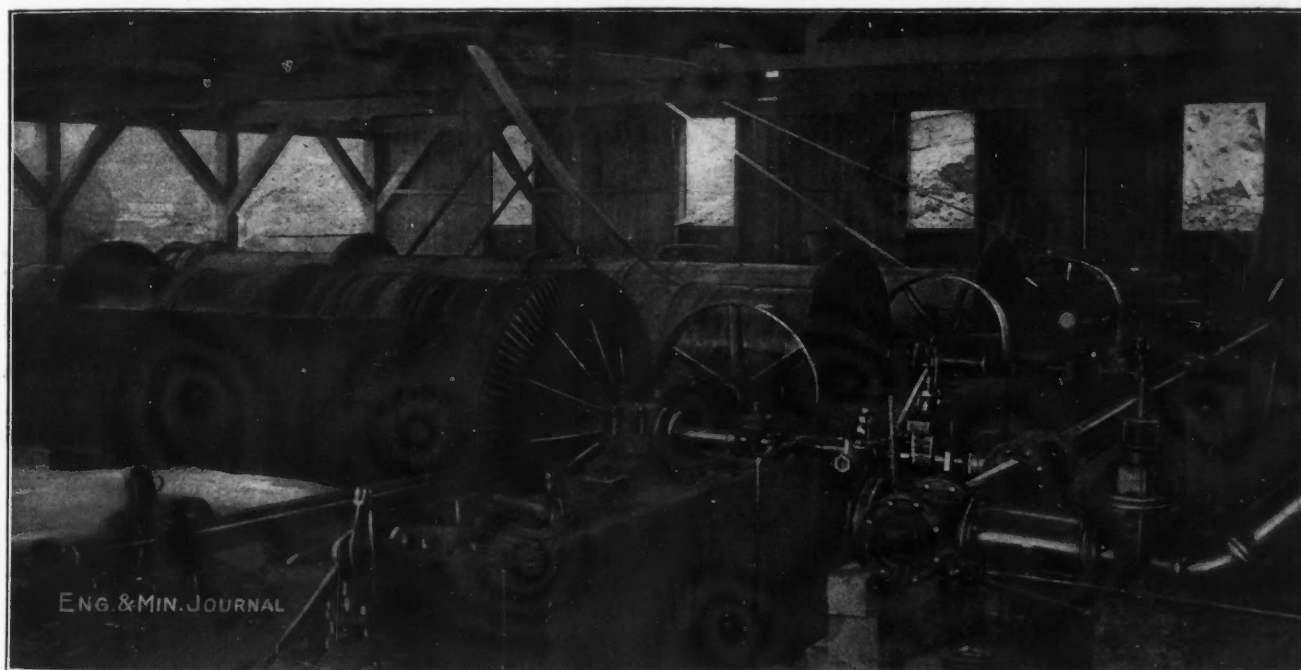


FIG. 5. HEAD END OF FILTERS DURING CONSTRUCTION

ing in quantity as the pressure increases, until, when the charge is complete, a full stream issues from each nipple. In case a mat is worn through or torn, it is noticed at once as the nipple will discharge cloudy solution until a cake has been formed over the hole. If a mat proves defective, it is cut out by stopping the nipple with a wooden plug, until it is convenient to change the mat.

The amount of solution discharged through the nipples gradually diminishes until, when the cake is formed, the air begins to blow through the nipple, atomizing the small amount of solution which is still being discharged. This is called blowing and indicates that the cake is dry and ready for a wash or to be discharged. When the filter first blows, the air pressure is released through the release valve, which is then closed, and the wash is allowed to enter at once through either the solution valve or the water valve. If the pressure of the wash exceeds that of the air pressure, there is no need of releasing the air, but otherwise it is, of course, necessary. When

tage of placing the angle irons at an acute angle is realized.

The cake, when ready for discharging, carries from 19 to 25% of moisture, depending upon the length of time the filter has been allowed to blow, and is uniform, there having been no classification or settling. Samples taken at ½-in. intervals from the inside to the outside of the cake and also at various intervals from the charge to the discharge end, showed practically no difference in the sizing tests.

GENERAL OPERATIONS

All work on the filters is done by native labor and no high-priced foreign labor is necessary. To handle the 14 filters there is a crew of four men per shift, two of them attending to the charging, keeping up the air pressure and putting on the washers, one to open and close the discharge doors, and one to attend to the oiling, cleaning and to act as general helper.

Like all machinery in constant use, the filters must be repaired and kept in good shape in order to get the best results. For this purpose a mechanic and helper are kept at the filters on day shift to make any needed repairs, and they are responsible for the upkeep of the filters, valves, pumps, pipes, etc. A book is kept in which is recorded all needed repairs, so there is no excuse for not keeping everything in good shape.

Formerly when it was the custom to acid-wash the mats floor, which always has a thick coating of lime salts, the

rip them apart, wash and scrub them with stiff brushes, and then extend them full length in a box which contains the acid bath. Here they are allowed to soak overnight and the next day are again well scrubbed and rinsed in water. Afterward they are dried, repaired if necessary, and the mat again made. An acid solution of from $\frac{1}{2}$ to 1% is used at present. Formerly a stronger solution was used, sometimes running up to 3% acid. With the strong solution the cloths soon rotted and could not be used more than three or four times, while with the weak

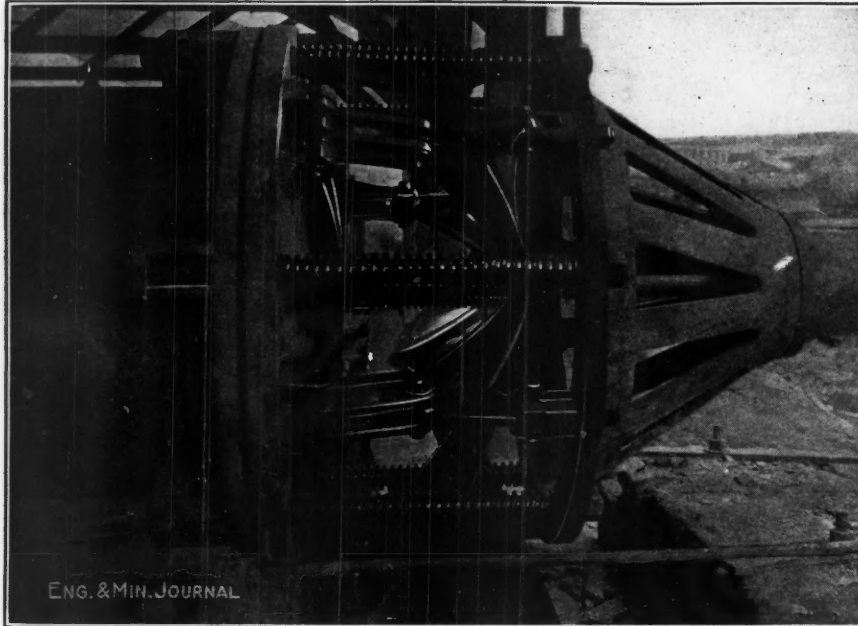


FIG. 6. DISCHARGE DOOR OF FILTER

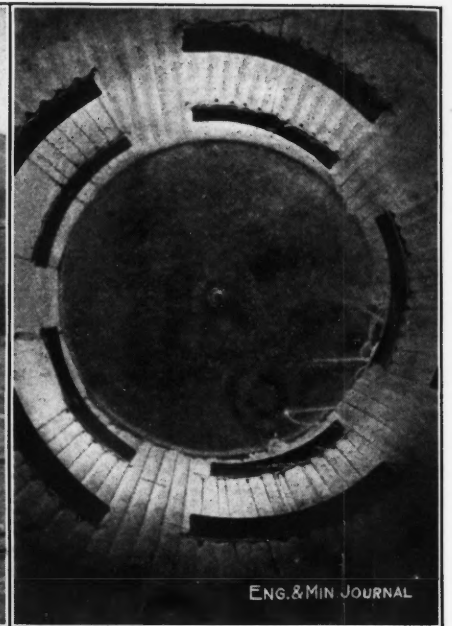


FIG. 7. INTERIOR MATS HELD BY ANGLE IRONS

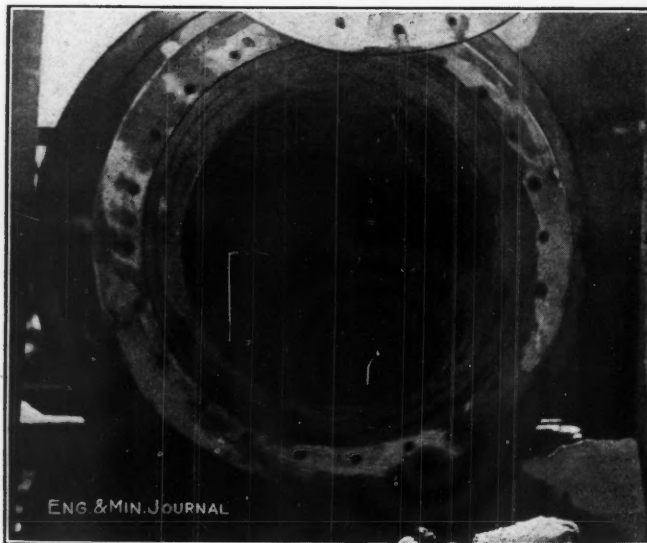


FIG. 8. CAKE BEFORE FALLING FROM THE MAT



FIG. 9. CAKE OR LOAF READY TO DISCHARGE

acid consumption was high. As there is but little carbonate of lime or other lime compounds in the cloth, and as it seems that the cloth fills up with fine slime, it was decided to take out the mats, clean them, wash with acid solution and rinse in water. At present each filter is changed once every six weeks. It takes from five to six hours to take out a set of mats and put in new ones. The old mats are carried to a tank where two small boys

solution they can be used six times before being discarded. Less than 500 lb. of commercial hydrochloric acid is used per month and costs, laid down at the plant, 8 centavos per lb. An experiment was made using lactic acid instead of the commercial hydrochloric acid, but the results did not justify changing the present system.

Table 1 gives the résumé of a few tests, taken over a period of several months under regular working conditions.

When the tests were being run, the air pressure varied from 20 to 50 lb., which will account for the variation in the total time of the cycles which does not check as well as it should. As will be seen, the best results were obtained by using long washes. A one-minute wash means that the wash was allowed to enter the filter for a period of one minute, while in a five-minute wash it entered for five minutes. With a one-minute wash not enough water enters to do much good for the filter begins to blow at the discharge end as soon as the air pressure is turned on. The above tests will show that a single large wash gives better results than by using a number of small washes, which is contrary to the practice of washing small amounts of precipitates in analytical work. The average moistures for all tests taken during the several months

spare parts should be used on account of frequent repairs. All valves and especially the charge valve should be well closed, as any obstruction in the charge valve will allow the charge to enter the filter continuously and thus fill it entirely. The angle irons should be placed properly in order to shorten the time of discharge. The air pressure should be kept constant and everything to save time should be looked after.

The complete time for one five-minute wash is 94 min., divided as follows:

	Minutes
Charge entering.....	5
Making cake.....	37
Wash entering.....	5
Displacing wash.....	42
Discharging and closing door.....	5
	<hr/> 94

COSTS

The costs at the plant of the El Oro Mining & Railway Co., Ltd., for the last 42 months, during which time 1,438,228 tons of ore were filtered, amounted to \$0.049 per ton of dry slime, which cost was distributed as follows:

Wages.....	\$0.014
Repairs and renewals.....	0.005
General supplies.....	0.013
Power.....	0.011
Water.....	0.002
Air.....	0.004
	<hr/> \$0.049

As this was the first plant to use these filters, many alterations have been made and the cost of such alterations were charged to operation. The above costs include all power, light, general supplies, supplies for repairs and renewals, all alterations on filter plant, wages of all laborers, proportion of the salaries of the superintendent, experimental man, shift bosses, and mechanical department, and everything else that could properly be charged to the filters.

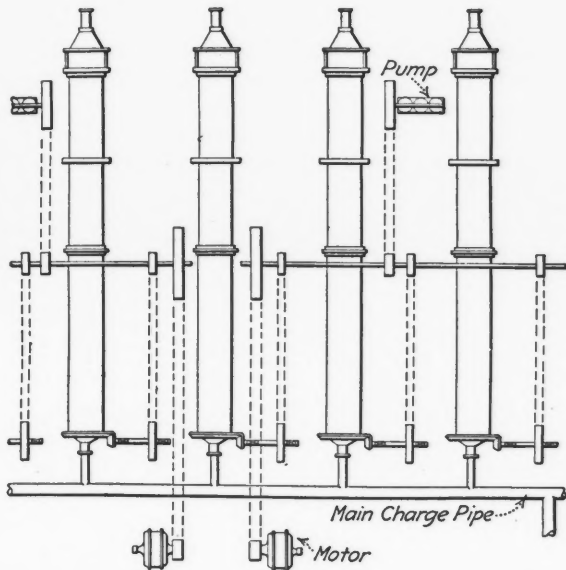


FIG. 10. CENTRAL DRIVING ARRANGEMENT OF FILTERS Only 4 of the 14 are shown, the rest being symmetrically placed

were, 50.5% for the charge entering the filter and 22.9% for the cake before discharging. The average of all sizing tests gave 77.6% through a 200-mesh screen. The average charge per filter was 5.9 tons, or about 90 tons per day.

TABLE I. WASHING DATA

No. of washes.....	3	3	2	1	1
Minutes of wash.....	1	2	3	4	5
Minutes of cycle.....	112	135	80	77	94
Per cent. of extraction of dissolved values.....	91.8	100	98.3	100	100
Extraction of undissolved values in dollars gold.....	0.0	0.02	0.09	0.05	0.03
Extraction of undissolved values in oz. Ag.....	0.0	0.1	0.1	0.0	0.0
Tons per 24 hr.....	77	65	106	112	88

It will be noticed that in nearly every case there is shown a slight extraction of the undissolved values. On one test with some exceptionally high-grade sulphide ore which had had a thorough treatment in the plant and was sent to a special filter, an extraction of \$1.25 per ton was obtained in the filter, due probably to the oxidizing effect of the air blown through the cake.

All the filtrate, which is clear, falls onto a cement floor, which drains to a common sump, to which the pump suction is connected. There are a few points on which at first trouble was experienced. It was found necessary to keep all packed joints in good shape in order to avoid slop and leakage of air. Valves with interchangeable

A Gold Brick

By H. W. HARDING*

My client, with whom I was traveling, stopped suddenly in our deck promenade, and with a satisfactory chuckle, said, "Harding, I was once accused of selling a gold brick. Here's one for you: When is a gold brick not a 'gold brick?' I'll give you the answer: 'When it's a brick of gold.'"

He then explained: "You know this 'gold-brick' mine; you've examined it. I bought it for \$100,000 because I knew it had great possibilities, but later I realized that it would require more for equipment than I had in hand at that time. Accordingly I recommended it to friends in the West, whose means were in proportion to the mine's necessities. They took the mine over for \$200,000, and operated it for about a year. During this time they built a smeltery. I had retained a small stock interest and kept my eye on the operations, making suggestions from time to time. Later I entered a protest which resulted in a slight estrangement, and finally culminated, after repeated failures on their part, in the accusation that I had sold them a 'gold brick'—this even in view of the fact that during their operation they had increased the ore supply by many thousands of tons. At the same time they had increased the mine's obligations.

*Mining engineer, 50 Church St., New York.

Matters went from bad to worse until, in exasperation, I asked them their price for the 'gold brick.' They named \$200,000, the figure for which they had originally purchased the property, plus 6%, under a three months' option. When the papers were presented the consideration had risen to \$275,000. Upon explanation it appeared they had put in their smelter equipment at \$75,000. I told them I had no intention of purchasing the cause of their failure. Finally a new set of papers were made out for \$200,000, plus interest. I then presented the proposition, together with my views, to some of my friends, with the result that we jointly took over the property and equipped it properly."

The rest of the facts are exceedingly simple. Within another year the mine was able to cover its own expenses and at the end of the second year began paying dividends. From that date to this, dividends have increased and the production has likewise increased, until this mine is now paying dividends equal to 6% on \$25,000,000, and there has been developed sufficient ore to insure a life of at least 25 years for the mine, under present conditions. Not a bad sort of "gold brick."

Ferrophosphorus Manufacture at Rockdale, Tenn.

By JAMES A. BARR*

Ferrophosphorus is being manufactured in a blast furnace at Rockdale, Tenn., under the patents of I. J. Gray, of that town, just as pig iron is ordinarily produced, except that the smelting column is low, and a larger percentage of fuel and correspondingly higher temperature are used.

The charge is composed of phosphate rock ($\text{Ca}_3\text{P}_2\text{O}_8$), silica sand, iron ore and coke, giving dark, brittle, platy crystals. Slag loss is high, but most of it is recovered by granulating the slag in water, then drying in a rotating cylinder, and finally treating in a Ding's magnetic separator.

The use of ferrophosphorus is practically confined to steel making, to give a uniform phosphorus content to the finished steel. The slag, when finely ground, makes a good fertilizer, having the same characteristics as Thomas slag. To the best of my knowledge the Rockdale installation is unique.

Report of Alaska Mine Inspector

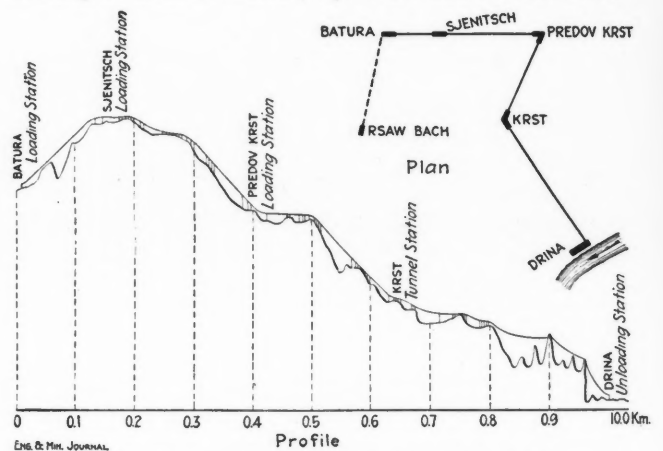
A report of Summer S. Smith, mine inspector for Alaska, covers the year ended June 30, 1913. It notes the need of more efficient inspection, impossible without increased appropriations. The conditions of the industry and of labor are briefly described. The appointment of a commission by the governor of Alaska is urged for the purpose of investigating the possibility of establishing a territorial insurance fund for mining employees, to be supported by both operators and workmen.

The Production of Brazilian Carbons runs about 30,000 carats per year, the stones running up to 500 carats in size. It is stated by J. K. Smit & Zonen of Amsterdam that the production is rather decreasing. The stones occur in decomposed or waterworn conglomerate in the state of Bahia and are recovered by the old-fashioned method of washing.

*Engineer, International Agricultural Corporation, Mt. Pleasant, Tenn.

Aerial Tramway for Timber

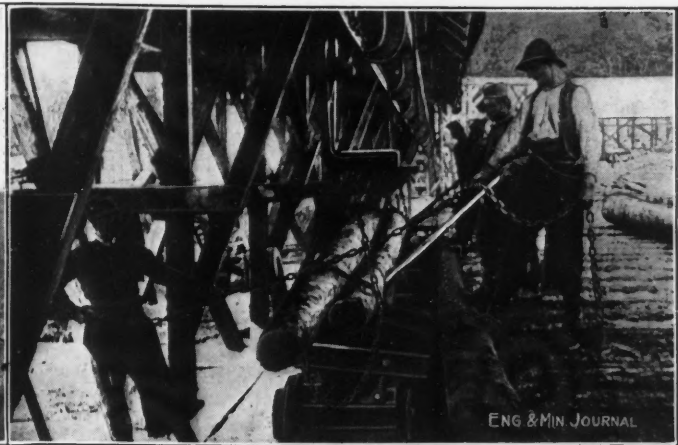
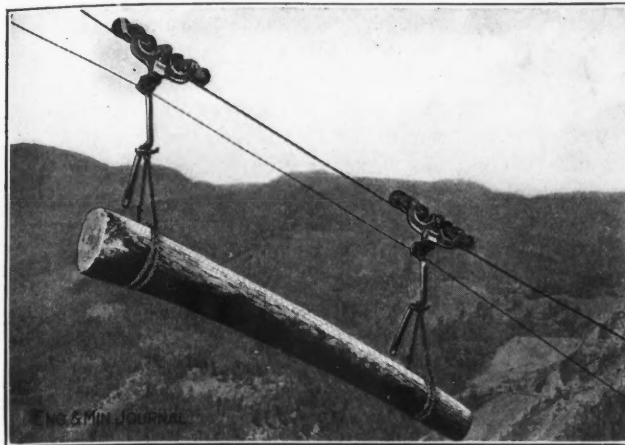
The installation of an overhead cableway here described is of interest to the mining industry as offering a suggestion for the solution of the problem involving the transportation of mine timber. So far as we know, there has been no installation of aerial tramways at American metal mines for the sole purpose of conveying mining timber from the forest tract to the mine, although tramways installed to carry ore from the mine often carry up timber and lumber along with other supplies on the return trip. Further interest lies in the fact that besides following a rather tortuous course, this tramway also is carried through two tunnels piercing spurs of the mountain. The installation was made by Adolf Bleichert & Co. for a company engaged in lumbering in a mountainous part of Servia. It carries the fir and pine logs from the forest to the Drina River. Referring to the map and profile, the original line extended from Predov Krst station to the unloading station on the Drina. A recent extension was made from Sjenitsch to Batura, and a further extension, shown dotted, is to be completed to Rsw Bach, which will give a total length of $8\frac{1}{2}$ miles. There are loading stations at Batura, Sjenitsch and Predov Krst.



PLAN AND PROFILE OF THE TRAMWAY

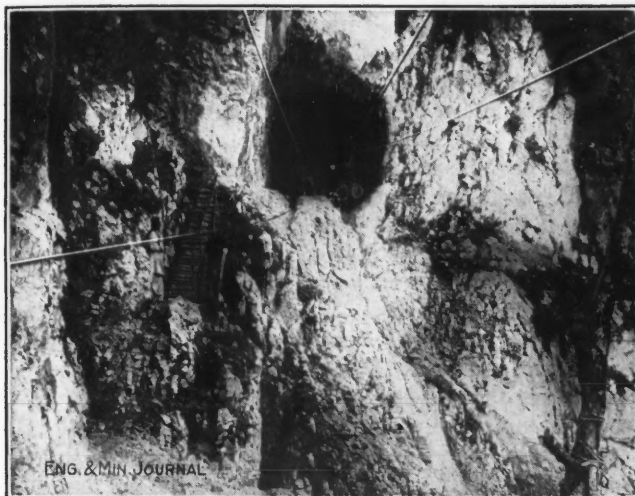
The line rises sharply 900 ft. from Batura to Sjenitsch, the high point, and then drops again to Predov Krst. This $2\frac{1}{4}$ -mile section is operated by a steam engine, as there is not sufficient difference of elevation to permit automatic operation. The boiler is fired with timber chips, and will move 15 loads per hour of 2 to 3 cu. m. of timber per load. There is a 2600-ft. drop from Predov Krst to the end of the line in a horizontal distance of about $3\frac{3}{4}$ miles. The descending load over this stretch gives a surplus of power so that no other drive is necessary, the surplus being available for various purposes.

Loading is accomplished by means of an auxiliary carriage on rails below the overhead rails of the loading stations. The log or logs are rolled on these carriages, chains thrown around them, and the chains fastened to the two carriers above. By lowering the deck of the carriage, the logs are then suspended from the carriers; these run down to the end of the station where the coupling apparatus takes hold of the haulage rope. The coupling is designed to grip the ropes of different diameters used on the different sections of the line. At the intermediate stations, the carriers couple themselves to the new haulage cables and pass through the station without stopping unless additional loading is necessary.



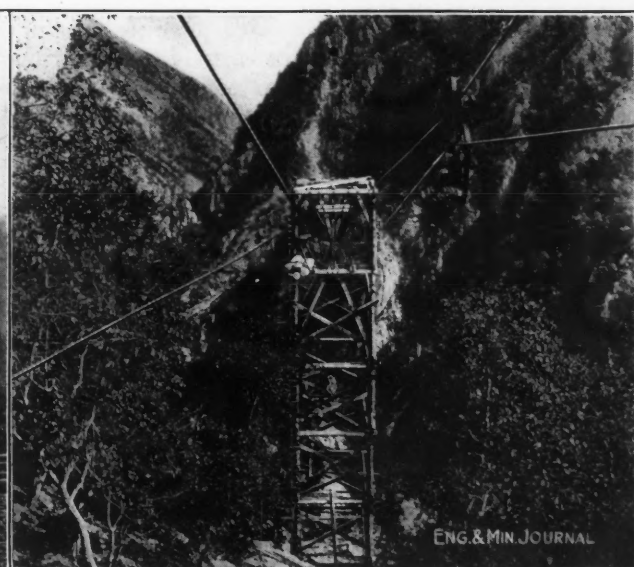
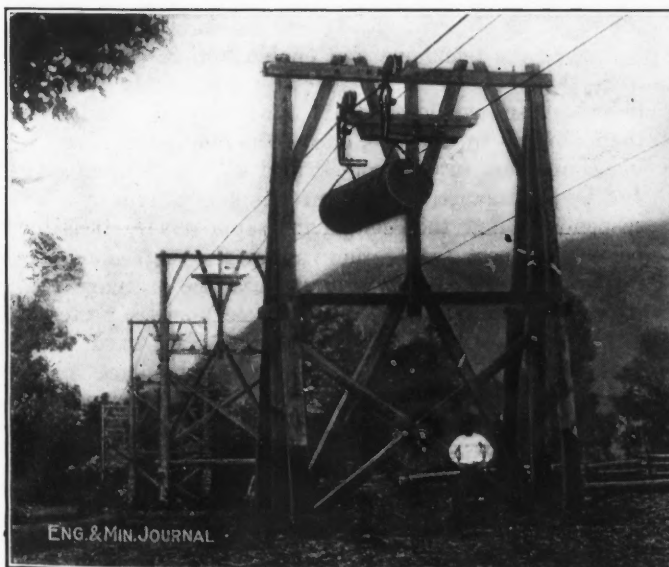
TIMBER IN TRANSIT. THE JAWS WILL OPERATE WITH ROPES OF DIFFERENT DIAMETERS

LOADING ON THE LOGS. WHEN THE CHAINS ARE ATTACHED THE TOP OF THE CARRIAGE IS LOWERED, LEAVING THE LOGS FREE



THE 185-FT. TUNNEL

SPAN BEHIND THE SECOND TUNNEL



A SERIES OF TOWERS NEAR FORMER LOADING STATION

SPAN OF 1300 FT. BETWEEN THE TWO TUNNELS ON THE DESCENT OF THE DERVENTA VALLEY

Toward its lower end, the line follows the valley of the Derventa, a tributary of the Drina. It crosses from one bank to the other with a span of 2300 ft., and immediately strikes a rock point through which it is conveyed by means of a tunnel 185 ft. long. Another long span of 1300 ft. carries it to a second ridge pierced with an 85-ft. tunnel, when a third span, also of 1300 ft., brings it to the level of the unloading station on the Drina. Unloading is effected by a mechanism similar to that used for loading.

A Wireless Mine Telephone*

The unique system of telephoning here described was invented by Herr Reineke, in Germany, in the attempt to overcome the difficulties resulting from broken wires in ordinary systems of telephony. His system has now been in regular use for two years in the Carolinenglück Pit, Bochum, Westphalia, where no other method of signaling is used. The Wireless Telephone Co., Ltd., London, is the owner of the British and colonial patents.

The invention seems to be entirely original; in fact, the German Patent Office did not at first believe it to be practicable, but, on its being demonstrated, granted a patent without restrictions or anticipations being cited, which is most unusual.

While called "wireless," the system is entirely distinct from that commonly used in wireless telegraphy.

In this system the transmission and reception of speech occur in the same manner as in ordinary telephoning, but there the resemblance ends. Instead of the current from the transmitter being conducted along the wire to the receiver, it is converted to high pressure by means of a transformer contained in the telephone case. The high-pressure or secondary winding of this transformer is connected to the ordinary rails or pipes in the mine and communicates to them a charge of electricity, which spreads over the whole system of rails, and varies with the fluctuations of the primary current in the transmitter circuit of the telephone. It is unnecessary to make any special provision to insulate the rails or pipes, or to connect the adjacent lengths electrically.

It is interesting to note that the invention was led up to by the discovery that the conditions of distribution of electric charges underground are entirely distinct from the conditions that hold on the surface of the earth, and the working of the system largely depends on this fact, which was demonstrated for the first time by the inventor.

Speech can be received by connecting telephones to the rails or pipes at any point of the system, by bridging a sufficient length so as to obtain a suitable difference of pressure; by connecting between the rails and pipes, if these exist; or, as is sometimes convenient in the case of portable instruments, by connecting to an antenna consisting of a loose coil of wire, which may be laid on the floor or hung on the timbers.

As in the ordinary telephone, a bell is used for calling attention, the bell being operated by a specially designed relay. On the button being pressed at the transmitting stations, all the telephone bells will ring, and all the telephones can receive the message by taking the

receiver off the hook, which operation cuts off the bell and connects the receiver in the usual manner. It is possible to tune the relays so that each will respond only to its own particular signal, and thus any one station can be called, but in mining work this is usually not necessary or desirable, and the different stations are called by giving one, two or three rings, as prearranged, while it is always possible, by a special signal, to call all the stations and speak to all simultaneously. The current required is furnished by an ordinary battery; in fact, in outward appearance the telephones are exactly similar to an ordinary mining telephone.

The portable instrument, which can be carried about and used in any part of the mine to which the rails extend, is contained in a strong metal case, the total weight being about 20 lb. This telephone can either ring up the other stations or be rung up by them. A smaller or pocket instrument is also made, which can ring up other stations, but cannot be called by them. With this instrument messages can be sent to or received from any of the fixed telephones, the only difference between it and the heavier portable type being that the other telephones cannot call it by ringing its bell. Thus each official provided with an instrument can give notice of any accident and ask for assistance from any point in the mine.

A telephone can be fixed at any convenient position on the surface, and connected to the headframe, if of iron, or to the hoisting-rope or pipes which go down the shaft. This telephone can speak to any of the telephones underground if necessary, but it is usually found more convenient to arrange for it to speak to the station at the pit-bottom only, and for this station in turn to speak to the underground telephones. In metalliferous mines, where a number of different levels run from the shaft, communication can be established from one level to another as required, the presence of the orebodies not affecting the speaking in any way.

A further most important application of the system is that of speaking from the moving cage to the hoist house, and for the latter position the inventor has designed an ingenious method of operation. The telephone is mounted on a standard fixed close to the hoisting engineer's ear. On receiving a call, he has only to put his ear to the receiver, and the slight pressure is sufficient to switch in the telephone and enable him to communicate with the cage, without removing his hands from the levers. Various methods of connection are possible for the telephone in the cage, one of the most satisfactory being connection into a loop formed by the hoisting ropes, and by the balance rope (or, if this is not used, by a wire suspended below the cage in the same way). It is then possible to speak from either cage to the surface or to the pit bottom, without any alteration in the ordinary hoisting arrangements. The surface telephone is preferably connected in circuit with a loop of wire fixed to the headgear, or in the shaft in any convenient place.

Several methods of telephoning from the cage to the shaft have been previously proposed, such as the construction of a hoisting rope containing an insulated wire, or the insulation of the attachment of the rope to the cage and also the overhead sheave, etc., or the use of sliding contacts to a wire suspended in the shaft. There are definite defects in all these methods, but they need not be discussed, as the best argument against them is that none of them has come into use.

*An abstract of an article by T. M. Winstanley Wallis in the "Transactions" of the Manchester Geological & Mining Society, Part X, Vol. XXXIII.

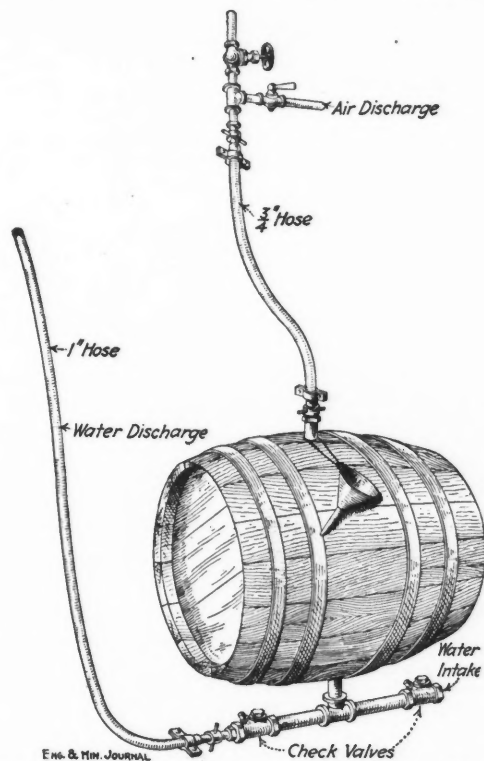
Details of Practical Mining

Hand-Controlled Compressed-Air Pumping Barrel

By ARTHUR O. CHRISTENSEN*

The home-made arrangement here described has been found useful in bailing out winzes or underhand stopes where the amount of water is not sufficient to pay for installing a pump, while the lift is too high to bail by hand; and also in situations where a pump is not desirable because of blasting, or lack of room, or cost of moving and installing, or because none is to be had.

The barrel, rigged as illustrated, can readily be put in place and operated with the same air and even the same hose as is used to run the drills. Into the upper side of



VALVES AND CONNECTIONS FOR PUMPING BARREL

the barrel is screwed a 1-in. nipple which has a 1-in. to 1 1/4-in. bushing for a hose spud. Into the bottom is screwed a 2-in. nipple. A few weights, such as pieces of track rails, drill steel or tripod weights, are bound to the bottom to act as ballast and sink the barrel, thereby hastening its filling.

In operation, the air-discharge cock is opened, allowing the barrel to fill and sink. As soon as air ceases to issue from this cock, it is closed and the compressed air is turned on. The water in the barrel is now forced up the discharge hose until air begins to issue with the water, showing the barrel to be empty. When so much of the water has been pumped out that the barrel no longer

fills, the hose is unscrewed from the top, a funnel inserted and the last of the water bailed by hand into the barrel. The hose is then screwed on again and the apparatus operated as before.

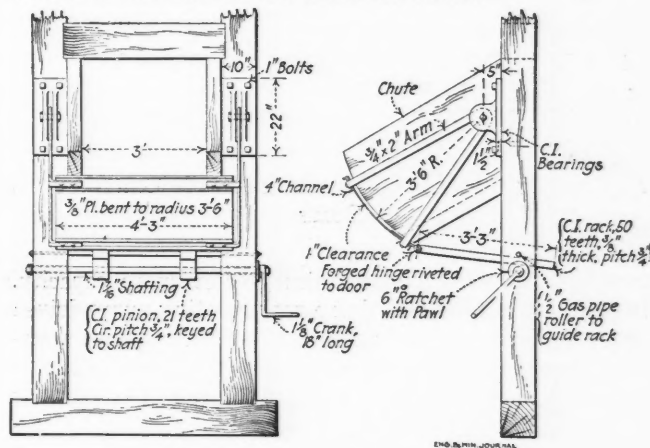
The check valve between the barrel and the discharge is not necessary unless there is a possibility of the discharge line siphoning back the discharged water while the barrel is filling again.

This operation might be made automatic, but a regular trap or ordinary pump would be more serviceable in such a case. The device, lifting water 30 ft. with an air pressure of 100 lb. per sq.in., and an average difference of 2 ft. in water levels between that inside and that outside the barrel, should handle 25 to 30 gal. per min. With a 2-in. discharge pipe or a 10-ft. submergence, this rate would be nearly doubled.

Underswung Rack-Operated Arc Chute Gate

By WALTER R. HODGE*

The chief advantage of this gate lies in the fact that it cuts up through the stream of ore and thus obviates jamming or rushing at the chute mouth and permits easy control of the flow of ore from the chute.



ELEVATIONS OF THE CHUTE AND DOOR

The door itself is of the arc type, but hung from heavy castings, which are bolted to the timbers of the chutes or bin and not to the chute lip, as they often are. These suspending members are made unusually heavy and extend well out from the face of the timbers to allow the top of the door to clear the bottom of the chute at the extreme open position.

The method of operating the gate is perhaps a little unusual. Two racks are fastened by pins to lugs riveted to the lower edge of the door. The racks are inverted, teeth down, and so are protected from dirt or fines. No lubricant is used. Each of these racks works on a pinion, keyed to a shaft. This shaft lies back and under the

*Mining engineer, Franklin, N. J.

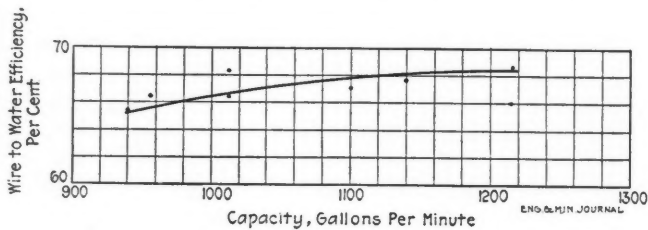
*Mining engineer, Ducktown, Tenn.

chute and turns in gas-pipe bearings set in the timbers. A crank operates the shafting and pinions. One revolution of the crank raises or lowers the door 6 in. and effectually checks any rush of ore. The rock caught on the closing edge of the door, instead of clogging the door, is thrown back into the chute by the rising door or pushed into the car. The whole mechanism is simply and easily operated by one man.

Gates of this type are used at Burra Burra mine, of the Tennessee Copper Co., in connection with large pocket chutes from which tram cars are loaded.

Centrifugal versus Reciprocating Electric Pump

One of the great advantages of centrifugal pumps is that the quantity of water can be regulated within comparatively wide limits by simply opening and closing a valve on either the suction or the discharge pipe, preferably the former, with but slight variation in the efficiency (*Bull. A. I. M. E.*, February, 1914). A reciprocating pump driven by an induction motor, on the other hand, must run at a constant speed. Mechanical devices to change the speed of the pump or the quantity of water per stroke are necessarily complicated. The common practice for decreasing the quantity is to use a bypass on the discharge column, allowing a portion of the water to return to the sump, at the expense of efficiency. In-



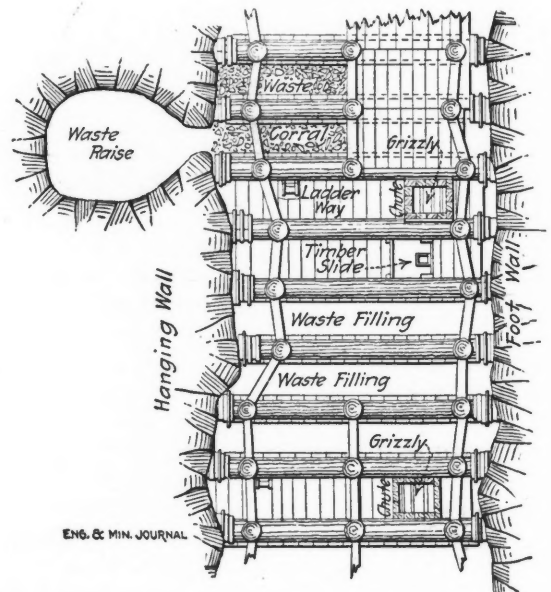
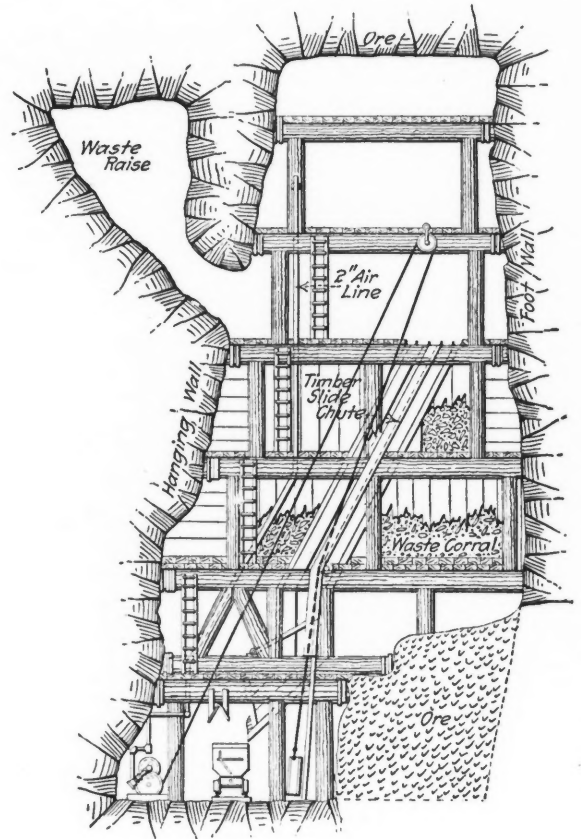
EFFICIENCY CURVE OF 8-IN. EIGHT-STAGE CENTRIFUGAL PUMP

termittent pumping necessitates greater sump capacity. It may be generally said that a reciprocating pump driven by an induction motor is especially suited to pump a certain amount of water against a head that may be varied at pleasure, while with a centrifugal pump the quantity of water can be regulated but the head cannot be materially changed without structural changes. To effect the latter end, a centrifugal pump should be designed for changing either the number or the diameter of the impellers. High-pressure centrifugal pumps are usually designed for a head of 100 to 150 ft. for each stage or impeller. The speed must be approximately 1200 or 1800 r.p.m. with a six- or four-pole motor and a 60-cycle alternating current. With a 25-cycle current, the speed would not be sufficient, except with a two-pole motor.

The drawing shows an approximate curve of efficiency based on eight tests at different quantities on an 8-in. high-head centrifugal pump of the Penn Iron Mining Co., when in first-class condition. During these tests the unit was being run at 1235 r.p.m. and the quantity was varied by manipulating a valve on the suction. The pump was eight-stage, driven by an induction motor, operating on a 2200-volt, three-phase current.

Heavy Combination Stope Timbering

The accompanying drawing represents the method of starting a new stope in the Morning mine in the Cœur d'Alenes, taken from the 1913 report of the Mining In-



TIMBERING WITH POSTS AND HORIZONTAL STALLS

dustry of Idaho. The wall rocks of the deposit show a marked tendency to swell in depth and thus produce an excessive side pressure on the timbers. The pressure is in some places so great as to broom up the ends of 20- to

24-in. red-fir caps. The ends of the caps are, therefore, protected by soft wood blocking, which can be removed to relieve pressure. Close filling is practiced and where the orebodies are heavy and clean it is often necessary to carry this filling within one floor of the back and get it by blasting waste out of the walls. The timbering system here illustrated is generally employed through the district where the orebody is not over 15 ft. wide. It may be described as a combination of square-sets and stulls.

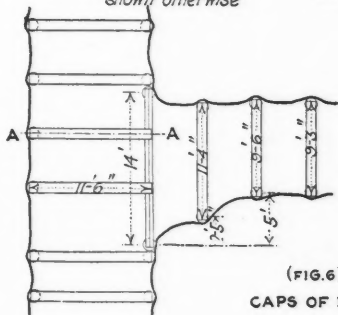
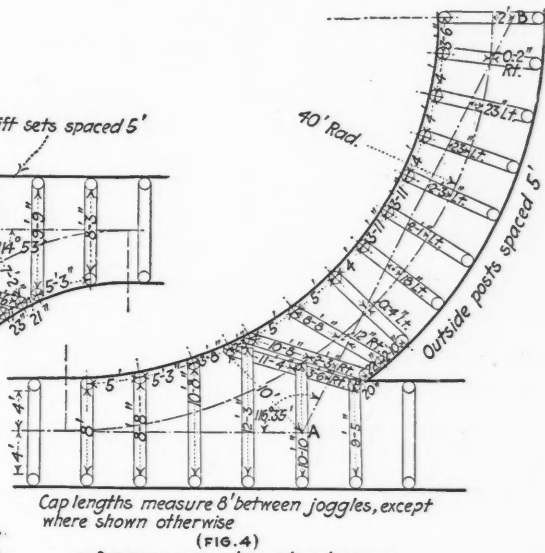
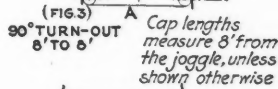
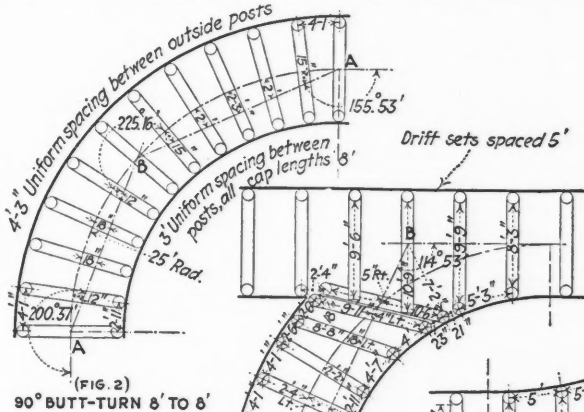
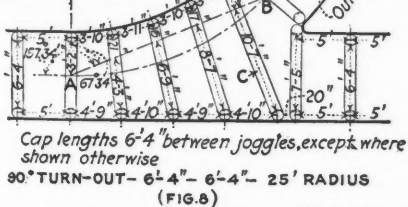
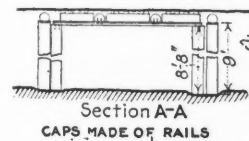
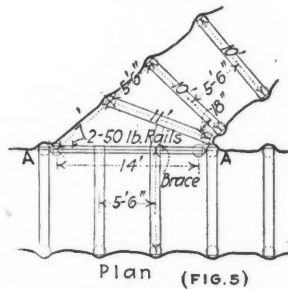
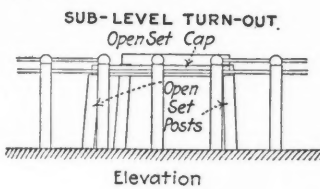
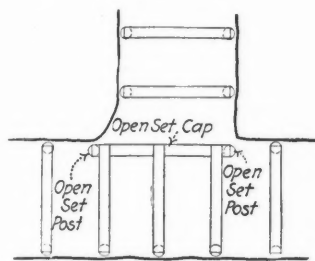
Mesabi Underground Turn Timbering

In underground mining on the Mesabi there are nearly as many different styles of timbering for drift

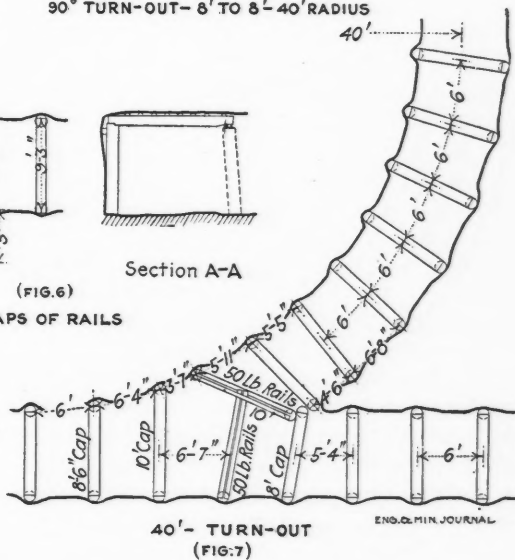
called the open set. The only drawback in this method is the loss of headroom.

For main levels, the chief considerations are permanency and ease in tramming. A square turn, such as is used on the subs, requires so long a cap to enable motors or mules to pass that it becomes weak and frequently causes a great deal of trouble, as the ground takes weight. It has, therefore, become generally customary to put in a carefully designed curve of 25- to 40-ft. radius. The method of timbering and laying out the curve then depends on the captain or the operating company.

Figs. 2, 3 and 4 show standard main-level curves used by one of the large operating companies. The lines AB are established by the engineer by putting two nails in the caps. Then the foreman by use of the blueprint is able to place accurately each set.



Diam. of Caps 14"
Diam. of posts 12"



VARIOUS METHODS OF TIMBERING TRACK TURNS ON MESABI HAULAGE LEVELS AND SUBLEVELS

and crosscut turnouts as there are separate operating companies.

On sublevels, which are nearly always temporary, turnouts and curves are put in by the foreman without help from the engineering department. A simple turnout commonly used in such cases is shown in Fig. 1. Here three drift-set posts are taken out and replaced by a set

Figs. 5, 6 and 7 show curves that make use of 50-lb. rails instead of long timber caps. These curves have the advantages of requiring less supervision and engineering, of being stronger, and of not requiring so high an excavation to secure equal headroom.

Fig. 8 shows a curve frequently found in the mines of one of the larger companies. Although a good-looking

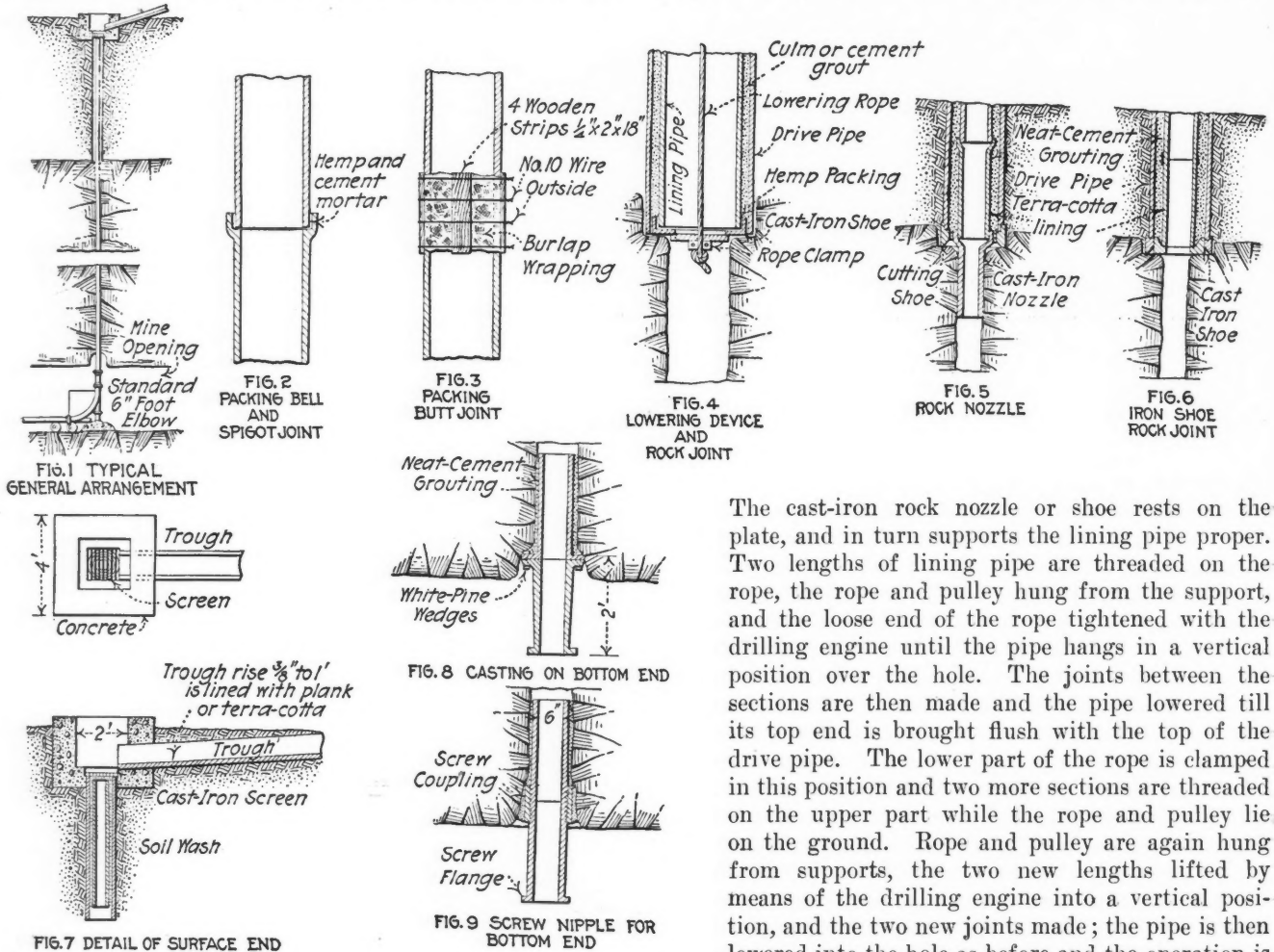
curve for firm ground, it has the disadvantage of the long cap *C*, which is liable to break before the drift is ready to be abandoned.

Hydraulic Mine-Filling through Boreholes*

The most common method in use for getting underground the material used in hydraulic filling of the anthracite mines in Pennsylvania, is to shoot it down a borehole. These holes are put in with churn drills, of a

tending for 9 in. on each side of the joint, and stiffened by 1/4x2x18-in. wooden strips held firmly in place with No. 10 galvanized wire, as shown in Fig. 3. Bell-and-spigot joints are packed with hemp and mortar, as shown in Fig. 2. The joints between these linings and the rock hole require special nozzle pieces or shoes, as shown in Figs. 4, 5 and 6.

To insert a lining in the hole, a hemp rope of strength to support the full length of pipe is threaded through a single pulley supported above the hole, and the lower end of the rope is knotted to support a clamp under a circular plate of diameter 1 in. less than the hole in the rock.



ARRANGEMENT AND DETAILS OF BORE-HOLE LININGS FOR SAND FILLING

diameter to suit the quantity of material to be handled, usually 12 in. Through the surface material down to the bedrock, the drive pipe is protected by means of a lining pipe of metal or of specially vitrified terra cotta, as shown in Figs. 1 and 7. Metal-lining pipe should be non-malleable and capable of being broken into small pieces and removed when worn out. It has special lock-flange connections, or bell-and-spigot joints; standard flanges require too large a hole to be practicable. Bell-and-spigot joints are packed with oakum and cement mortar as the pipe is lowered in the hole. Terra cotta lining may have plain butt joints, or bell-and-spigot. Butt joints are reinforced with a triple thickness of burlap wrapping, ex-

The cast-iron rock nozzle or shoe rests on the plate, and in turn supports the lining pipe proper. Two lengths of lining pipe are threaded on the rope, the rope and pulley hung from the support, and the loose end of the rope tightened with the drilling engine until the pipe hangs in a vertical position over the hole. The joints between the sections are then made and the pipe lowered till its top end is brought flush with the top of the drive pipe. The lower part of the rope is clamped in this position and two more sections are threaded on the upper part while the rope and pulley lie on the ground. Rope and pulley are again hung from supports, the two new lengths lifted by means of the drilling engine into a vertical position, and the two new joints made; the pipe is then lowered into the hole as before and the operation is repeated until the entire lining has been inserted. The space between the outside of the lining pipe and the inside of the drive pipe is filled with cement grouting.

Ordinary screw-sleeve gas-pipe lining may be used, and if so used, is lowered into the rock for several feet to act as a rock nozzle as in the other cases.

Lining pipe is usually suspended by clamps over the receiving basin, which is generally made of concrete, and is protected by means of a screen, as shown in Figs. 1 and 7.

Where the borehole opens into the mine workings, there is used either a specially cast connecting piece, as shown in Figs. 1 and 8, or a short piece of wrought-iron pipe is fitted with a screw sleeve and inserted up the hole for two or three feet, as in Fig. 9. The space between this finishing piece and the sides of the hole, after packing with hemp, wedges or burlap, is filled with a grouting mixture of proper consistency.

*An abstract from Bull. 60, "Hydraulic Mine Filling," U. S. Bureau of Mines.

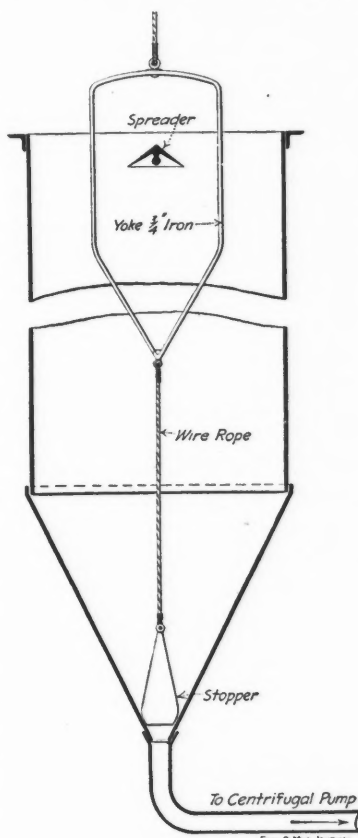
Details of Milling and Smelting

A Simple Agitating Tank

For agitation of cyanide pulp, where agitation and settlement are required in the same tank, the Deloro Mining & Reduction Co., of Deloro, Ont., has designed a steel tank 11 ft. in diameter and 27 ft. 3 in. deep. There is a cone bottom 10 ft. from base to apex. Agitation is performed by means of a 6-in. centrifugal pump coupled at the apex of the cone bottom, delivering into the center of the tank at the top.

In order to permit the settling operation to be performed in the same tank without choking the pump, a pear-shaped stopper, or valve, is arranged to plug the exit in the tank bottom. This plug is rather pointed at the top in order to facilitate drawing it up when there is settled solid over it.

A pulley and counter-balance are placed over the tank to facilitate drawing the plug. As a spreader, for distributing the pulp, is sometimes used in the center of the tank, a yoke was arranged to avoid interference. The accompanying sketch shows the arrangement.



SIMPLE AGITATING TANK

Since the mixture for agitation consists largely of sand, precautions have had to be taken to ensure satisfactory agitation and avoidance of difficulties. The tank described is satisfactory in every way.

Operations of the Belmont Mills, Tonopah

The report of the Tonopah Belmont Development Co. for the year ended Feb. 28, 1914, gives some interesting data of mill operation. The milling plant at Tonopah was operated continuously with only a few minor interruptions, generally on account of the water supply. There were treated 172,398 tons of dry ore, averaging 0.2676 oz. gold and 26.331 oz. silver, or \$21.095 per ton; a total of contained metals of 46,128.854 oz. gold and 4,539,429.48 oz. silver. Of this total, 44,465.878 oz. gold were re-

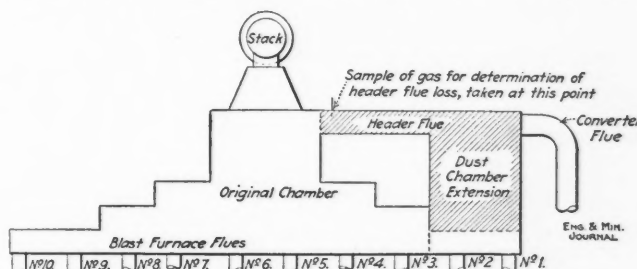
covered, and 4,251,746.48 oz. of silver. Average extraction was 94.45%, about the same as during the previous period.

The average number of stamps dropping during the year was 54.8 of a possible 60, or 91.33%. The average daily stamp duty was 8.66 tons. This could be materially increased if occasion arose. Crushing, stamping and regrinding departments of the mill have a large excess over the capacity of other departments. The settling capacity, designed for operating on the clean quartzose ores of the Belmont vein, is but 5.65 sq.ft. of settling area per ton milled daily. This is not enough for talcose ores, coming from other veins than the Belmont, such as the mill has been called upon to handle. The slime from these is very colloidal and hard to settle.

The plant at Millers has been operated on varying tonnages of custom ores, 48,088 tons having an average value of \$18.906 per ton, have been treated, 2,782 tons of that quantity being sand tailings and 1868 tons slimes tailings, and 43,438 tons purchased ores. Average extraction was 87.39%, some of the ores received having proved rebellious.

Dust Losses at Copper Queen

The results of the latest dust tests made on the blast-furnace stack at the Copper Queen works at Douglas, Ariz., show a large decrease in metal loss from this stack



ARRANGEMENT OF COPPER QUEEN DUST CHAMBER

since the tests made in 1909, when the dust loss was 2.73% of the total ore charged. In 1911, after the flue-dust chamber had been extended, the dust loss was 1.03%. In 1913, after the installation of reverberatory furnaces to treat the concentrates and flue dust, the dust loss in the stack was only 0.671%. The details of these important reductions in the stack losses are shown in the accompanying tables which we are able to present through the courtesy of Dr. James Douglas.

With the blast furnaces treating practically the same quantity of ore, the percentage of dust lost in September, 1913, was less than one-quarter of what it was in 1909. This excellent result has been brought about by the extension of dust-settling facilities and by adding reverberatory furnaces for treating the fine material. During the two tests just mentioned, the daily copper losses in stack dust were as 2589 lb. to 11,747 lb. In both

tests, there were, in operation, eight blast furnaces and seven converters. The copper in flue dust, however, was about 9% in 1909, as against 6.33% in the later experiments. The temperature in the stack in 1909 was 349° F. and the volume of gas passing up the stack was 1,268,000 cu.ft. per min., as against a temperature of 318° and a volume of 997,200 ft. in 1913. In the interim, the dust chamber had been extended and the velocity of the gases reduced. Both the original dust chamber and the extension now have wires suspended at 3-ft. intervals to assist in the deposition of the dust and fume. The velocity of the gases in the stack in the latest test

concentrates and flue dust in reverberatory furnaces, was nearly as great as that obtained by the first step. With a present stack loss of only 0.671%, which is but 0.0615% of the weight of the gases passing up the stack, it does not seem likely that further commercial results will be obtained by additional settling facilities.

As most of the extremely fine material that now passes up the stack is of the nature of fume, electric precipitation is looked forward to as the most effective treatment, and some experiments are to be made with the Cottrell process to determine whether a further commercial saving can be obtained.

EXPERIMENT NO.	DURATION OF RUN—HOURS	UNITS IN OPERATION	BLAST PRESSURE W.T. PSI INCH	VELOCITY HEAD INCHES OF WATER		TEMPERATURE °F.		VELOCITY OF GAS FT. PER SEC.		WEIGHT OF GAS POUNDS				WEIGHT OF DUST POUNDS				AMOUNT OF DUST IN GASES PER CENT.	AMOUNTS LOST IN 24 HOURS					TONS OF ORE CHARGED INTO BLAST FURNACES	DUST LOSSES EXPRESSED AS PERCENTAGE OF CHARGE		
				FAN	STACK	FAN	STACK	FAN	STACK	FAN	STACK	FAN	STACK	FAN	STACK	FAN	STACK		FAN	STACK	GOLD	SILVER	COPPER			LEAD	ZINC
				PER SQ FT PER SEC		TOTAL DURING RUN		DURING RUN		IN 24 HOURS		DURING RUN		IN 24 HOURS		DURING RUN			IN 24 HOURS		LB.	LB.	LB.			LB.	LB.
I	6 1/2	8	7	29	0.114	0.151	121	318	24.76	33.31	918300	1528	1539	12470	17682000	7.37	10440	27.21	38570	0.059	0.19	82.9	2059	5554	3008	2920	0.66
II	6	8	7	30	0.136	0.165	121	318	26.4	33.45	994500	1620	1570	12250	16638000	5.93	8048	23.72	32192	0.0483	0.16	56.3	2089	2863	2350	3006	0.36
III	6	8	8	28	0.120	0.161	123	313	25.44	33.93	999600	1565	1574	11790	16697000	7.62	10780	30.48	43120	0.0646	0.21	81.9	2630	5605	3277	2948	0.73
IV	5 1/2	8	5	28	0.120	0.155	132	313	25.63	33.26	979800	1534	1547	9954	13805000	6.56	9190	31.18	43680	0.0665	—	63.2	2752	5067	3319	2942	0.74
V	6	8	7	29	0.122	0.163	133	326	25.87	34.64	1025000	1565	1562	11800	16569000	5.43	7625	21.72	30500	0.046	—	41.2	2025	2867	2287	3072	0.50
VI	6	8	6	28	0.113	0.152	125	318	24.74	33.08	974500	1517	1527	11430	16173000	5.62	7588	22.48	30352	0.048	—	30.3	1878	3217	1396	2980	0.51
VII	6	7	6	29	0.133	0.179	120	304	26.73	35.55	1047300	1659	1671	12450	17720000	8.75	12450	35.00	49800	0.0702	0.25	114.5	3306	7121	3735	2881	0.86
VIII	6	8	5	29	0.109	0.146	115	309	24.09	32.20	948600	1501	1504	11100	15948000	7.12	10030	28.48	40120	0.0629	—	64.2	2539	2286	2808	2993	0.65
IX	5 1/2	8	5	27	0.125	0.163	127	314	26.06	34.14	1005700	1592	1584	11030	15400000	7.00	9798	30.54	42750	0.0636	—	68.4	2586	3377	3249	2979	0.72
X	6	8	5	27	0.130	0.171	136	334	26.79	35.43	1043700	1610	1602	12130	16994000	8.00	11190	32.00	44760	0.0657	—	80.5	2238	3993	3884	3023	0.74
XI	6	8	5	27	0.114	0.154	126	332	24.86	33.59	989500	1521	1521	11470	16137000	7.75	10900	31.00	43600	0.0675	0.21	72.4	2794	3400	3793	3149	0.69
XII	6	8	6	27	0.131	0.172	133	324	26.80	35.30	1039900	1621	1617	12220	17146000	9.18	12870	36.72	51480	0.0751	—	97.8	3480	3500	3706	2930	0.88
Ave	6	8	6	28	0.122	0.161	126	318	25.68	33.99	997200	1571	1568	11674	16409000	7.19	10075	28.39	40910	0.0615	—	71.1	2531	4158	3067	2985	0.669

DETERMINATIONS OF STACK GASES AND DUST LOSSES AT DOUGLAS, ARIZ.—SEPTEMBER, 1913.

DATE	CONDITIONS AND PURPOSE OF EXPERIMENT.	NUMBER OF RUNS	AVERAGE DURATION OF RUNS, HOURS.	TEMPERATURE OF STACK GASES, °F.	NUMBER OF BLAST FURNACES IN OPERATION	NUMBER OF CONVERTERS IN OPERATION	BLAST PRESSURE W.T. PSI INCH	VOLUME OF GAS PASSING UP STACK CU. FT. PER MIN.	WEIGHT OF GAS LB.				WEIGHT OF DUST LB.				AMOUNT OF DUST IN GASES %	TONS OF ORE CHARGED IN 24 HOURS	DUST LOST AS % OF TOTAL CHARGED	ANALYSIS OF DUST											METALS LOST IN 24 HOURS					
									PER SQ FT. PER SEC.		DURING RUN		DURING RUN		IN 24 HOURS					PER CENT.											GOLD	SILVER	COPPER	LEAD	ZINC	
									FAN	STACK	FAN	STACK	STACK	STACK	STACK	STACK				GO	SILVER	Cu	Pb	INSOL	SiO ₂	Fe	Mn	CaO	Al ₂ O ₃	S	Zn	LB.	LB.	LB.	LB.	LB.
MAY 1909	DETERMINATION OF DUST LOSSES WITH ORIGINAL ARRANGEMENT OF DUST CHAMBER	60	7-8	258	7	6	—	1127000	19053	19069	17953	25260000	27698	88633	0.109	2362	2.76	002	586	878	8.6	224	17.3	124	0.4	25	94	119	53	101	262	7801	7622	4697		
SEPT 1909	SAME AS ABOVE	5	4 1/2	349	8	7	—	1268000	19162	19134	10718	19524000	25048	130523	0.161	3009	2.73	0023	643	900	5.9	25.6	20.3	14.7	0.5	15	85	111	4.2	149	436	11747	7700	5481		
JUNE 1911	DUST CHAMBER EXTENDED AND CONVERTER FLUE ERECTED DETERMINATION OF EFFECT ON DUST LOSSES	15	6 1/2	344	9	7	25	9.6	1239000	1872	1877	15257	21531000	16483	60861	0.076	2362	.03	001	48	790	—	20.3	14.8	13.5	0.5	18	81	12.7	56	030	145	5355	—	3408	
NOV. 1911	SAMPLE TAKEN FROM BRICK HEADER FLUE. DETERMINATION OF LOSS FROM FURNACES NO. 1, 2, AND ALL CONVERTERS	16	7	294	2	6	28	10.5	302050	0.759	0.757	6709	6150900	5120	17556	0.083	—	—	006	10.6	935	13.7	—	11.4	12.4	—	—	—	—	—	—	—	—	—	—	—
FEB. 1912	SAMPLE AS ABOVE. FURNACES NO. 1 & NO. 2 DOWN DETERMINATION OF CONVERTER LOSS ALONE	14	6 1/2	198	0	6	0	9.75	282700	0.793	0.796	6477	6008900	1679	6200	0.027	—	—	001	78	597	21.4	—	—	—	—	—	—	—	—	—	—	—	—	—	
SEPT. 1913	SAME AS EXPERIMENT ON JUNE 11 BUT NO FINE MATERIAL (CONCENTRATES OR FLUE DUST) CHARGED INTO BLAST FURNACES	12	6	318	8	7	28	12.25	997200	1.571	1.568	11675	16409000	—	40910	0.0615	2985	3.671	NIL	32	633	5.7	18.0	13.4	11.0	0.6	15	70	12.0	70	—	64.2	2589	2286	2808	

SUMMARY OF DETERMINATIONS OF STACK GASES AND DUST LOSSES AT COPPER QUEEN WORKS

was about 34 ft. per sec., and dust-settling space is calculated to give a velocity of five feet per second.

The average analysis of the stack dust during the 1913 experiments was as follows: Au, trace; Ag, 3.41 oz; Cu, 6.16%; Pb, 10.2; Insol., 16.9; SiO₂, 12.4; Fe, 10.8; Zn, 7.4, Al₂O₃, 7.1; S, 11.7; CaO, 1.4. Screen analyses of the dust showed that only 2.89% was retained on a 100-mesh screen; through 100-mesh but retained on 150-mesh screen, 7.65%; through 150-mesh, but retained on 200-mesh screen, 12.29%; through 200-mesh screen, 76.90 per cent.

The test made in June, 1911, after the dust chamber had been extended, showed that the stack loss was 1.03% of the ore charged, as against 2.73% in 1909 before these additional settling facilities were provided. The further reduction in dust loss by the treatment of the con-

Creosoted Wood Blocks for Mill Floors

Creosoted-wood blocks are being introduced as flooring for shops and factories. They offer many advantages, being not so hard on the feet of the workmen, not subject to breakage by heavy metal pieces nor themselves likely to injure the metal, less expensive to keep up, and longer lived. They are warm underfoot, can be sluiced by a hose, offer a smooth surface for trucking and reduce noise. Their use in this manner suggests their availability for flooring concentrator buildings. We have heard of no instances where a wooden-block floor has been laid in a concentrator, but such a floor would appear to be splendidly adapted to the conditions existing.

Company Reports

Montana-Tonopah

In its report for year ended Aug. 31, 1913, the Montana-Tonopah Mines Co., Tonopah, Nev., shows a realization of \$179,347 from milling 52,362 tons of ore, having a gross value of \$665,208. After deducting depreciation the net realization was \$139,701. A dividend of \$100,000 was paid. The following table gives costs per ton of ore milled:

	Cost per Ton
Direct costs:	
Mining	\$2.620
Development	1.364
Milling	3.121
General expenses.....	0.404
Maintenance	0.197
Marketing	0.461
Total direct	\$8.167
Indirect costs	0.384
Total operating costs.....	\$8.551
Less miscellaneous earnings.....	0.389
Net operating cost.....	\$8.162
Depreciation charged.....	0.757
Total cost of production.....	\$8.919
Average grade of ore.....	\$12.704
Less tailings loss.....	1.124
Realized from ore.....	11.580
Net realization from ore.....	\$2.661

The available cash assets at the end of the period amounted to \$312,051, and consisted of cash in banks, \$74,460; products in transit, \$20,760; and money advanced to the Commonwealth Mining & Milling Co., \$216,831. During the year \$156,756 was advanced to this company. No estimate of ore reserves was attempted.

As the Commonwealth Mining & Milling Co., Cochise County, Arizona, is owned by the Montana-Tonopah, a summary of its annual report is given herewith: No ore was shipped as the work has been confined to development and construction. Development work consisted of driving 6773 ft., about 82% of which was in country rock to get at various blocks of ore still remaining in the upper levels. An estimate made of ore reserves indicates a gross value of \$1,378,000 for ore averaging \$5.35 per ton. Actual construction work started on a 30-stamp mill on Dec. 1, 1912, and the plant should be ready to operate by August, 1914. The estimated cost of this mill, as submitted, was \$239,000. Power plant and mine equipment will cost about \$71,000.

Seneca-Superior

The 1913 report of the Seneca-Superior Silver Mines, Cobalt, Ontario, shows a balance of \$288,954 from operations and \$274,446 after deducting adjustments. Dividends No. 2 to 6 inclusive amounting to \$263,136 were paid. There was a balance of \$137,091 in quick assets at the end of the year. The production was \$1,085,774 oz. of silver at a cost of 13.2c. per oz. Ore reserves are estimated to contain 3,460,000 ounces of silver, which is an increase of 2,310,000 oz. over last year's estimate. It is claimed that there are four levels opened in high-grade ore. Development on the second level has proved

an ore shoot 440 ft. long and averaging three inches of 3500-oz. ore. The third level at a depth of 262 ft., the drift has been run for 280 ft. and is still in ore, the vein averages about 2300 oz. per ton for a width of 2.5 inches. On the fourth level at a depth of 334 ft., 220 ft. of vein has been disclosed, averaging 1.2 in. wide and assaying 960 oz. of silver per ton.

Nevada Consolidated

An analysis of the Nevada Consolidated report for 1913 shows that the company's receipts over all expenditures evidently amounted to \$3,924,574 and apparently \$979,010 of this amount came from the sale of securities, and the remainder, \$2,945,564 came from operations after payment of all charges, including deferred stripping. These figures were arrived at in the following manner from figures given in the report:

Balance of quick assets end of 1912.....	\$3,324,236.45
Balance of quick assets end of 1913.....	3,249,897.08
Decrease in balance of quick assets during 1913	\$74,339.37
Receipts and expenditures:	
Receipts from sale of product.....	\$10,225,493.47
Miscellaneous receipts and income.....	1,470,442.75
Total operating and miscellaneous receipts	\$11,695,936.22
Less operating expenses, 1913.....	8,212,049.89
Net profit as shown in report.....	\$3,483,886.33
Less deferred stripping expense.....	538,321.97
Net balance from operations over all expenditures	\$2,945,564.36
Dividends paid:	
Regular dividends	\$2,999,185.49
Extra dividend	999,728.50
Total dividends, 1913.....	\$3,998,913.99
Source of dividends:	
From quick assets forwarded from 1912.....	\$74,339.37
From operating and miscellaneous receipts as above	2,945,564.36
Receipts apparently from the sale of securities	979,010.26
Total to balance with dividends paid.....	\$3,998,913.99

The item of \$979,010 is undoubtedly the net credit to the Nevada Consolidated through the redemption of \$500,000 par value, of capital stock of the Steptoe Valley Smelting & Mining Co., and the redemption of bonds, par value, \$500,000, by another subsidiary, the Nevada Consolidated R.R. It seems that a part of the earnings of these subsidiaries are placed in a sinking-fund account and this fund used to buy back some of the bonds and stocks held by the parent company, the Nevada Consolidated, and in this manner, amortize the original cost to the parent company. If the mines, railroad, and treatment plants were operated as one company and their earnings were paid out as regular dividends the result would be the same. Therefore, if figured on the same basis as most other mining companies the operating profits of the Nevada Consolidated are much greater than shown in the report.

During the year 3,139,137 tons of ore were concentrated and 29,971 of siliceous carbonate ore were shipped to the smelter; this resulted in the production of 64,972,829 lb. of copper which sold f.o.b. Atlantic seaboard

@ 14.879c. per lb. The total revenue from the sale of copper contents was \$9,667,506 and from gold and silver, \$557,987; total revenue from product, \$10,225,493. Operating expenses as charged were \$8,212,050, leaving an operating profit of \$2,013,443. To the operating profit must be added: Dividends on investments, \$1,381,772; interest on bonds, \$37,500; interest and discounts, \$38,029 and rents, etc., \$13,142; total, \$1,470,443. Total net profit available for dividends, \$3,483,886. Deferred charges to operations amounted to \$538,322. The following table shows details of operating costs for producing copper and delivery to Atlantic seaboard.

OPERATING COSTS			
3,169,148 tons of ore yielding 64,927,829 lb. of refined copper.			
	Total Amount	Cost per Ton Ore	Cost per Lb. Copper
Mining, including proportion of stripping expense.....	\$1,651,998	\$0.52	2.54c.
Freight on ore.....	843,446	0.26	1.31c.
Milling	1,682,726	0.53	2.61c.
Smelting	1,829,939	0.58	2.81c.
Rent of Steptoe plant, including depreciation	1,162,476	0.37	1.79c.
Freight and refining.....	943,564	0.30	1.45c.
Selling commissions	97,900	0.03	0.15c.
Total operating expenses	\$8,212,049	\$2.59	12.66c.
Less value of gold and silver.....	557,987	0.18	0.86c.
Net operating cost.....	7,654,062	2.41	11.8 c.
Less miscellaneous income.....	1,470,442	0.46	2.28c.
Net cost of producing copper.....	6,183,620	1.95	9.52c.

The tonnage milled increased 10% over 1912, but due to the lower rate of concentration, concentrate tonnage increased 44% with but 3% increase in final copper output. This naturally raised the cost of copper. Advance in wages also accounted for an increase of 0.394c. per lb. of copper in cost of production.

Mining at the Veteran was carried on by underground methods and at the Eureka, Hecla, and Liberty pits by steam shovels. The mine production was as follows: Eureka pit, 1,543,456 tons and Liberty and Hecla pits, 1,345,933 tons, average of all pit ore, 1.511% copper; underground mining at the Veteran, 258,896 tons of 2.588% copper ore. Siliceous carbonate ore amounting to 29,971 tons, averaging 3.28% copper, was mined and shipped direct to smeltery. Stripping operations removed 3,100,661 cu.yd., making a total of 11,872,320 cu.yd removed up to the end of 1913. Beginning with 1914, a reduction in stripping operations is expected, as a greater part of the waste still to be removed will be that in the grade slopes. The direct cost of steam-shovel mining in the pits was 17.75c. per dry ton, including a proportion of overhead charges. In addition to this cost a charge for the redemption of the cost of removing overburden is made. This charge for the different pits follows: Eureka pit, 15c. per ton of ore; Liberty pit, 22c.; Hecla pit, 30c. per ton of ore. The cost of mining and redemption of development charges for underground mining at the Veteran was \$2 per ton of ore mined. The cost of mining carbonate ore was 80.2c. per ton. A charge of 26.72c. per dry ton of ore is made by the Nevada Northern R.R. from the mines to the Steptoe plant. The following table gives the results at the concentrator:

Tons of dry ore treated.....	3,139,137
Average copper assay.....	1.559%
Percentage of extraction.....	68.52%
Ratio of concentration.....	6.94
Assay of gold, oz.....	0.013
Assay of silver, oz.....	0.034
Percentage of extraction, gold.....	43.87%
Percentage of extraction, silver.....	57.83%
Average gold and silver recovered per ton.....	12.32c.
Average copper in concentrates.....	7.61%

In addition to the treatment of company ore, 280,041 dry tons of Giroux Consolidated Mines Co.'s ore was milled. The following table gives details of ore reserves.

	Tons	Assay Cu %
Total developed ore to Dec. 31, 1912.....	50,010,087	1.70
Ore developed in 1913.....	3,269,000	1.42
Total	53,279,087	1.68
Unprofitable account of slopes.....	1,419,300	1.21
Total profitable ore developed.....	51,859,787	1.69
Tons of ore milled to Dec. 31, 1913.....	12,751,197	1.82
Profitable ore remaining in reserve at Dec. 31, 1913.....	39,108,590	1.65

Mining costs are expected to increase in 1914 due to a greater tonnage coming from the Liberty-Hecla area, and the ratio of concentration may be somewhat lower, thereby increasing smelting charges. However, departmental costs are expected to be lower so that the total cost should approximate 1913 figures.

Inspiration

The 1913 report of the Inspiration Copper Co., Miami, Ariz., shows that the company spent \$2,252,981 during the year getting the property in shape for operations. Of this amount \$300 came from capital-stock account and the remainder from quick assets forwarded from 1912. Balance of quick assets at the end of the year amounted to \$2,198,874. Of the 1,500,000 shares authorized, 537,042 remain unissued.

The company has decided to build a mill of 10,000 tons daily capacity instead of 7500 tons as first planned. This, together with other construction contemplated, will involve an additional expenditure of \$4,000,000. To provide for this fund and allow for contingencies an issue of \$4,500,000 five-year 6% convertible debenture bonds has been authorized. Interest on these bonds will be payable semiannually, and they are redeemable by lot at 105% of par value on interest date. They are convertible at par for stock at \$25 per share at any time prior to redemption.

The surface plant at the Inspiration will consist of structures of steel and concrete: Mine power house, comprising 11,000-cu.ft. air compressors for mine drills with place for additional units; a high-pressure compressor for underground haulage; two electric hoisting engines; head frames for two main shafts and receiving bin of 2000 tons capacity between same for mine ore; coarse-ore crushing plant consisting of four No. 8 gyratory crushers and eight 48-in. disk grinders; ore-storage bins on railroad at mine of 25,000 tons capacity and a bin at the concentrator of 12,000 tons capacity; water supply to furnish 5,000,000 gal. of water per day; 7½ miles of standard-gage railroad to mine, mill, smelter and outside connections; steam-power plant of three 6000-kw. units; concentrator situated 1.5 miles from the mines. This equipment will have a capacity of 10,000 tons a day. During 1913 development work amounted to 37,760 ft., making total development 110,609 ft. to date. The following table gives tonnages in ore reserves at Dec. 31, 1913:

	Tons	% Cu.
Sulphide ore	45,000,000	2.00
Low sulphide material	28,322,000	1.26
Oxidized material	12,445,000	1.34
Mixed carbonate and sulphide	3,876,000	1.24
Total	89,643,000	1.64

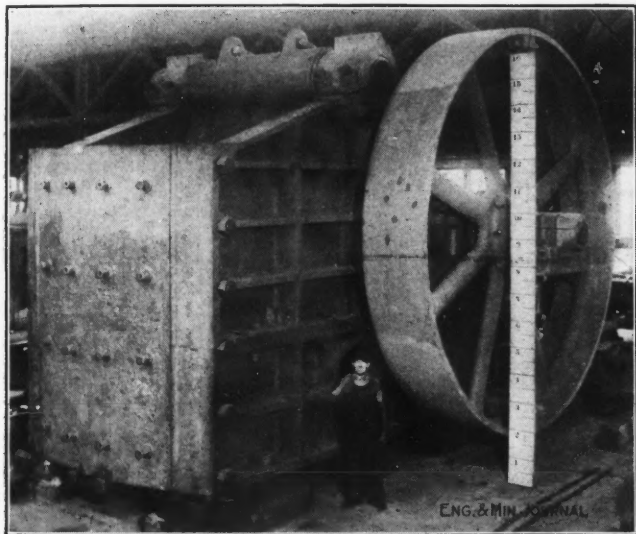
A 600-ton experimental flotation plant was built and started on Jan. 3, 1914; the average results so far are said to be better than accomplished by water concentration. Previous results with a 50-ton experimental plant were also favorable.

Mining & Metallurgical Machinery

A Large Blake Crusher

Readers of the JOURNAL will recall that an unusually large crusher was recently built for use at Valhalla, N. Y. A Blake crusher of the same size, (60x84 in. opening) but of somewhat different dimensions and type of construction, is now being built by the Traylor Engineering & Manufacturing Co., Allentown, Penn., the same firm that constructed the Valhalla crusher.

The crusher now under construction is to be used at the plant of the H. W. Johns-Manville Co., at Asbestos, Quebec, Canada, and the rock to be crushed is asbestos. Because of the slippery nature of the rock it was necessary to have the angle of nip more acute than in the case



LARGE BLAKE CRUSHER

of the Valhalla crusher, these angles being 18 and 23° respectively, in the two crushers.

The side plates are of rib design and were cast in two parts. The end plates are one-piece. The crusher will be 19 ft. 7½ in. long, 11 ft. high and 18 ft. 1½ in. wide, and will weigh 500,000 lb. The machine is made of cast steel throughout, with manganese-steel crushing plates, cheek plates and toggle seats. A better idea of the size of some of the working parts can be obtained perhaps from their dimensions, notably those of the shafts. The main shaft is 23 in. in diameter, and the swing-jaw shaft 19 inches.

The steel castings were made by the Penn Steel Castings & Machine Co., Chester, Penn. The main bearings are water-cooled. Much attention has been given to the matter of accessibility of parts, to facilitate quick repairs, and to making the machine efficient and durable. For instance, in the case of the main eccentric shaft, all the wear is designed to come on the top of the bearing. The babbitts at this point are interchangeable, and when the top one becomes worn it is interchanged with the lower one, this doubling the life of the bearing. The

crushing plates on both the moving and stationary jaws are interchangeable; that is, on the stationary jaw, the center plate can be turned end for end, as can also the two end pieces, and the latter two can also be interchanged. The same holds true for the three plates on the movable jaw. Also, the size of the opening can be regulated according to the wear of the plates.

Ample provision has apparently been made against breakage of parts, that might be occasioned by substances other than rock entering the machine. It is claimed that the machine is unbreakable and that a car wheel could be dropped in without damage to the crusher. This is made possible by a breaking toggle, which will give away first, and which is easily replaced. Incidentally, the toggles are kept at as flat an angle as possible, to reduce pressure on the bearings, and to secure the highest efficiency. When completed, the machine will have cost about \$25,000 and will have taken about six months to build.

What was primarily here desired was ample size of opening, in order to permit a reduction in quarrying expense. The size of the feed opening is 60x84 in., and under working conditions the crusher will deliver a 10-in. product. As an indication of its capacity, when crushing down to 14 in., it will crush approximately 1000 tons per hour. When crushing to 10 in., its capacity with asbestos rock is expected to be 3000 tons per 8-hr. day.

As an indication of the strength and power contained in machines of this size and type, it is claimed for the Valhalla crusher that after stopping the machine and shutting off the power, the crusher was filled with rock, power was then turned on, and the crusher cleared itself without any difficulty. Ordinarily the momentum in the flywheel enables the machine to clear itself of any common obstruction, or with the crusher hopper full of rock, even though the power stops.

Improvements in Precision Instruments

The Taylor Instrument Companies, Rochester, N. Y., have made, recently some changes in some of the recording, base-metal pyrometers. On the latest type made by this company, the use of ink or an ink pad is done away with entirely. In its place are used threads, the number and color of these depending upon the number of simultaneous readings desired. These threads are impregnated with a pigment, and their action and effect is similar to the ribbon on a typewriter. The recording lever strikes the thread and depresses it on the chart, on which the reading is recorded. This chart is also of a new design, having rectangular coordinates instead of the familiar curving kind.

The Colorado Iron Works Co., of Denver, Colo., has issued a new edition of its catalog "Some Details as to Smelting Practice and Equipments." This is a well printed book of 160 pages and in its make-up and text it is superior to many technical treatises on the subject. It is worthy of a place in anybody's technical library.

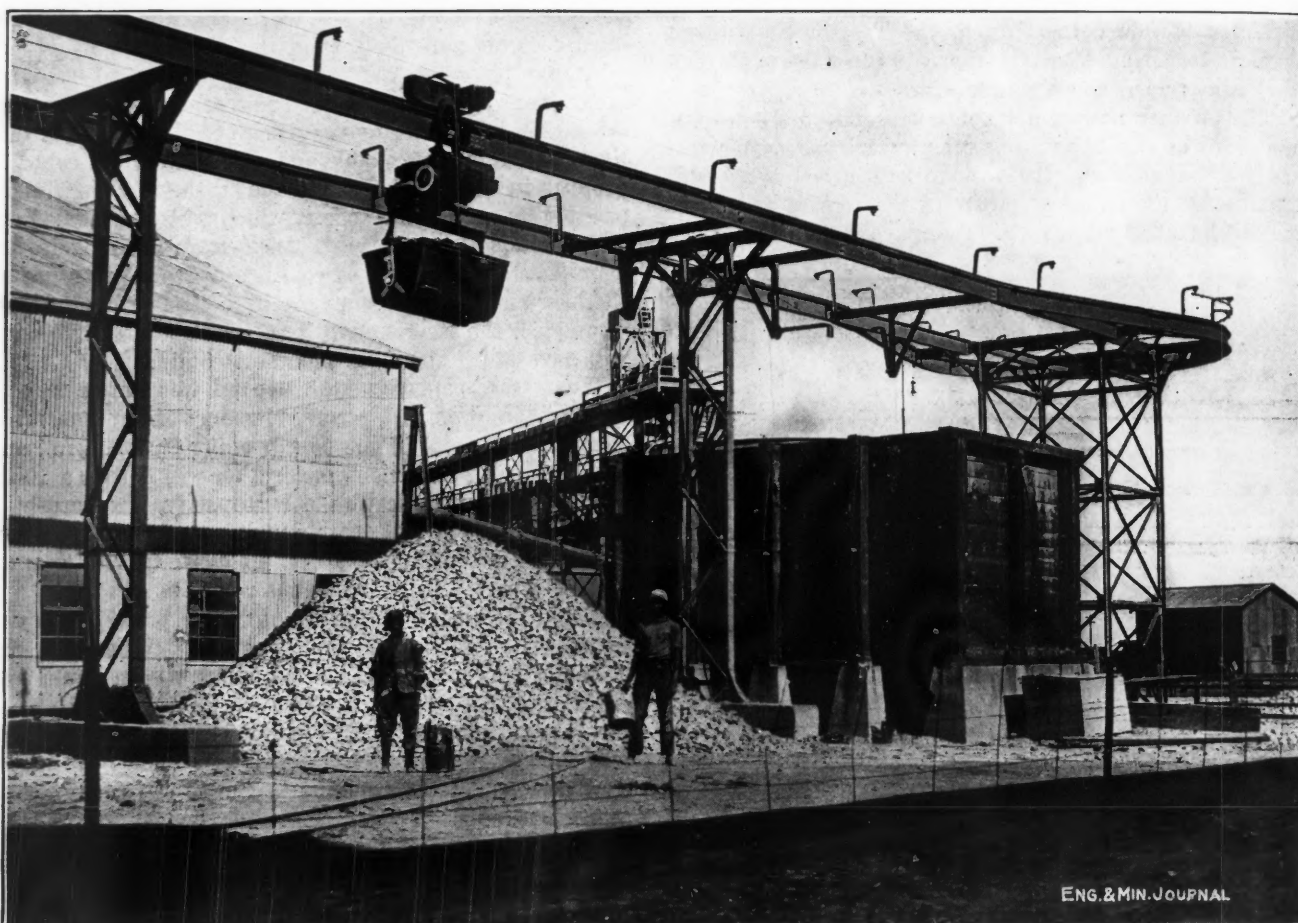
Randfontein Telpher System

A telpher system is used at the mill of the Randfontein Estates Gold Mining Co., on the Rand, a part of the installation, which was built by the Bleichert company, being shown in the accompanying illustration.

The telpher is a conveyor which consists of cars running independently behind one another on a suspension line, each being driven by a traveling motor built in the carriage. It is so arranged that the cars, following each other, mechanically throw over switches which break the current on the section behind them, the current being reestablished only when the car has passed the

placed on a bogie truck or it may be loaded direct. The operator thereupon switches on current and the winch mechanism raises the car. It is now unnecessary for the operator to pay further attention to the car as all further movements are automatic. On reaching the proper level the car switches off the winch mechanism motor and switches on the traveling motor so that it automatically starts on its journey to the end station, where it tips and returns automatically, the next car, in the meantime, proceeding to the loading station.

An advantage of the telpher is its adaptability to nearly all conditions. No less than 125 men were dispensed



BLEICHERT TELPHER INSTALLATION AT RANDFONTEIN ESTATES ON THE RAND

Each bucket carriage carries a driving motor. As each carriage passes to a new section of track it automatically cuts out the electric current in the section over which it has just traveled until it reaches the next section beyond. An auxiliary winch and motor controlled by station operator, raises and lowers bucket from its carriage.

succeeding section of the track and thrown over the next switch. In this manner, there is always a section without current between any two cars so that collisions are impossible. The cars stop automatically before the loading place and then move up under control of a portable controller.

In the Randfontein Estates installation a so called electric-winch line is used. The winch mechanism has its own motor which actuates, by a worm drive, the drums which raise and lower the buckets. The control of the drums is effected by an automatic controller fitted in the box. On arrival at the loading station the car stops automatically and the operator completes the electric circuit through a controller which he closes with a plug, thus causing the car to lower its bucket. The car is then

with at the blast furnaces of Gebrüder Stumm, Neukirchen on the Saar, by the installation of a telpher for charging the furnaces.

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Metallic Tube-Mill Lining

The Lehigh Car, Wheel & Axle Works has developed a cast-iron tube-mill lining which is said to have exceptional wearing qualities. It was designed to give the hardest chilled surface on the inside with a strong, soft iron back of the chill. To insure elevation of the pebbles a cup-shaped depression is provided in the plate surface. This was found to do the work satisfactorily. An added advantage is the additional mill capacity gained over cases where silex or El Oro type linings are used.

Grading Iron Ores

BY WILBER MEYERS*

SYNOPSIS—Factors determining selection of grades of ore to be furnished by any given mine. Classification of ore from various working places based on continual chemical analysis. Prompt returns necessary. Tendency of shift bosses to disregard instructions must be guarded against. Mixing of grades in skips, bins, etc., a source of trouble. Check samples from cars and skips afford data for estimating whole stockpile. By giving two working places to each gang of men, more accurate grading is possible.

In grading iron ores the first things to be known are the percentages of iron, phosphorus, silica, etc., that are permitted in the different grades; the tonnages of each grade required, and the possibilities of the mine itself, such as the quantity and quality of the ore blocked out, the tonnages and probable analyses of the different drifts, rooms, stopes, etc., on each level, and the relation of the existing method of mining to the production of clean ore.

Suppose it is decided to mine three grades of ore, iron and phosphorus being the determining factors, with specifications as follows:

First grade; iron 58% or over; phosphorus, 0.040% or less.

Second grade; iron 50%; phosphorus, 0.050% or less.

Third grade; iron 50% or over; phosphorus not considered.

The first grade would be a selected ore, the second would be a mixture of ores ranging from 45% to 55% in iron, the third would be a grade to accommodate all the ores that are good in iron but too high in phosphorus to be included with the other piles.

When the required tonnage of each grade is known, a study is made of the analytical map of the mine workings, that is, a map showing drifts, rooms, etc., with the tonnages blocked out in each and their probable analysis as shown when the development work was being carried on. A map of this kind gives a good idea of what to expect when the actual mining is being prosecuted, and will be a guide as to the number of men that can be worked to advantage on each grade of ore.

When the main points have been settled, the miners placed to the best advantage and mining begun, then the work of keeping the stockpiles up to grade with the minimum of expense for labor and supplies, at the same time separating the grades as mined, in such a way as to get the minimum tonnage of the lowest grades, calls for close attention of the most expert kind. Some of the problems met with are here described, but each property will have some features peculiar to itself.

RAPID CHANGES IN ORE COMPOSITION MAKE TROUBLE

It is not an uncommon thing on the Marquette range to have the ore so changeable that a sample of the breast of a drift is not to be relied upon for the ore broken in the next 5 ft. of the same drift; this further complicates the problem of keeping the ore up to grade. Suppose a sample taken of the breast of a drift before the

miners drill and blast, the sample sent to the laboratory, analyzed, and the returns sent down to the boss underground so that he may route the ore properly; by this time the miners will have drilled and blasted, and a second sample taken after the blast from the pile of ore broken will often show that something has changed the character of the ore; probably the phosphorus content has increased or decreased in the 5-ft. round that was drilled and blasted while the first sample was being analyzed by the chemist. This second sample will indicate that some or all of the ore has been dumped on the wrong stockpile. Sometimes a seam of paint rock will enter the face and if not noticed, may be blasted and mixed with the ore. It is a good plan for the chemist to get his samples the first thing in the morning, have them crushed, dried and run as soon as possible, and then report to the bosses the grade of ore in each drift or stope; any particular changes he can report by telephone as soon as he notices them. The drifts or stopes are numbered according to the contracts for each level, and these numbers are written on tags inclosed with the sample; so the usual plan is for the chemist to make out a report something like the following:

Sampled by.....		Analyzed by.....			
Date	Chemists Series No.	Place Sampled	Iron	Phos.	Remarks
1/26/14	234	Contract 7	57.20	0.032	1st grade
.....	235	Contract 32	53.20	0.075	3d grade
.....	236	Raise, M.	52.10	0.045	2d grade

This report is handed to the boss in charge of the shift, he in turn sees that the ore coming from the places is routed as designated by grades, and this report governs until the next report is received from the chemist. Even then the routing of the ears must be watched, since trammers mistake the grade of ore, skip-tenders ring the wrong bells, and sometimes the shift boss trusting his judgment rather than the chemist's analytical work as to the quality of the ore, will often take a chance when the ore looks good.

MISTAKES OF THE BOSS

One of the mistakes commonly made by the boss in trying to get the greatest tonnage of the best ore, is to average the working places, sending an ore high in iron and low in phosphorus up with one lower in iron and higher in phosphorus, reasoning that the average will even up. For instance, the chemist reports as follows:

Contract 9; iron 66.40; phosphorus, 0.028; first grade.

Contract 12; iron 51.10; phosphorus, 0.048; second grade.

The boss takes an average and finds it to be: Iron, 58.75; phosphorus, 0.038; he concludes that both places can go up for first-grade ore and orders them routed accordingly. When the returns of the day's work comes in, it is found that 30 tons of ore has been mined from contract 12, and only 10 tons from contract 9, and the average turns out to be really: Iron, 54.93; phosphorus, 0.043; so that 40 tons of second-grade ore has been dumped on the first-grade pile. The only safe way is to make the chemist responsible for the routing of each individual place, according to his analysis. If the bosses

*Palmer, Negaunee, Mich.

are allowed to use their own judgment in cases of this kind, the work of the chemist is almost useless. If a place breaks into rock, or if a cave occurs where the ore is mixed, the boss can usually switch the men to some other work until an analysis shows how the ore should be routed. One chemist on the Marquette range always reported his iron analysis $\frac{1}{2}$ of 1% lower than it really was, thus guarding against the boss taking a chance and switching on him. For instance, if the ore ran 65% in iron he reported to the boss 64.50%, but always entered the correct figures on his own records, which were permanent. By keeping this fact from the boss the routing ran along smoothly and the stockpile was kept to standard.

NECESSITY OF PROMPTNESS

A great deal depends upon promptness in getting the sample to the chemist after it has been taken, and in the chemist's getting the returns to the boss after the sample has been run. If this work is not done promptly a round of holes may be blasted and the dirt mucked out before the returns are given to the boss. The samples can in most cases be taken the first thing in the morning, be rushed to the chemist, and while the miners are rigging up, drilling, etc., the analysis can be made for iron, if not for phosphorus, and the results will be in the hands of the boss by the time the miners are ready to do their mucking. If a batch of 10 samples is delivered to the laboratory at 7 a.m., one chemist can crush, dry and run them for iron and phosphorus and have the returns ready by noon. If phosphorus is the determining factor it can be started first, as it takes a little longer to run than does iron. One company used to keep two drifts for one crowd of miners, who did their own mucking. They would drill and blast in one drift, then go to the other, and while they were drilling and blasting this the broken pile in the first drift would be analyzed. In this way the ore was correctly sampled before routing, and the miners lost no time waiting for smoke to clear. They usually worked alternate half-shafts in the drifts. Where it is possible for one crowd to have two drifts in this way there need be no trouble from changes in the nature of the ore. More time was usually lost waiting for smoke to clear out before the men had two drifts, than was lost in moving their equipment from one drift to the other when working on the two-drift system.

TROUBLE FROM MIXED ORES

One trouble met with in mines where the hoisting is done with only one skip, one pocket, or one dump car on the trestle, is the mixing of the ores in the chutes, skip, or car on top; many times a few hundred pounds of rock or ore of different grades is left in the pocket, skip or car and is thus mixed with the ore of the next skip hoisted; the fact that iron ores are usually damp and sticky and capable of freezing to the sides of a receptacle makes this trouble possible. The analysis of the general sample is often unreliable because of this fact. While it is impossible to clean the skip every time it is hoisted, some of the trouble may be eliminated by hoisting several skips of one kind of ore, then cleaning the skip and chutes before transferring to another grade; this, however, necessitates extra care, or a delay due to men waiting in the mine for a chance to dump the grade they are mucking.

INCREASED COST

The grading of ores increases the cost per ton of production and this increased production cost will appear on the cost sheet by which a mining man makes or loses a reputation. If three grades of ore are mined, three stockpiles have to be cribbed; three floors have to be laid under the piles; snow has to be cleaned away as the dump advances; three dumps must be kept up, extra switches, lights, etc., must be provided; and all these operations necessitate extra labor and supplies with increased production costs.

GENERAL SAMPLES

In addition to the routing of the ore from the various drifts, raises, stopes, etc., according to the chemist's analysis day by day, as broken and hoisted, some means of ascertaining the average analysis of all ore in the stockpiles at any time must be had. For this purpose a general sample of all ore hoisted is taken for each grade in the following manner: At each station underground a box is kept for each grade and from every car a small scoopful of ore, consisting of five or six little dips over the top of the car, is taken and dumped into the box. At the end of the 24-hr. period these boxes are cleaned out, the contents taken to the laboratory, thoroughly mixed, crushed, quartered, dried and run for iron and phosphorus; this represents a general underground sample of all ore hoisted for the 24-hr. period. A check on this sample is taken on the surface in the same manner, only there is one box for each grade, instead of there being two or three boxes for each grade, as would be the case underground where the number of boxes depends upon the number of levels from which ore is hoisted. If the skip tenders, and landers have done the sampling properly the underground and surface samples will check closely.

This general sample is made use of to determine if the average of the whole stockpile is up to requirements or not. Two methods of handling this sample are used on the Marquette range. In one, the chemist weighs out a proportionate amount of the pulp from the daily general sample, as $\frac{1}{4}$ gram per ton of ore, the work being done day by day according to the tonnage hoisted. This pulp is placed in a large glass bottle and kept tightly corked to prevent any accumulation of moisture. When the average analysis of the whole stockpile is desired, the pulp is thoroughly mixed by shaking, a small amount weighed out and run in the usual way.

Another method is to get the average by mathematics. Every day the average sample returns are entered in a book, including the tonnage and the determinations of iron or phosphorus. The determinations are multiplied by the tons represented; when an average is desired the products are added, and the sum divided by the total number of tons, the result being an average of the whole stockpile. If the work is correctly done the two methods will check each other closely, and thus give reliable information as to whether the average of the stockpile is being kept up to requirements or not.

The main advantage of the pulp method is that a complete analysis can be run at any time. Its disadvantages are that the average analysis cannot be determined for any particular week or month as can be done by the mathematical method, it cannot be performed so quickly

and every analysis costs a little, whereas the other method does not require an additional analysis after the daily sample is once run, and, furthermore, by the pulp method, every time an average is found, a little of the pulp is used and cannot be replaced, so that the last pulp deposited in the bottle will have an undue influence in determining the composition of the sample.

Methods in Driving the Sheep-Creek Tunnel

We are indebted to the Ingersoll-Rand Co. for a brief, but interesting discussion of the machines and methods used to drive the Sheep Creek tunnel of the Alaska Gastineau near Juneau, Alaska. The information came originally from the mining company itself.

From Dec. 1, 1912, to Feb. 1, 1914, a period of 14 months, the tunnel was driven 7670 ft., an average speed of 548 ft. per month. The equipment and routine during this period were not changed.

The tunnel or adit is $8\frac{1}{2} \times 10\frac{1}{2}$ ft. in section, driven along the general strike of the formation, a short distance on the foot-wall side of the contact of the ore zone with the country rock. The character of the ground varied a good deal. The first 2000 ft. approximately was in a tight, closely laminated slate, the remainder was through greenstone and metagabbro. The ground was all hard and tough; the best footage was made in greenstone. The monthly record was made in November, 1913, when 661 ft. was driven.

Three crews of men were employed. Each crew worked 6 hours and rested 12 hours. This resulted in a complete cycle of operations every three days. Considered by days, the average working time per day for each crew was eight hours; this was the time at the face, as the incoming shift always relieved the outgoing at the working place. Each crew consisted of a shift boss, eight machinemen, six muckers, one carman, one motorman and one brakeman; three men were also employed on the compressed-air and ventilating pipes, the ditch and the floor.

Drilling was carried on with E-44, $3\frac{1}{4}$ -in. Ingersoll-Rand machines on two horizontal bars, $4\frac{1}{2}$ in. by 9 ft. The compressed air was obtained at 105 lb. from an Ingersoll-Rand 22- and 13x16-in. machine of the Imperial type driven by a General Electric 200-hp. motor. Half of the compressed-air line was of 7-in. casing and the other half of standard pipe.

Ventilation was furnished by four high-speed exhaust fans driven by General Electric, form K, 20-hp. induction motors running at a speed of 1740 r.p.m. These were spaced about 3000 ft. in the tunnel and were operated as exhaust machines, delivering the exhausted air into a ventilating pipe, 15 in. in diameter, of 18-gage galvanized iron.

The cars used were $1\frac{1}{2}$ -ton side dumpers with roller bearings; they were handled with a 6-ton Jeffrey storage-battery locomotive. The track was of 24-in. gage, laid with 50-lb. rails. There were no switches installed, but at certain intervals iron slick-sheets were laid alongside the track and the cars were transferred to them by the carman using a crowbar. A false track, 25 ft. long was placed over the rail ends when needed to keep the cars up to the muck pile.

A 1-in. water line was kept well up to the face and

water was used to wash down the muck pile at once after blasting, in order to kill the gas. The drills were sharpened with a No. 5 Ingersoll-Rand sharpener; about 600 pieces of steel per day were used.

Rhodesian Mining Notes

SPECIAL CORRESPONDENCE

Several of the mines developed during the last few years are now entering the producing stage.

The Shamva mine has 2,400,000 tons developed, valued at 21s. 3d. Milling has been started with the new 50,000-ton per month equipment. The Cam & Motor mine, with an ore reserve of nearly a million tons of ore, valued at 40s., has also started its dry-crushing and roasting plant. Apparently difficulties are being met with in the extraction and the mill is closed for adjustment.

The Antelope mine, with 155,000 tons of rock developed, has started up a smaller plant of a similar type, which is also being adjusted. Further producers will be Golden Koppie mine, to start next year, with an ore reserve of 210,000 tons, valued at 25s. 6d., and 26,000 tons valued at 56s. 6d. in its Union Jack mine.

The three mines of the Planet-Arcturus state group have 322,700 tons developed, valued at 12.5 dwt. This ore will probably require roasting. The Falcon mine has 1,786,000 tons of oxidized ore, valued at 6.4 dwt. gold, 0.71% copper, or 32s. 7d. per ton, and 638,389 tons sulphide, valued at 5.5 dwt. gold and 3.15% copper, or 53s. 6d. per ton. This mine is erecting a concentrating and smelting plant. It is very doubtful if any profits can be made, however, as costs will be high and extraction low. The Bell Reef mine and the Connemara are also well developed and will shortly start erecting plants.

Of the older producers, the Globe & Phoenix continues to make large profits and rich ore is being developed in the lowest levels.

The ore reserves of the Giant mine are becoming depleted, but recently some promising discoveries have been made by the diamond drill.

The glory of the Eldorado mine has almost departed. There are only 36,000 tons of 15-dwt. ore developed; the output is to be reduced to 4500 tons per month. The 12 level shows 130 ft. valued at 13 dwt. over 134 in. The Gaika mine, near the Globe & Phoenix, continues to develop well, and has now nearly 100,000 tons, valued at 14.4 dwt., and is making profits of £7500 per month, working costs 26s. per ton.

The Lonely mine has apparently suffered from a shortening of the pay shoot in depth, and reserves are 170,000 tons, valued at 17 dwt. A profit of about £10,000 per month is made.

The Wankie coal mines, near the Victoria Falls, has entered into a contract with the Katanga copper mines to supply 60,000 tons of coal and 40,000 tons of coke per annum for a period of 10 years from July 1, 1915. This means that a large and steadily increasing copper output from Katanga may be expected.

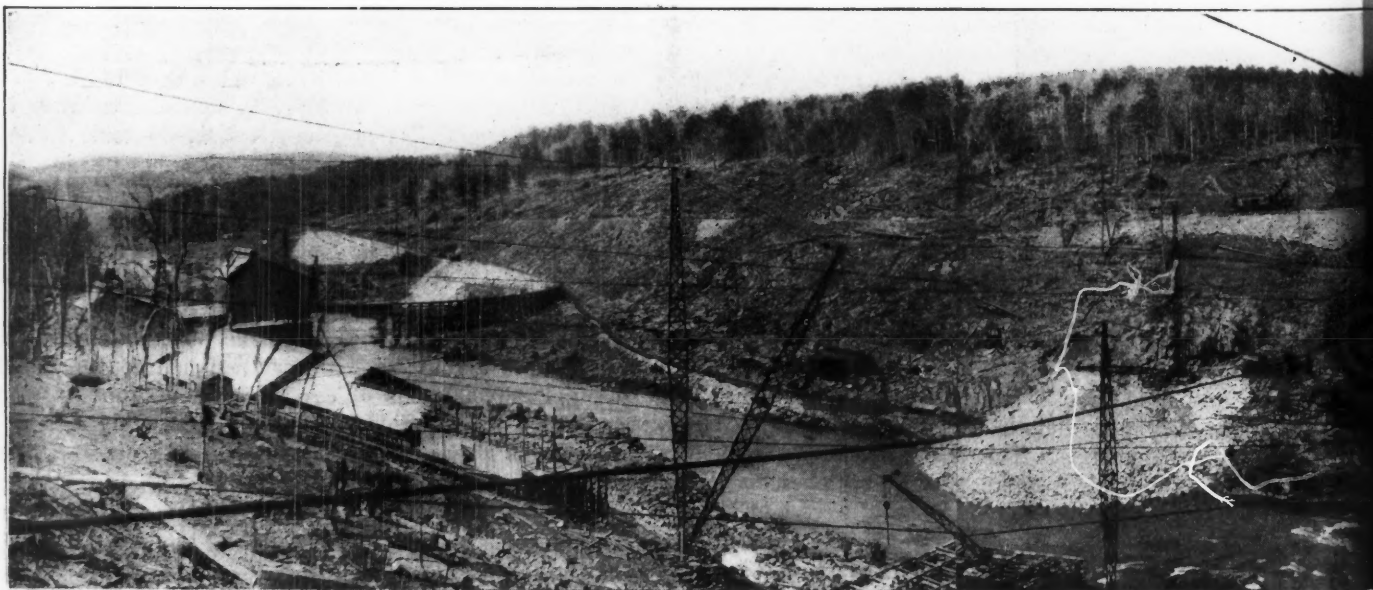
For Drilling Sandstones That Are Not Too Hard, bortz or Cape "ballas" are preferable to carbons as being cheaper, according to J. K. Smit & Zonen. The grains of sandstone exert a high cutting action, although the bond between them may be so slight as to make the rock as a whole soft. This abrasive action on the bit holding the diamonds loosens the stones and results in a high loss. The loss being excessive, it is wise to confine it to cheap stones.

Photographs from the Field



ORE TRAIN ON BUTTE, ANACONDA & PACIFIC RY., RECENTLY ELECTRIFIED

Ore is hauled to the Anaconda company's Washoe reduction works at Anaconda, Mont., there sometimes being as many as 75 cars in a train.



SOUTHERN ALUMINIUM Co.'s OPERATIONS ON THE

The concrete mixing plant is seen on the extreme left. To the right of the first crane is seen the cribbing for the dam, the cut which will serve as a spillway. To the right is seen the dump from the lower mouths of the



H.S. Crocker Co. Official Photographers

ENG. & MIN. JOURNAL

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EASTERN FACADE OF PALACE OF MINES & METALLURGY, PANAMA-PACIFIC EXPOSITION, SAN FRANCISCO, CALIF.



ENG. & MIN. JOURNAL

GARFIELD SMELTING CO.'S SILVER LAKE MILL AT WALDHEIM, NEAR SILVERTON, COLO.
Mill was recently opened as a custom plant for low-grade gold, silver, lead, copper and zinc ores.



ENG. & MIN. JOURNAL

YADKIN RIVER, NEAR WHITNEY, NORTH CAROLINA

across the river are the upper mouths of the diversion tunnels, while on the hillside opposite, the steam shovel is making diversion tunnels, while on the near side of the river is the power house excavation and cribbing.

THE
dam,
the

Flotation of Zinc Sulphides

It has been announced, *Proceedings Aust. Inst. M. E.*, No. 12, 1913, that the Zinc Corporation, Ltd., as the result of work done in its initial plant at Broken Hill, has definitely adopted the Horwood process for separating the lead and zinc of its slime concentrates. The class of material is too fine for separation on concentrating tables and was formerly sold at a low price as a low-grade zinc concentrate. Its buyers were unable to make adequate payment for the lead and silver contents, because in the roasting, preceding the distillation of zinc, and in the distillation process itself, there are large losses of these metals.

The process has been found particularly well adapted to the treatment of slime concentrates from dumps, because the lead contents of such slimes are tarnished by oxidation and do not lend themselves readily to selective lead flotation, which requires bright surfaces on the galena particles. Moreover, when dump slimes are treated by ordinary flotation processes, producing zinc-lead concentrates, much of the oxidized and semi-oxidized lead is recovered along with the sulphide particles by a mechanical occlusion with the mixed sulphides. By the Horwood process the oxidized lead is recovered as a lead product.

A new feature of importance has been added, through which a higher percentage of the silver contents of the material is recovered with the lead than formerly. It was found that if the material be submitted to a preliminary washing in clean water for the removal of soluble salts before roasting, an effective separation of the lead and zinc constituents could be obtained with a lower degree of sulphatization, and at the same time the effect on the silver constituents was to render a much higher percentage unfloatable and made, therefore, to accompany the lead products. As an index of the extent of this improvement, in the earlier tests before the soluble salts were removed, the lead and zinc products assayed approximately the same in silver, while products assaying, say, 30 oz. silver per ton, when produced from material without washing, will, if the material be first washed, assay from 10 to 12 oz. in the zinc concentrates, and from 60 to 70 oz. per ton in the lead product.

The plant of the Zinc Corporation has a capacity of about 500 tons weekly, and consists of a thickening tank about 20 ft. in diameter by 10 ft. deep, fitted with slowly revolving stirrers, which prevent the material from settling hard on the bottom of the tank. This tank receives pulp from the main treatment plant, or pumped from the vicinity of the slime dump, after having been brought into suspension with water in a portable mixer set on rails at the face of the dump. Superfluous clarified water having been overflowed from the tank, the thickened pulp is discharged into a 20-ft. diameter tank, 4 ft. deep, set on the ground, in which revolving arms keep the slime in suspension. The suction of a pump is connected with this tank and the pulp is then pumped to a 50-frame filter press having 3-in. cakes and a capacity of about 7 tons.

After the press is filled, clean water is turned on for a short time to replace the remaining water accompanying the slime and containing the soluble salts, and this is followed by compressed air which quickly drives out most of the remaining water and enables the cakes to be discharged with but 10 to 12% of moisture. The cakes drop

through grizzly bars to a conveyor belt, which delivers the material to a storage platform. Another conveyor belt fixed below this platform delivers the material to an elevator, which lifts it to a small storage bin, at the bottom of which is a small automatic feeder, which delivers the feed at the rate required by the plant, a pair of light running rolls pulverizing the material on its passage to the roaster, which is at the end of a duplex type Edwards roaster with 12 panels and 48 rabbles, the furnace measuring 102x14 ft. Although the fuel consumption for the roaster amounts to only 4.8% of the ore charged, it is burned in 6 fireboxes fixed on both sides of the furnaces.

It has been found that the degree of sulphatization sufficient for the process ranges about 30% of the lead contents of the material. The roaster serves as a drier as well as a roaster, and although its capacity as a roaster is reduced, the arrangement is satisfactory and obviates any dusting which a separate drier might entail. The slimes are withdrawn from the roaster by a conveyor and delivered to a circular concrete tank, set at a low level to receive all the drainage from the flotation plant, the tank being fitted with slowly revolving paddles.

The plant liquor circulates through this tank, where most of the acid required for the flotation is also added, it being found advantageous to allow the material the time thus obtained for digestion prior to flotation. From the digestion plant or tank, the pulp is pumped to a set of 10 alternating agitation and separation boxes of the staggered type used with the Minerals-Separation process. The froth made in the first 5 and sometimes 6 boxes is taken as a final zinc product, by revolving paddles, which insure a minimum quantity of liquor and solids in suspension, other than zinc accompanying the zinc concentrates, while the meager float from the remaining boxes is returned to the first box for retreatment, owing to the presence of lead and gangue with the zinc floated.

The two products, lead and zinc concentrates, resulting from the process, flow to circular tanks similar to that receiving the initial feed, from which pumps take the respective products and deliver them to filter presses, thus enabling the securing of a product with only about 9% moisture. Sulphuric acid consumed is 20 to 27 lb. per ton and about $\frac{3}{4}$ lb. of eucalyptus oil is used. The capacity of the plant is 72 tons per 24 hr. At present the zinc concentrate is floated only once, and as the grade frequently reaches over 50% zinc, it is not yet certain a refloatation would be warranted to increase it, as is the case in most of the Minerals-Separation flotation plants. The material being treated varies in grade according to the class of feed passing through the Zinc Corporation's main treatment works. The following typical plant results illustrate recent work done by the process:

RESULTS OBTAINED BY THE HORWOOD PROCESS

	Zinc %	Lead %	Silver oz. Per Ton
Feed to roaster	39	16	18
Zinc concentrates	49.5	6	11
Lead residues	9.0	47	45

Based on the prevailing charges at Broken Hill, the cost of treatment showed an average above 20s. per ton, and the profit reached about £3.

The presence of a small amount of gangue in the original feed, and of a portion of the lead in the residues in the form of lead sulphates, naturally reduces the grade of lead product.

Correspondence and Discussion

Job Hunting in Alaska

The following experiences may prevent some men from going to Alaska until the country is thoroughly opened up. On Mar. 21, Seattle celebrated the passage of the railroad bill, and ever since, every steamship that left for Alaska has been loaded, not with men with money, but working men; miners, carpenters and mechanics. Juneau has had a boat from Seattle every day for 10 days, dating back from Apr. 2. When I landed there with my family, I found over 500 men in the bread line. A large part of that crowd is made up of the "loaf if possible" kind, but many are good men, clear skin and eyes, and alert, who are really anxious for work.

Having heard so much about the Treadwell mines, I immediately applied for work there as machine runner and found each mine full handed, and those working were holding up for friends until they could get a job. I then tried to get any kind of work, but could not manage to be around when a man was needed. It takes 10 minutes to cross the channel from Juneau to Douglas and the fare is 25c. Douglas is the business part of the Treadwell camp with independent stores, etc.

The Alaska-Juneau company is controlled by Treadwell men. It is opening a mine two miles up Gold Creek from Juneau and has built a mill right in the town. Only 200 tons of ore per shift is being crushed, and the force is small. All employees live in Juneau, there being no company houses yet. The Ebner company is driving a tunnel to tap the ore lower on the creek, and is going to move down part of the old mill from above. Only a small force is working.

The Alaska-Gastineau company is spending an immense amount of money here. All the miners have confidence in Manager Thane, who has been in this country several years. On Apr. 1, the mine was connected with Sheep Creek, by a tunnel driven a distance of 10,400 ft. which will permit hauling the ore direct from the mine to the mill at tide water. It was a big job to make the survey over the mountain, through snow and ice, and connect after two years of work on each end. This lays off about 100 tunnel men.

At the Perseverance mine of the Alaska-Gastineau company, 275 are working. To supply the ore to the mill 1000 men will be required some 18 months hence. This camp is well planned. Living quarters are good. There is an excellent recreation hall, with card tables, reading room supplied with papers and magazines, and billiard and pool tables. Evidently good men are wanted. Officials are civil, but there are no jobs open. None of the mines are organized. Machine men are paid \$3 and board; helpers and laborers of all kinds \$2.50 and board. All men furnish their own blankets. Wages in Alaska seem to be the same as in the northwestern states, making allowance for the cost of transportation in and out, in places where there is only summer work. Where wages are big, the cost of getting in and out evens matters up.

Juneau is experiencing a boom now and living expenses

are too high for a workingman's town, and that is all Juneau will ever be. For example, a shave costs 25c., beer 15c., ham and eggs 35c., hot cakes and coffee 20c., bunk 25c., bed 50c. to \$1.50. No houses are for rent. Rooms rent from \$20 per month up, and you are lucky to find one. Board is \$1 per day by the month, \$1.35 for a single day, but it is good. Clothing and wearing apparel is somewhat more than outside, but not enough to warrant outfitting before coming in.

There are already more men in Alaska than there will be jobs for during the next year, and it is a good place for working men to avoid unless they are sure of work. Norwegians, Swedes and Finns comprise the major part of the working people; they are intelligent and hard workers. I realize it will be some time before I will be able to get a job, as there are good men ahead of me on the lists; there are plenty of men here to build all the railroads Uncle Sam wants.

A. B. MINER.

Juneau, Alaska, Apr. 6, 1914.

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Relative Importance of Sedi- mentary Iron Ores

Comparisons between the quantitative importance of the different types of iron-ore deposits, which I was lately led to make, show results that seem to be of general interest. The interest is greater if further comparisons are drawn between the actual tonnage importance of the different types with their theoretical importance, as indicated by the space given to them in textbooks on the subject now in use. Of course, it has always been realized that certain types of ore deposits yield more, according to classroom statements than is actually found to be the case in the furnace, and this has been accepted as a necessary difference between instruction and actual work. But I do not think that many geologists or engineers realize exactly how far this divergence has gone. This article is an attempt to supply some data bearing on this subject.

In order to get some idea of the theoretical or textbook importance of the various types of iron-ore deposits, I have taken the two books which most fairly represent modern American literature in this line, and have divided the space devoted to iron ores according to the type of ore deposit discussed. The results are as shown in Table I. The subdivisions of this table need no definition, except that it may be noted that the term secondary concentration is here used for convenience to include deposits of the Lake Superior type, in which the replacement has taken place in the original low-grade ore bed itself. It may be of interest to note that this type is practically confined to the Lake Superior region. I have also made an honest attempt to discriminate between magnetite deposits about which the two authors do not seem to be willing to go on definite record, and those which they definitely describe to igneous origin.

It will be of interest to compare the interest shown in the various types of iron-ore deposits, as evidenced by the figures in Table I, with the actual quantitative importance of these deposits. Fortunately it is now possible to make this comparison with some reasonable approach to exactness.

TABLE I. COMPARISON OF SPACE ALLOTTED TO DIFFERENT TYPES OF IRON ORES IN TWO REPRESENTATIVE TEXTBOOKS

Type of Deposit	Space Devoted		Average
	Book A	Book B	
	%	%	%
Bog ores and beach sands.....	6	8	7
Sedimentary basin deposits.....	18	22	20
Normal replacements.....	12	1	6½
Secondary concentrations.....	27	25	26
Contact deposits.....	6	12	9
Residual deposits.....	11	14	12½
Magmatic segregations.....	7	12	9½
Magnetite deposits, origin doubtful	13	6	9½
	100	100	100

For comparison with the theoretical or textbook importance of the various types of iron-ore deposits, we have available estimates of reserve tonnage on three continents, North and South America and Europe. The scattered data available for the three remaining continents are of little service.

As a basis for subdivision by types, the following estimates shown in Table II may be tentatively accepted as

TABLE II. FIGURES OF KNOWN IRON-ORE RESERVES

Area	Reserve Tonnage in Millions of Tons
Newfoundland and Canada.....	4,150
Lake Superior district.....	2,500
Southern United States.....	3,750
Eastern and Western United States.....	1,300
Cuba, Mexico, etc.....	3,060
Total North America.....	14,760
South America.....	8,000
Europe.....	12,032
Total, three known continents.....	34,792

being close enough for present purposes. The figures for Europe are taken unchanged from the International Geologic Congress report on the iron ores of the world; those for North and South America were recently published in the *Iron Trade Review*.

As soon as we attempt to divide these totals among the classes of ore deposits described in current literature, several facts become obvious. First, the total tonnage of bog ores and beach sands known to exist anywhere in usable condition is so small that no space need be reserved for either class in a new grouping. Second, since the titaniferous ores are omitted, the class of magmatic segregations has no certain representative left. Under these circumstances, it seems best to throw all the doubtful magnetites into the same group.

Tabulated in the same order, as in Table I, results are obtained as shown in Table III, the quantities being given in millions of tons.

TABLE III. ALLOTMENT OF KNOWN IRON-ORE RESERVES ACCORDING TO TEXTBOOK TYPES OF DEPOSITS

	Tonnage in Millions of Tons—			Total
	North America	South America	Europe	
Bog ores and beach sands.....	none	none	none	none
Sedimentary basin deposits.....	6,030	7,500	8,407	21,937
Normal replacements.....	310	none	1,441	1,751
Secondary concentrations.....	2,750	none	none	2,750
Contact deposits.....	680	350	507	1,537
Residual deposits.....	4,350	none	272	4,622
Magmatic segregations.....	none	none	none	none
Doubtful magnetites.....	640	150	1,405	2,195
Totals.....	14,760	8,000	12,032	34,792

The differences between the theoretical and the actual importance of the various types of deposits can best be brought out by calculating both on a percentage basis. Table IV gives the results of this process.

To judge from this comparative table, it would seem

that the real importance of the sedimentary ores has been heavily underrated even by the best authorities. The fact that, of the world's five great competitive steel centers, four depend largely or entirely upon ore of this type does not appear to have been noted. It might be added that the above estimates are based upon ore of current commercial grade. If we assumed that lower-grade

TABLE IV. DIFFERENCES BETWEEN THEORETICAL AND ACTUAL IMPORTANCE OF DIFFERENT TYPES OF IRON-ORE DEPOSITS

Type of Deposit	Actual Importance	Textbook Importance
	%	%
Bog ore and beach sand.....	0.0	7.0
Sedimentary basin deposits.....	63.1	20.0
Normal replacements.....	5.0	6.5
Secondary concentrations.....	7.9	26.0
Contact deposits.....	4.4	9.0
Residual deposits.....	13.3	12.5
Magmatic segregations.....	0.0	9.5
Doubtful magnetites.....	6.3	9.5
	100.0	100.0

ores would in time be used, the percentage of the sedimentary reserves would be still further increased. For current estimates, however, we may assume that the sedimentary ore reserve contain two-thirds of the world's iron supply; and that all of the igneous and doubtful ores together make up about one-sixteenth of the world's reserve.

EDWIN C. ECKEL.

Washington, D. C., May 24, 1914.

Leaching at Warrior, Ariz.

From 1895 to 1903, we operated a 300-ton copper-ore leaching plant at Warrior, Ariz., which has since been destroyed by fire. In connection with this, we built and operated an up-to-date sulphuric-acid plant of a capacity of 25 tons of 50° Bé. acid per day. I doubt if there has been a better general leaching plant in operation in the United States. It is true that a leaching plant was in operation during these years at Clifton, Ariz., but they leached a product from the concentrating mill from which the clayey material is washed out, while we leached ores direct from the mines. We recovered the copper by scrap iron, contained in a perforated heavy plate-copper drum, 8 ft. in diameter by 12 ft. long, revolving in copper-sulphate solution in a lead-lined tank. We smelted and refined the copper precipitates in a reverberatory furnace, using oil for fuel, and the ingots ran 99.85% copper.

We discovered that when you make a solution of from one- to three-tenths of 66° sulphuric acid and from seven- to nine-tenths of water, you are through with chemistry and the leaching practice then becomes absolutely a mechanical fit-and-try proposition. We extracted about 65% of the copper contained in the 7% ore and encountered the same difficulties that everyone else has in freeing the tailings from the last of the copper; this is even more necessary when leaching low-grade ores. Since the active practice mentioned, I have been studying how to overcome the difficulties and have now developed an apparatus that I claim is inexpensive to build and operate, is automatic in operation and turns out tailings containing but a trace of copper. The mechanical arrangement I use is also adapted for cyaniding gold ores with more economy in plant construction and operation than the equipment now in use. I have nothing to sell or market at present, but thought best to advise you of what is on the way.

Globe, Ariz., May 26, 1914. JAMES A. FLEMING.

Editorials

The Copper-Producers' Report

The report of the Copper Producers' Association for the month of May cannot be said to present any special features, nor does it—as these reports sometimes do—show any unexpected feature. The production dropped about 9,200,000 lb. from the large output of April, but was only a very little above the 140,000,000 lb., which was expected as the average for the summer months. The domestic deliveries dropped from April a little, but exceeded those for January and February, and were about at the average of the five months of the year which has so far passed. So far as can be judged, they indicate that actual consumption is not on the increase, but is not falling back from that of the first quarter of the year. The export deliveries also showed a reduction from April and presented, in fact, the greatest change of any feature of the month, being something like 10,000,000 lb. below the monthly average for 1914. This, taken together with the fact that European stocks at the close of the month show a considerable increase, seems to indicate that the most active demand from the other side is satisfied for the present, although the foreign takings of copper are still large.

The increase in domestic stocks was close to 14,000,000 lb. We have now had three months of the year in which the stocks diminished and two months in which they increased. The gain has not been large, however, and the total stock reported on June 1 is 7,096,226 lb. below that on the first of January. Even this small difference would hardly have existed if it had not been for the abnormally large output of the refineries in April. It cannot be said now that the refiners' production is far apart from that reported by the smelters and the probability seems to be that it will continue at about the same level for at least two or three months to come, if not longer. From all accounts, the European demand is likely to continue good, perhaps to improve, and any change in our domestic consumption is likely to be an increase. The May figures cannot be said to make any important change in the position of copper.

Anaconda as a Custom Smelter

By its acquisition of the property of the International Smelting & Refining Co., the Anaconda company, besides being the largest copper producer of the world, will become a factor in the lead market and in the custom smelting business. In addition to its copper, gold and coal mines in Montana, this great company will have copper smelters at Anaconda, Great Falls, Tooele and Miami, a lead smeltery at Tooele, copper refineries at Great Falls and Perth Amboy, and a lead refinery at East Chicago. These are the most up-to-date metallurgical plants in America, save Great Falls, and that is in the process of being rebuilt.

The Anaconda company also owns an electrified railway in Montana, a hotel, machinery-manufacturing

shops and firebrick factory at Anaconda, is building a sulphuric-acid factory at Anaconda, and has extensive agricultural holdings, which it is developing in a scientific manner. Its wood lands and sawmills supply all of its requirements for timber, while its coal mines and coke ovens supply all its fuel. There are few American industrial companies which have so large and so varied interests as the Anaconda.

Miners' Con

There has been in this country practically no investigation deserving the name, of the health of the underground workers in the metal-mining industry. It is commonly recognized that the occupation is deleterious to health, just as it is dangerous to life and limb. Just how deleterious, in just what ways, and what means of amelioration are available, these are facts unknown, and adequate measures looking to an improvement of conditions have never been undertaken.

It is our opinion that underground mining is almost always debilitating, and lacking accurate figures, we feel safe in saying that the metal miner can expect a much shorter life than the workman performing equally arduous labor in the open air. While the miner frequently works in an equable atmosphere and is not exposed to inclemencies of the weather, his surrounding conditions otherwise are unfavorable. Of these, there may be present: High temperatures, excessive water, poor ventilation, dust, noxious gases, unsanitary surroundings and infected mud. As a result of these influences, the miner not only has his health undermined so that he is less able to resist the attack of diseases, but he is also subjected to their attack more frequently than he would otherwise be. He is generally regarded as peculiarly subject to pneumonia, rheumatism, ankylostomiasis, typhoid and consumption.

Unquestionably, the most serious of these is "consumption," taking the term to include the group of diseases affecting the tissues of the lungs, such as tuberculosis, phthisis, fibrosis and silicosis. "Miners' con," the subject of grim jest, is commonly looked forward to by the underground man as his ultimate end.

In the Transvaal and in Western Australia, the ravages of silicosis grew so alarming as to call forth the appointment of royal commissions for its study, and the reports published in both countries within a few years, not only furnished a large amount of statistical information on the prevalence of the disease, but also outlined methods for its control and alleviation. The conditions existing were found to be terrible, especially in South Africa, and the figures presented shocked the mining industry and the government into drastic action, looking to the relief of the sufferers and the improvement of conditions. An analysis of the report of the Transvaal Commission, by F. L. Hoffman, can be found in the *JOURNAL* of Nov. 30 and Dec. 7, 1912. It was found that 32% of the underground workers in the Rand mines were affected with

some form of silicosis and that in 15 years every machineman became thus diseased.

It should be stated that in the Transvaal the term "silicosis" is used to denote the production of disease in the lungs by the inhalation of fine rock dust; "fibrosis" is the first result of this inhalation, consisting of the growth of fibrous tissue replacing the good lung tissue; "tuberculosis" is the disease caused by the introduction of the tubercular bacilli which find in lungs affected by fibrosis an excellent opportunity for propagation; just what relation "phthisis" bears to these other diseases is not clear; apparently it includes fibrosis and tuberculosis.

In view of the previously unappreciated conditions unearthed by these two commissions, the question arises: Would a similar investigation in the United States reveal a similar condition of affairs?

We are led to make these remarks by the receipt of a letter from Temple Chapman, of Webb City, Mo. Mr. Chapman states that an attempt is being made to organize a fight against miners' consumption and notes the fact that the deaths from that source in 1913 were 700 as against 28 resulting from accidents. He suggests that the dust from drilling dry holes and the practice of using a common drinking keg are responsible for the spread of the disease, and asks for information as to how to educate the miners to take care of themselves and how to care for cases already contracted. Discussion on these points would be welcomed by the JOURNAL.

Unquestionably, the chief cause of fibrosis with resulting tuberculosis is the prevalence of dust. This is caused primarily by drilling, and machinemen are most subject to the disease; blasting and shoveling are contributory causes. The methods of dust prevention are the use of water sprays at the drills and wherever else necessary in the mine, and the removal of the dust following blasting, by an adequate ventilating current, before men are again permitted underground. The elimination of dust would go a long way toward the elimination of fibrosis and the reduction of tuberculosis following thereon. The spread of tuberculosis itself must be checked by the usual methods prescribed in sanitary regulations. Unquestionably, the use of a common drinking keg is an encouragement to the spread of the disease. Such kegs are an abomination and are unnecessary. The description of a sanitary drinking keg appeared in the JOURNAL, Mar. 8, 1913. Many of the best managed iron mines have installed bubble fountains underground, connected to a piped supply of good water.

Consumption can be checked and eradicated if taken early enough. Tubercular individuals should not be allowed underground, where the opportunities for communication of the disease are excellent. Would it be feasible to combine profit with humanitarianism and set miners, in whom the disease is not too far advanced, to prospecting for zinc in the western, especially the southwestern, mountain regions? A prospector's life, of all lives, is best calculated to arrest tuberculosis.

We assume that Joplin is going at the matter in earnest and the first step would seem to be a searching investigation into existing conditions by a thoroughly competent commission, preferably part medical and part mining. With the actual facts known, the remedies can be applied. In all events, the Joplin district deserves emphatic commendation for starting this movement. It is to be hoped that results of value to the rest of the country, as

well as to the district itself, will be obtained. Conditions in Joplin are probably as bad as anywhere else in the country, since the dry-hole drilling in the chert of the sheet-ground mines produces a great deal of fine dust.

There is a legitimate and important field of work here for the Bureau of Mines. The safety work of the bureau is its most praiseworthy activity. We suggest that the conditions of health in metal mining deserve increased attention. Let the slogan be amended to read, "Safety First and Health Next."

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Double Tender of Contributions

Occasionally we are about to publish a contribution received from some engineer when we observe the same thing appearing in some other paper. Of course, the other papers have similar experiences. We cannot understand the train of thought which leads an author to send the same contribution to two or more papers at the same time. We must be charitable enough to assume that it is done in ignorance of the ethics and proprieties of professional conduct and of publishing.

When an author sends a contribution to a paper or magazine, he voluntarily gives that paper an option upon it. When he has been notified of its acceptance he is committed to the disposition of the manuscript that he has offered, unless he formally withdraws it, to which no editor would object if duly notified.

Failure to receive notice of the acceptance or rejection of a contribution does not release the author. Communications frequently go astray in the mails. Any case of doubt can be settled quickly by a brief inquiry on a one-cent post card, as may also any doubt arising from delay in publication after an article has been accepted.

These are not arbitrary rules, but are simply what is prescribed by good professional behavior. If an author accompanies his MS. with a letter, stating that he has contemporaneously sent it to some other paper, he relieves himself of the charge of being unethical, but courts a summary rejection by both papers.

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Are You a Western Patriot?

Not inquiring in any captious spirit, but simply seeking information, we should like to know just what our contemporary, the *Daily Mining & Financial Record*, of Denver, wishes to have people believe in the fight that it has inaugurated against the Department of the Interior and the other Denver newspapers, which it says are negligent to their patriotic duty. It says in its article: "The Federal Government has perceived this mental paralysis of the press in Denver and it now has a well ordered plan to complete its program of imperial aggression in the West. It proposes to take possession of Colorado while you are kow-towing and thanking the President for having sent a few hundred government troopers into the State." Then it asks, "Have you not the will to emphasize the objections to the industrial subjugation of your state by the trust-ridden East? Are you willing to accept Federal bribes that you may be sold into serfdom?" It is the latter remark that bothers us, inasmuch as we are unaware that the East is trust-ridden, or that anybody is being sold into serfdom.

We gather that our contemporary is entering a vigorous protest against bureaucratic operations, in objecting to which we are quite in harmony with it. However, we have never seen any evidence that the growing bureaucracy in Washington has any idea of selling anybody or any part of the country into serfdom, or could do so even if it wanted to. It wants to magnify its importance, create more jobs and increase its staff, get its fingers into more pies and generally have more to say, all for the purpose of aggrandizing the organization. Of course, it will tie things up with red tape more and more and be increasingly vexatious and hampering to common people, but there is no more serfdom about this than is included in the obligation to pay the salaries and expenses, which comes out of the taxes. Heretofore, nobody in this country has worried much about taxation, which has supposedly come out of the benighted foreigners and henceforth will come in part out of the trusts, corporations and rich people, wherefore the sun-dried towns of the Grasshopper state may continue to have marble post offices, Senator LaFollette may continue to make \$10,000 speeches, a half a hundred Washington bureaus may continue to publish literature and ideas of economy may go hang.

BY THE WAY

Mines in Columbia River—Report that Government Ships Are Busily Planting Them. So read the headlines. Then we recovered as the editorial mind turned from thoughts of peaceful underground operations to that little affair way down the coast.

And as a further contribution to dowsing, the German Society for Investigating the Internal Structure of the Earth now declares that it can discover subterranean springs and ore deposits (also subterranean we judge) by means of the wireless telegraph and that it can ascertain their depth by means of electrical waves. At latest reports, Marconi operators were taking to the hills in large numbers.

Col. E. A. Wall, of Salt Lake City, has started litigation against the Consolidated Coppermines Co., finding fault generally and asking that the company be dissolved. He puts great stress on the claims for Giroux that were made by Thomas F. Cole, but alleges that Mr. Cole sold nearly all of his stock at \$10@13. Colonel Wall expresses the belief that Giroux and Butte & Ely can mine for 25c. per ton and can realize a profit of between \$1.50 and \$2.50 per ton. Using its old concentrating mill, he believes that Giroux could make \$1000 a day. It is the common opinion in mining circles that the management of the Coppermines company has a hard problem to work out. If Colonel Wall can really do what he claims, the management would surely do best to turn the property over to him.

The E. I. du Pont de Nemours Powder Co. hung up a prize for the most satisfactory suggestion on a method of constructing dynamite primers, which should be an improvement on the best methods now in use. The current number of the *du Pont Magazine* reports results. These

results were negative. All of the 60 suggestions handed in were turned down for some reason or other. Among the unsuccessful contestants, six proposed devices which had to be built into the dynamite cartridges at the factory. The expense and danger of a change in dynamite packing methods, and the fact that all sticks must be made available for primers are the reasons given for rejecting these suggestions. We suppose the device invented by W. W. Jones and described by him in the *JOURNAL*, Feb. 21, 1914, would come in this category. As a matter of fact, we cannot see that the manufacture of this would entail either expense or danger. Any sincere desire to promote safety in blasting would not balk at the inconvenience this device might cause.

The difficulties of the British banking house of Chaplin, Milne, Grenfell & Co., Ltd., announced this week, have some mining interest, as this house was heavily interested in mining and was the banker of a number of mining companies, of which A. M. Grenfell was chairman. These companies include Camp Bird, Ltd., Santa Gertrudis Co., Ltd., Messina (Transvaal) Development Co., Ltd., Mexican Agency, Ltd. Mr. Grenfell was one of the organizers of Canadian Agency, Ltd., which has also suspended; besides being heavily interested in the Grand Trunk Railway and the Lake Superior development scheme, Canadian Agency was last year the leading factor in optioning the Bonanza and adjacent mines in Nicaragua; it is understood, however, that Canadian Agency had disposed of its interest in this negotiation. No information is available as to what losses, if any, will be sustained by the mining companies for which Chaplin, Milne, Grenfell & Co., Ltd., were bankers. A cable from London states that Sir William Plender is to be special manager of both suspended institutions.

The United States sent three representatives last week to Christiania, Norway, to attend a conference of nine European governments relative to coal lands in "No Man's Land," 300 miles north of Norway. The governments to be represented, besides the United States, are Great Britain, Germany, France, Russia, Belgium, Holland, Denmark, Norway and Sweden. About 10 years ago, the coal deposits of West Spitzbergen began to attract the attention of foreign capitalists. In 1907, the exploration of an American company, the Arctic Coal Co., had proved so satisfactory that it began the construction of an expensive aerial tramway, to facilitate the transport and loading of its product. Owing to the difficult climatic conditions within the Arctic Circle, the tramway was not completed until 1909. The American company, which is controlled by the J. M. Longyear interests, of Michigan, then began shipments in earnest, and was able to load its ships in much less time than any of the other companies—an important advantage during the short Arctic shipping season. In the absence of any formal government, difficulties began to arise between the operators and squatters, says the *New York Herald*, and forced the present conference for the establishment of a government. The United States will not be a party in the formulation of the new government, but has sent its representatives merely to look after the interests of Americans who have already invested their money there. It is expected that the territory will be declared neutral and put under international protection.

Robert H. Richards Retires from Technology

With the close of the present term at the Massachusetts Institute of Technology, Prof. Robert H. Richards will retire from the active work of teaching which he has followed for 46 years. He is made professor emeritus and receives the benefits of the Carnegie Foundation. Professor Richards has been identified with the institute since its beginning, for he was a student in the first class, a graduate in the first group to receive the B.S. at Technology, following which he became assistant—1868-1871—and then in 1871 took the chair of mineralogy, in the department that afterwards developed into that of mining engineering and metallurgy. He it is who developed the splendid laboratories at the institute; and practised himself in the details of the various technical processes, he has been always at the head of his profession, advancing the technique by a number of important inventions.

Professor Richards was born at Gardner, Me., Aug. 26, 1844, but since his schoolday life has been identified with Boston. His activities in any of the directions to which he turned them were always remarkable. In investigation he took up the jet aspirator, looked into amalgamation in the stamp mill, determined the curves of material settling in water, which established the fundamental principles of sorting ore by means of jigs and similar machines. In the same line are the determinations of the settling velocities of quartz and galena, the ground rock being passed into a current of water where the differential settling serves to sort the ore from the worthless rock. The details of various jigs and of the Wilfley table—another sorting device—were investigated by Professor Richards, whose latest work of the kind has been in a variation of the process termed "hindered" settling. Then he has stepped out of the strict province of mining and perfected for civil engineers a prismatic hand telescope for stadia work.

In addition to his work in the class room and laboratory Professor Richards has been in demand for an expert in mining matters and has used his spare time and vacations in professional work of the kind.

In the class room Professor Richards has always been a personality of interest. His lectures have been such as to impress on his hearers the care with which they were prepared, and the teacher has been an example and a stimulus to his students for patient and painstaking work in the interests of accuracy.

The laboratories of the institute in the specialties cared for by Professor Richards were the first of their kind in the world and have been the model for many others since established. It was in these laboratories that some of the first investigations were made of the treatment of ores of the Calumet & Hecla, and in return contributions from that mine aided in the equipment of the laboratories.

In the development of the courses Professor Richards has naturally been the guiding spirit. In his early days he was associated with the summer school of mining, established in 1871, and discontinued only recently, when it was found possible to secure for the students the even better practice of vacation work in established mining plants.

With all this activity there has been always that admin-

istrative labor in behalf of Technology that the heads of departments must give, in the case of Professor Richards augmented by his assuming the duties of secretary of the institute for a number of years in the late seventies, in addition to his work of instruction.

For the profession he has been always active in his studies and aid, besides the advice he was able to give to the Calumet & Hecla, of which Prof. Alexander Agassiz spoke in highest praise, a work that has been constant in an advisory capacity, and was very active up to 1890, he was consulting engineer in the ore-dressing mill of the Pennsylvania Steel Co., the Sulphur Mines & Railway Co., of Virginia, the Longdale Iron Works, and the Firth Sterling Steel Co. In 1905 he spent the summer on the west coast in investigations for the United States Geological Survey.

His writings have been voluminous, more than one hundred titles being credited to his name by the bibliographers, the most important being his monumental treatise on ore dressing.

But best of all, Professor Richards has been a man whom everybody, instructing staff, students and the outside world which came into his sphere of influence, all unite in appreciation of his unselfish and gentle nature, his patience and his forbearance, and for the steadfastness with which he has held to his ideals through life. Such is the professor and student whom Technology is to lose as a teacher, but by no means as man. His life has been devoted to the institute, his laboratories are those which he has created within the school, and relieved of the drudgery that is inseparable from the lecture hall, he will be the freer to give to the world the benefits of long experience.

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Discovery of Oil on Eastern Slope of Andes

WASHINGTON CORRESPONDENCE

The Pan-American Union has announced a discovery of petroleum on the eastern slope of the Andes, stating that it has been known for some time that petroleum exists in many parts of even the high Andes mountains, although in but few cases has the output been so abundant as to encourage commercial study of its possibilities. Recent investigations, details of which have only within the last few days been sent to the Pan-American Union, have, however, given a new turn to the problem, and it is not beyond reason to hope that paying oil will be mentioned with gold, silver, tin and copper, as a source of wealth of this immense region.

According to a report now in the hands of Director General Barrett, of the Pan-American Union, the Espejos (mirror) spring, 12 leagues (about 36 miles) from Santa Cruz, in Bolivia, is a fair sample of the character and kind of petroleum surface manifestations found in the region extending from the northern boundary of the Argentine Republic to the Madre de Dios River. This river is close to the Southern boundary of western Brazil, and with the Beni into which it runs, finally joins the Mamoré River, to form the Madeira River. The Espejos spring yields a petroleum by oozing from its surface flow, an analysis of which shows a content of 78.2% of kerosene, 17½% of lubricating oil and 4.3% of coke. Careful geologic examinations of the entire eastern slope of the

Andes are said to support the view that petroleum in paying quantities will be found in other parts as well as in the neighborhood of Santa Cruz.

Sundry Civil Appropriation Bill

WASHINGTON CORRESPONDENCE

The Sundry Civil Appropriation Bill which has just passed the House of Representatives contains the following appropriations for the U. S. Geological Survey, which are expected to be retained substantially unchanged by the Senate:

Office of director: Director, \$6000; chief clerk, \$2500; chief disbursing clerk, \$2500; librarian, \$2000; photographer, \$2000; assistant photographers—one \$900, one \$720; clerks—one of class two, three of class one, one \$1000, four at \$900 each; four copyists, at \$720 each; watchmen—one at \$840, four at \$720 each; janitor, \$600; four messenger boys, at \$480 each; in all, \$35,340.

Scientific assistants: Geologists—two at \$4000 each, one \$3000, one \$2700; two paleontologists, at \$2000 each; chemist, \$3000; geographers—one \$2700, one \$2500; two topographers, at \$2000 each; in all, \$29,900.

General expenses: For every expenditure requisite for and incident to the authorized work of the Geological Survey, including personal services in the District of Columbia and in the field, to be expended under the regulations from time to time prescribed by the Secretary of the Interior, and under the following heads: For pay of skilled laborers and various temporary employees, \$20,000; for topographic surveys in various portions of the United States, \$350,000. For geologic surveys in the various portions of the United States, \$300,000.

For chemical and physical researches relating to the geology of the United States, including researches with a view of determining geological conditions favorable to the presence of deposits of potash salts, \$40,000; for preparation of the illustrations of the Geological Survey, \$18,280; for preparation of the report of the mineral resources of the United States, \$75,000; for gaging streams and determining the water supply of the United States, the investigation of underground currents and artesian wells, and the preparation of reports upon the best methods of utilizing the water resources, \$150,000.

For purchase of necessary books for the library, including directories and professional and scientific periodicals needed for statistical purposes, including payment in advance for subscriptions to publications, \$2000; for engraving and printing geologic maps, \$110,000; for continuation of topographic surveys of the public lands that have been or may hereafter be designated as national forests, \$75,000; in all, United States Geological Survey, \$1,205,520.

The appropriations granted to the Bureau of Mines in the same bill are as follows:

For general expenses, including pay of the director and necessary assistants, clerks, and other employees in the office at Washington, District of Columbia, and in the field, and every other expense requisite for and incident to the general work of the bureau in Washington, District of Columbia, and in the field, to be expended under the direction of the Secretary of the Interior, \$70,000.

For investigation as to the causes of mine explosions, methods of mining, especially in relation to the safety of miners, the appliances best adapted to prevent accidents, the possible improvement of conditions under which mining operations are carried on, the use of explosives and electricity, the prevention of accidents, and other inquiries and technologic investigations pertinent to the mining industry, \$347,000; for purchase of mine-rescue, first-aid and fire-fighting equipment and supplies for use in the operation of mine-rescue cars and stations, \$30,000; for purchase of steam and electric equipment for supplying light and power to the testing plant of the Bureau of Mines at Pittsburgh, Penn., \$10,000.

For investigation of mineral fuels and unfinished mineral products belonging to or for the use of the United States, with a view to their most efficient mining, preparation, treatment and use, including personal services in the bureau at Washington, D. C., not in excess of the number and total compensation of those so employed during the fiscal year 1913, \$135,000.

For inquiries and scientific and technologic investigations concerning the mining, preparation, treatment, and utilization of ores and other mineral substances, with a view to improving health conditions and increasing safety, efficiency, economic development, and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries; to inquire into the economic conditions affecting these industries: Provided, that no part thereof may be used for investigation in behalf of any private party, nor shall any part thereof be used for work authorized or required by law to be done by any other branch of the public service, \$100,000.

For inquiries and investigations concerning the extraction, preparation, treatment, and utilization of petroleum and natural gas, with a view to economic development, and conserving resources through the prevention of waste; to inquire into the economic conditions affecting the industry, \$25,000; for one mine inspector for duty in Alaska, \$3000; for expenses, subject to such rules and regulations as the Secretary of the Interior may prescribe, in lieu of subsistence at a rate not exceeding \$5 per day when absent on official business from his designated headquarters, and for actual necessary traveling expenses of said inspector, \$2500.

For technical and scientific books and publications and books of reference, including payment in advance for subscriptions to publications, \$1500; for purchase or lease of the necessary land, where and under such conditions as the Secretary of the Interior may direct, for the headquarters of five mine-rescue cars and for the construction of the necessary railway sidings on the same, \$1000: Provided, that the Secretary of the Interior is authorized to accept any suitable land or lands that may be donated for said purpose; in all, for the Bureau of Mines, \$725,000.

Persons employed during the fiscal year 1915 in field work, outside of the District of Columbia, under the Bureau of Mines, may be detailed temporarily for service at Washington, D. C., for purposes only of consultation or in connection with the preparation of results of their field work; all persons so detailed shall be paid in addition to their regular compensation only their actual traveling expenses in going to and returning therefrom; and all details made hereunder, and the purposes of each during the fiscal year shall be reported, in the annual estimates of appropriations, to the Sixty-fourth Congress at its first regular session.

Attempt to Push Conservation Bills

WASHINGTON CORRESPONDENCE

In view of the early completion of the discussion on anti-trust legislation in the House of Representatives, that having been closed on Friday, June 5, a strong demand has arisen in the lower chamber for the adoption of a compulsory party program, designed for the adoption of the so called "conservation bills," all of which have been before Congress in one form or another for a good while past.

Included in this program are the radium bill, which provides for government monopolization and control of radium-bearing ores, the Alaska coal-land leasing bill, the general oil-land leasing bill, and the water-power and public-land bill, all of which have been heretofore explained at some length. It is not yet certain how the effort to secure action on these bills at the current session will turn out, but up to date about 200 members have agreed to sign a petition to the Rules Committee, asking for the preparation of a binding rule, which shall insure the pressing forward of this general scheme of legislation. Secretary Lane and Chairman Henry, of the Rules Committee, recently had a lengthy conference with President Wilson in regard to this whole matter, and it is understood that the President expressed strong interest in the conservation measures, although he did not undertake to commit himself to them as a necessary part of the administration scheme of legislation for the year.

PERSONALS

Will J. Bonnevie is requested to communicate with J. N. Houser, Mascot, Tennessee.

T. A. Rickard was in New York for a few days last week, but has returned to London.

Harley A. Sill, of the firm of Sill & Sill, is in Sonora, Mexico, on professional business.

J. C. Porter, of New York, left, June 3, for Porto Rico, to undertake examination and prospecting work for a New York syndicate.

J. B. Haile sailed from New York for Spain last week to install the Myers-Whaley shoveling machine purchased by the Rio Tinto Co. for its mines.

George E. Farish has just returned to New York from the San Juan district in Colorado, where he has been engaged in examination work since February.

J. W. Jeffrey, of the Jeffrey Manufacturing Co., Columbus, Ohio, at a recent meeting of the board of directors of that company, was elected second vice-president.

A. H. Trotter sailed from New York, May 26, for Azansul, Government of Kutais, Russia, where he will be engaged for the Caucasus Copper Co. in construction work.

A. G. Haultain, for the Canadian Geological Survey, is making a survey of Lake Athabasca, which will serve as a base for all explorations and surveys in the surrounding region.

James M. Callow, of the General Engineering Co., of Salt Lake, Utah, has been in New York for a fortnight, and has left for the West. He expects to be in Salt Lake about the middle of June.

A. A. Hassan has examined the Crimora manganese mine in Augusta County, Va., and has gone to Nevada, where he will examine gold mines near Hawthorne, Esmeralda County. He expects to remain there one month.

E. R. Dunsford, mining engineer and demonstrator for the Myers-Whaley Co., Knoxville, Tenn., is sailing from New York, June 5, for South Africa to install the two Myers-Whaley shoveling machines purchased by the Crown Mines for their tunnel work.

C. D. Kaeding, formerly assistant general manager of the Goldfield Consolidated, and recently assistant superintendent of mines for the Canadian Copper Co., has been appointed vice-president and general manager of the Dome Mines, Ltd., South Porcupine, Ont., and has taken charge of the property.

W. A. Thomas, who for several years past has been commercial engineer in charge of all sales of mining apparatus for the Westinghouse Electric & Manufacturing Co., with headquarters at East Pittsburgh, resigned his position, June 1, and has taken up the practice of consulting engineer in Pittsburgh with offices in the Second National Bank Building.

William C. Post, metallurgical engineer at South Works, Illinois Steel Co., has resigned to become associated in a similar capacity with the Jeffrey Manufacturing Co., Columbus, Ohio. He leaves the Illinois Steel Co. after a service of 24 years. He was assistant to Albert Sauveur, the first metallurgical engineer at South Works, at the time the laboratory was installed.

OBITUARY

Albert Arents, the well known inventor of the siphon tap attached to lead blast furnaces, died at his home in Alameda, Calif., on May 13, aged 74 years. He was a native of Germany, but resided most of his life-time on the Pacific Coast. He received his education as a mining engineer and metallurgist at the Royal Schools of Mines at Clausthal and Berlin and was quite prominent in the earlier days of California, chiefly as a smelter and amalgamator. He was also the discoverer of the silver mineral "partzite," formerly so common in the mines of Mono County, California. In recent years he had almost entirely withdrawn from active business.

John F. Budke died at Canonsburg, Penn., June 3, aged 61 years. He was born in Wheeling, W. Va., and for many years was engaged in the iron and steel business in the Pittsburgh district. He was president of the Parkersburg Iron & Steel Co. and of the Canonsburg Steel & Iron Works. He

was a pioneer in opening the natural gas field of Washington County. He was active in politics and had held several local offices, besides serving in the Pennsylvania state senate.

SOCIETIES

Panama-Pacific International Exposition—The first exhibit was formally installed in the Palace of Machinery, May 27, by the Busch-Sulzer Brothers Diesel Engine Co., of St. Louis.

Iron & Steel Institute—The autumn meeting will be held in Paris, Sept. 17, 18 and 19. On the conclusion of the meeting in Paris a visit will be made to Nancy, and to the principal iron mines and metallurgical works of French Lorraine.

American Chemical Society—A circular from the secretary gives notice that, owing to the fact that the Cartier Celebration is to be held in Montreal during the week beginning Sept. 6, and the resultant hotel and transportation congestion, the date of the meeting of the American Chemical Society in that city has been changed to Sept. 15 to 18, one week later than had been announced.

American Institute of Mining Engineers—Sir Robert Hadfield, Sheffield, England, an honorary member of the Institute has offered the Hadfield Research Prize of \$1000 for the best contribution to the publications of the Institute on "The Different Forms and Combinations of Carbon with Iron Including those in Iron Alloys." The prize will be awarded at the annual meeting of the Institute, held in New York in February, 1916, to the best paper on this subject which is presented to the Institute before Nov. 1, 1915, provided such paper is deemed worthy by the Iron & Steel Committee of the Institute. The scope and object of the proposed research are outlined by Secretary Bradley Stoughton in the "Institute Bulletin" for May:

INDUSTRIAL NEWS

The Duluth office of the H. W. Johns-Manville Co. has moved to No. 327 W. First Street.

Hardinge Conical Mill Co., 50 Church St., New York, N. Y., reports that the Caucasus Copper Co., of South Russia, has ordered two 8-ft. Hardinge Mills. This is a repeat order.

The Diester Concentrator Co., Fort Wayne, Ind., recently shipped 14 sand and slime tables to Lima, Peru. These were ordered through the Cyanide Supply Co., of London, Eng., and were prepared for mule-back transportation. This company has also sold 19 sand tables to the Old Dominion company, Globe, Ariz., these tables having been selected after extended tests.

Morse Bros. Machinery & Supply Co., of Denver, has recently purchased the entire machinery and supplies of J. H. Wilber, the largest machinery dealer in Cripple Creek, Colo. It has also purchased the tunneling plant of the Karns Tunneling Machine Co., located in Magnolia, Colo., and a complete 100-ton cyanide plant, crushers, rolls, steel cyanide tank, etc., located at Creston, Colo.

The Hammond Iron Works, Warren, Penn., has recently shipped three thickener tanks to the Cinco Minas, Jalisco, Mexico, being the last instalment of the equipment for the large mill that was built there about a year ago. Within the last few months the company has also sent six 15x45-ft. Pachuca agitation tanks and some Dorr thickener tanks to the San Pedro Analco plant of the San Raphael company, Magdalena, Jalisco, Mexico. The Hammond company has furnished a large number of the tanks now in use in Mexico, and is well equipped to build tanks of various sizes for many purposes.

The General Electric Co. reports the following orders recently received: Alaska Gastineau Mining Co., at Sheep Creek, Alaska, 35 motors ranging from 7½ hp. to 300 hp.; Anaconda Copper Mining Co., Butte, Mont., 23 induction motors ranging from 5 hp. to 20 hp. with starting compensators and 10 oil switches; Arizona Copper Co., Clifton, Ariz., a 150-hp. induction motor and two three-bearing 17½-kw. motor-generating sets; International Smelting & Refining Co., Miami, Ariz., two 200-kw. three-bearing synchronous motor generator sets; Alaska TreadwellGold Mining Co., San Francisco, Calif., three additional 75-hp. induction motors with compensators.

The Traylor Engineering & Manufacturing Co., of Allentown, Penn., has recently received a contract from the Union Minière du Haut Katanga for four copper blast furnaces,

48x240 in., equipped with Giroux air-jacketed tops; these furnaces are for smelting to black copper. A large amount of furnace accessories, and also certain concentrating machinery, including Anaconda classifiers, are to be shipped to the Congo. The Traylor company has also received orders recently for a complete smelting furnace for the Cananea-Sonora Smelting Co.; a complete furnace for the Balbach Smelting & Refining Co., Newark, N. J.; blast furnaces and other accessories for the Tennessee Copper Co.; blast-furnace jackets for the Ducktown Sulphur, Copper & Iron Co., Isabella, Tenn.; smelting furnaces for the Consolidated Mining, Smelting & Power Co.; water jackets for the International Smelting Co., Phelps, Dodge & Co., and the Democata Mining Co.; also furnace tuyeres for the Consolidated Mining & Smelting Co., Trail, B. C.; blast-furnace jackets, and special machinery in connection with the new process for resmelting matte and dross at the St. Joseph Lead Co., Herculaneum, Missouri.

TRADE CATALOGS

Doak Gas Engine Co., Oakland, Calif. Bulletin No. 11, 16 pp. Illus. 9x7 inches.

Mesta Machine Co., Pittsburgh, Penn., Bulletin O. Mesta Rope Drives. 8 pp. Illus. 9x6 inches.

Helmick Foundry-Machine Co., Fairmont, W. Va. Catalog. Frogs and switches. 22 pp. Illus. 5x8 inches.

E. R. Watts & Son, London, England. Catalogue M. 114. Surveying Instruments. 158 pp. Illus. 6x5 inches.

The Lunkenheimer Co., Cincinnati, Ohio. Booklet Lunkenheimer "Renewal Valves." 12 pp. Illus. 6x3½ inches.

Slocum, Avram & Slocum, Inc., 87 Nassau St., New York, N. Y. Folder Productograph. 4 pp. Illus. 9x6 inches.

Lane Mill & Machinery Co., Los Angeles, Calif. Catalog No. 7. Lane slow-speed Chilean mills. 54 pp. Illus., 6x9 inches.

Sprague Electric Works, 527 West 34th St. New York, N. Y. Catalog 905. Sprague Electric Hoists. 32 pp. illus. 9x4 inches.

Herman Bacharach, 14 Wood St., Pittsburgh, Penn. Catalog. Hydro volume and pressure recorders. 16 pp. Illus. 9x6 inches.

The Baldwin Locomotive Works, Philadelphia, Penn. Catalog Record No. 78, 1914. Locomotives for Industrial and Contractors' Service. 32 pp. Illus. 9x6 inches.

The Brown Hoisting Machinery Co., Cleveland, Ohio. Catalog P, 1914. Brownhoist Overhead Hand-Travelling Cranes. 36 pp. Illus. 9x6 inches.

Percy Pitman, 3, Willcott Road, Acton, London, W. England. Booklet. An Improved Governor for Water-Turbines. 22 pp. Illus. 8½x5½ inches.

The Ohio Brass Co., Mansfield, Ohio. Catalog No. 14—1914. Electric Railways Mine Haulage Systems and Transmission Lines. 606 pp. Illus. 9¼x6 inches.

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General Chemical Co., Herreshoff Furnace Dept. 25 Broad St., New York, N. Y. Bulletin No. 3. The New Herreshoff Furnace for Roasting Ores. 10 pp. Illus. 10x7 inches.

The Braun Corporation, 363-371 New High St., Los Angeles, Calif. Catalog Number 6. Scientific Apparatus, Laboratory Appliances, etc. 592 pp. Illus. 10x7 inches.

This catalog contains a very complete list of all articles used in scientific laboratory work and will be found of use to all assayers and chemists and should be in their files.

Link-Belt Co., Chicago, Ill. Advance Section A, General Catalog No. 110. Original Ewart detachable link-belt and sprocket wheels. 112 pp. Illus., 6x9 in. Book No. 190. Wagon and truck loaders. 32 pp. Illus., 6x9 inches.

Industrial Works, Bay City, Mich. Bulletin No. 212. Industrial Works Power Wheel and High Power Clam-Shell Buckets. 2 pp. Illus. 2x9 inches.

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Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 152. "Chicago Gatling" drills. 24 pp. Illus., 6x9 in. Bulletin No. 153. "Chicago Sinker." 20 pp. Illus., 6x9 in. Bulletin No. 154. "Chicago Stoper." 24 pp. Illus., 6x9 in. Bulletin No. 172. No. 5 Chicago plug and feather drill. 4 pp. Illus., 6x9 inches.

NEW PATENTS

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

ALUMINUM ALLOY and Method of Producing the Same. William A. McAdams, Bay Shore, N. Y. (U. S. No. 1,095,653; May 5, 1914.)

AMALGAMATING—Rifle and Amalgamator Box. Charles H. Oders, Redding, Calif., assignor to Sophy D. Oders, Redding, Calif. (U. S. No. 1,097,352; May 19, 1914.)

BISMUTH FROM COPPER, Process for Separating. William Thum, Hammond, Ind., assignor to United States Metals Refining Co., New York, N. Y. (U. S. No. 1,098,854; June 2, 1914.)

BRIQUETTING—Improved Process for Briquetting Iron Ore and the Like. G. Crusius, Kreise Peine, Germany. (Brit. No. 27,536 of 1913.)

CHARGING APPARATUS—An Improved Device for Use in Charging and Discharging Retorts, Muffles and the Like. R. von Zelewski, Engis, Belgium. (Brit. No. 12,120 of 1913.)

CONCENTRATING—Machine for Concentrating Ore and Other Materials. Leo Michael Andrew Zumbusch, Johannesburg, Transvaal, South Africa. (U. S. No. 1,096,087; May 12, 1914.)

CONCENTRATION—Improved Apparatus for Concentrating Ores. S. Michaelis, Aranyida, Hungary. (Brit. No. 10,972 of 1913.)

CONCENTRATOR. John Malcolm Nicol, Mill Valley, Calif. (U. S. No. 1,097,139; May 19, 1914.)

COPPER ALLOYS—Process of Hardening Copper Alloys Containing a Small Amount of Tin. Henry Bryda, Blackstone, Mass. (U. S. No. 1,095,804; May 5, 1914.)

CRUSHING—Grinding and Crushing Roll. Enos A. Wall, Salt Lake City, Utah. (U. S. No. 1,098,417; June 2, 1914.)

CYANIDING—Filtering Leaf. George W. Shepherd, New York, N. Y., assignor to Butters Patent Vacuum Filter Co., Inc. (U. S. No. 1,096,133; May 12, 1914.)

DIAMONDS—Apparatus for Breaking Diamonds. John F. Linderberg, Hibbing, Minn. (U. S. No. 1,096,849; May 19, 1914.)

DRILL Mather W. Sherwood, Franklin, Penn., assignor to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S. No. 1,098,690; June 2, 1914.)

DRILL—Fluid-Operated Percussive Tool. Lewis C. Bayles, Easton, Penn., assignor to Ingersoll-Rand Co., Jersey City, N. J. (U. S. No. 1,096,986 and 1,096,987; May 19, 1914.)

DRILL CHUCK. Ivar F. Lindberg, Milwaukee, Wis. (U. S. No. 13,724; May 12, 1914.)

DRILLS—Machine for Making and Sharpening Rock Drills and for General Forging. Carl Brown, Denver, Colo., assignor to the Champion Forging Machine Co. (U. S. No. 1,098,474; June 2, 1914.)

ELECTRIC FURNACE. Alf Scott-Hansen, Christiania, Norway, assignor to Norsk Hydro-Elektrisk Kvaestofaktieselskab, Christiania, Norway. (U. S. No. 1,096,321; May 12, 1914.)

ELECTRIC FURNACE working with an Electric Arc or Arcs for Melting and Extraction of Metal from Ore. Peter Krefting, Christiania, Norway. (U. S. No. 1,097,336; May 19, 1914.)

ELECTRIC SMELTING—Apparatus for Electrically Smelting Metal, Metal Ores and the Like. S. Guggenheim, Berlin, Germany. (Brit. No. 23,004 of 1913.)

EXCAVATING BUCKET. Charles B. King, Clarence B. Weston, Herbert E. Roush, and Louis R. Russell, Marion, Ohio, assignors to the Marion Steam Shovel Co., Marion, Ohio. (U. S. No. 1,097,029; May 19, 1914.)

EXCAVATION—Stirrup for Door-Latches of Excavating Dippers. Edward L. Pemberton, New Haven, Conn., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,096,451; May 12, 1914.)

FURNACES—Improvements in Furnaces Provided with Regenerative Chambers. H. Poetter and Poetter G. m. b. H., Düsseldorf, Germany. (Brit. No. 26,411 of 1913.)

HYDROMETALLURGY—A Method of Precipitating Iron from Solutions Containing Zinc and Iron. A. Ramen, Olympia, Helsingborg, Sweden. (Brit. No. 9064 of 1913.)

JIGGING MACHINE. Karl Schuchard, Beuthen, O. S., Germany. (U. S. No. 1,098,979; June 2, 1914.)

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ORE REDUCTION—Process of Reducing Ores. Harvey Carroll Alford, St. Louis, Mo. (U. S. No. 1,097,156; May 19, 1914.)

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SINTERING MACHINE. Eugene Hiram Laws, Salida, Colo., assignor to the Ohio & Colorado Smelting & Refining Co., Denver, Colo. (U. S. No. 1,097,592; May 19, 1914.)

SIZING—Apparatus for Sizing Comminuted Ore or Other Material. Harry W. Hardinge, New York, N. Y. (U. S. No. 1,098,497; June 2, 1914.)

SKULL-BREAKING APPARATUS. Alexander G. McGregor, Douglas, Ariz. (U. S. No. 1,097,105; May 19, 1914.)

SMELTER FUMES—Device for Treating Smelter Fumes. Olof V. Blom, Fresno, Calif. (U. S. No. 1,098,611; June 2, 1914.)

Editorial Correspondence

SAN FRANCISCO—June 4

Iron Chief Mining Co. Decision of the United States land office at Los Angeles, allows the company 80 iron mining claims and four millsites in the contest by the Government against the patenting of claims and millsites in the Eagle Mountains, Riverside County. The situation of the iron claims is 40 miles northeast of Mecca, a station on the Southern Pacific R.R. running between Colton and Yuma. Eagle Mountain district is 20 miles southeast of Virginia Dale district, which is in San Bernardino County. The original holdings of the Iron Chief included 146 mining claims and 8 millsites. Pending the hearing in the land office, the company withdrew 45 claims and 3 millsites, so that the decision of the land office actually canceled only 21 mining claims and one millsite. This action was begun in July 1911, by the filing of a protest by the field service of the general land office against the issuing of patents upon the ground that no mineral in place had been discovered upon a number of the claims. The decision of the local land office while probably not wholly satisfactory to the company is evidently of great importance because it will give the owners of the iron claims an opportunity to prove that they are ready to develop these claims, and undertake the production of iron. The Southern Pacific Co. is largely interested.

BUTTE—June 3

Electrifying of Milwaukee Railway between Deer Lodge and Three Forks is being carried on rapidly and trolley poles have been set for several miles from Three Forks. R. Beeuwkes, the electrical engineer in charge of the work, has returned from a trip to Chicago where he held a conference with officers of the road, and engineers from the electrical company, concerning substation plants, and the electric locomotives to be used.

SALT LAKE CITY—June 4

Right of State to Hold Land on Which Mineral has been Found is being argued in the local United States land office. The ground involved consists of 40 acres in Spring cañon, which the state land commissioners arranged to sell to Jesse Knight. Taking it for granted that the sale would be made, Knight used the land for a plant and headquarters for the Spring Cañon Coal Co. Meanwhile W. F. Olson, of Price, applied for a mineral location on the ground, which reflected on the title, and the state was unable to give a clear deed to the property. A piece of coal land juts into the 40 acres, but coal is not considered to be present in commercial quantity. Members of the state land board contend the ground is non-mineral, and therefore belongs under the classification of state lands.

HOUGHTON—June 6

Franklin's Development of the Allouez Conglomerate continues so good that the management believes it better policy to concentrate on opening this formation rather than resume general mining operations on the old lode. A stockpile of approximately 2500 tons of this conglomerate rock has been accumulated for treatment at the Point Mills plant. It is unlike the Allouez conglomerate as it was originally opened in the old Allouez properties in that it has every appearance of being of good grade. There are openings on the conglomerate now for a distance of 400 ft. These openings in drifts and drift stopes along the trend of the formation have recently been widened to 16 ft. The lode besides carrying a good copper-bearing rock practically all the way, shows commercial rock for better than 8 ft. on an average. The Allouez conglomerate as a rule is wide from foot to hanging but the copper streak ordinarily is confined to a narrow margin. It seems wider on the Franklin than anywhere else. There are some who have given the stockpile attention who assert that there may be some doubt as to the identity of this lode, that it may not be the Allouez conglomerate after all.

Operations on the Ashbed Lode in Keweenaw County are of interest owing to the favorable impressions which the recent developments in the Phoenix shaft have created. There is a good deal of misapprehension concerning the mineralization of Keweenaw County. Such good mines as the Ahmeek, Mohawk and Allouez, all profitable producers, are

in Keweenaw County. For many years their development was retarded because of the general prejudice against mining in that section of the Michigan copper district. In fact it was only after most persistent urging that the Mohawk was put on the market and the Ahmeek was idle for many years because the controlling interests in that property were loath to spend money in development work. This antipathy to opening mineral deposits in Keweenaw County was due to the fact that Keweenaw had produced a number of failures which had been costly to the shareholders. The three mines mentioned, the Allouez, Mohawk and Ahmeek are close to the border of Houghton County, at the extreme southerly end of Keweenaw County and a long distance from the scene of the earliest copper exploration work on the Keweenaw peninsula. Furthermore they are opened on the Kearsarge lode. This lode, where it has been opened in Keweenaw County, has not proved commercially profitable. The general condemnation of the Ashbed lode in the public mind is not warranted by circumstances. It is based on the assumption that all operations on this formation have started with great promise, showing rock that had every appearance of value but which yielded poorly in the mill. The very word, Ashbed, here is synonymous with leanness, yet such a conclusion is far from fair. The case of the Arnold property in Keweenaw County, which was quite extensively advertised throughout the East at the time of its market promotion and exploitation, does not warrant condemnation of the Ashbed lode. The opening of the Ashbed in the Arnold shaft was not extensive. The openings were narrow and when stamp mill work started the mine was not prepared for production. Expenditures for underground development had to be made with great economy for funds were limited. There was no rock selection. Owing to the desire of the Eastern management to get the mill in operation it was necessary to send practically all of the rock broken to the mill and the results showed eight pounds of copper per ton. This was in 1901, when the property closed down. While it is true that some of the rock ran as high as 17 lb. per ton at that time and there was one month when a showing close to that figure was made, the general average was half that. However, some of the men most competent to judge of Keweenaw operations, are confident, that if the Ashbed lode could be opened and operated extensively, with a daily tonnage of at least 1200, now considered necessary to success in any ordinary Lake Superior copper mine, profitable operations could be carried on with an average copper market of 15 cents.

DULUTH—June 6

Baraboo Iron Field of Wisconsin has been explored by the Steel Corporation but after having spent a large sum of money the company is abandoning the field having failed to find a profitable mine. The Freedom is being dismantled. With the pumps and the other machinery removed, the property will be abandoned. It is at this mine that the last operations in the field were conducted. Other tracts had been previously tested. A few years ago it appeared probable that the Baraboo country would vie with some of the districts of the Lake Superior region as a source of iron supply. Exploration with the diamond drill had shown the existence of ore and it was surmised that with shafts put down and lateral development undertaken the deposits would be found satisfactory. The entry of the Steel Corporation was hailed as an event of great significance, but the district has not come up to expectations. Not only is the ore liberally mixed with rock, but water is present in such abundance as to make operations decidedly expensive. On one level at its North Freedom mine the Steel Corporation had in commission no less than nine pumps. So wet is the sandstone formation that it is estimated that with the machinery stopped the mine will fill with water within two hours. Threatened adverse taxation legislation also discouraged the operators. It is believed unlikely that anything in the mining line will be undertaken at Baraboo for a long time to come, not by Lake Superior interests at least.

IRON RIVER—June 6

Movement of Ore from all the Ranges continues light, compared with the outgo a year ago. Only 500 carloads are

going forward daily from the Menominee district. A recent curtailment in that field has been made at Oglebay, Norton & Co.'s Bristol mine, the largest producer in the Crystal Falls country, where the working force has been cut to 170 men, a reduction of 100. The retrenchment here is due to lack of room to store the ore brought to the surface, the stockpile having, in fact, already encroached somewhat on the adjoining Ravenna ground. With a larger pump installed, the Enterprise Mining Co., successor to the Iron River Ore Co., is preparing to explore the Buchholz property in the Iron River field. A shaft sunk by the former operator is down 300 ft. The Buchholz is to the west and southwest of the Beta mine and it would appear it is well worthy an extensive test. At Iron Mountain, the Chicago & Northwestern and Chicago, Milwaukee & St. Paul railroads again are engaged in bolstering up their tracks which span the big pit at the Steel Corporation's Chapin mine. This is an annual, almost endless task. The pit is deepening steadily as the ore beneath is being taken out, and as the railroad tracks subside it is necessary to keep dumping earth along their course to maintain the grade. Material for this purpose is taken to the pit by the trainload. The maintenance of the tracks is a costly undertaking, but one it is impossible to avoid, since the contour of the country is such that the tracks cannot be shifted. Due to mining operations and the consequent instability of the surface, it has become necessary for the Chicago & Northwestern to change the route of its main line in the Norway district, east of Iron Mountain. The tracks will be removed south of the city. Five miles of line will be constructed. Preparatory to rebuilding its ore dock at Ashland, the Soo Line is assembling timber at that port. Directly navigation closes in the autumn, the pier will be demolished and during the winter a new structure will be built on the present foundations. The height of the dock will be 80 ft. It had been the intention to build a steel and concrete pier south of the present dock. Required realty was purchased, buildings were removed and preliminary construction work was started. It was decided later to postpone the erection of the proposed steel and concrete dock indefinitely. The new pier, while constructed of timber, will be thoroughly modern in equipment and will suffice for many years.

MARQUETTE—June 6

Jones Step-Process Plant is being built at Marquette on a site where there is a ledge of rock 22 ft. high. The stack of the furnace will be erected on top of this. The ledge eliminates the necessity for a concrete foundation and also the necessity for erecting concrete piers for the support of the horizontal tube in which the ores will be heated before reaching the furnace. The tube will be inclined from the stack on the top of the ledge to the furnace at the base. It will be 60 ft. long. The furnace will be 31 ft. high. By early next autumn all the buildings and equipment will have been completed and machinery installed. There is great interest in the work. In many quarters skepticism is naturally pronounced. However, John M. Longyear and the other men associated with the inventor have not underestimated the difficulties, and that they have gone into the undertaking on a scale involving such a generous expenditure is considered proof of their confidence in Jones.

A Concentrator For Low-Grade Ores is being built by Chicago men at the old Kloman mine at Republic, in the western end of the Marquette range. The proposed concentrator is designed merely for testing purposes and it will, it is understood, have a capacity of only 20 tons per day. There is no small amount of interest in this process. It is stated that funds are available for operations on an extensive scale, once it has been shown that the method will beneficiate iron ores. In this connection it is of interest to note that Rogers, Brown & Co. are installing a sorting system at the Portland mine at Michigamme, on the Marquette range. Mined by steam shovel after having been blasted, the ore will be treated in a large crushing plant erected a year ago. The material will pass from the crusher to the shipping pockets, conveyed there on a wide rubber belt, and as it passes four to eight men will pick out the rock. It is figured that the grade can be improved fully 10%. The expected production this season is 100,000 tons.

Republic Mine was taken possession of by the Cleveland-Cliffs Iron Co., June 1, it having been assured that the negotiations for the sale of the property would be ratified at the formal meeting of the stockholders of the Republic Iron Mining Co., set for June 10 at Philadelphia. Until recently, the Republic had for months been worked only four days per week. While the single-shaft program is retained, operations have now been expanded to six days weekly. It is the understanding that the mine was sold to the Cleveland-

Cliffs by the Cambria Steel Co. for \$600,000, which sum is to be paid, not in cash, but in ore. A large acreage is included in the transaction. No exploration on the various tracts will, however, be undertaken at this time. It is the belief that not only will the Lake Superior & Ishpeming R.R. in which the Cleveland-Cliffs and the Jones & Laughlin company are jointly interested, be extended to the Republic mine, but the Cleveland-Cliffs company will materially enlarge the hydro-electric plant which is part of its newly acquired possessions. This plant is on the Michigamme River, the waterpower of which is capable of much more extensive development.

SILVER CITY, N. M.—June 5

Parcel Post Ore Shipments amounted to 16 tons, shipped from Silver City to the Mogollon district in Socorro County, during the first half of April. The post offices of both camps are evolving into freight depots as a result of the 50-lb. parcel-post rate, which has been taken advantage of by all shippers to the Mogollon mines. Machinery, supplies and all commodities that can be shipped in 50-lb. packages are being sent to the Mogollons by parcel post at a saving over the regular freight rate. So far the Government has made no road improvements on the 90-mile highway from Silver City to Mogollon, as was first thought the parcel-post business would necessitate, but is shipping goods at a rate by which freighters would sustain a heavy loss.

Red River District Prospects are good. Recently, in this part of Taos County an oreshoot 5 ft. wide was cut on the Caribel property at a depth of 400 ft., and the ore is said to have assayed \$25 per ton in gold and silver, where intersected by a crosscut from the tunnel level. Exploration through the Anaconda tunnel cut two large shoots assaying 2% copper at vertical depths of 150 and 500 ft. The gold and silver-bearing fissures are usually confined to a part of the vein, the rest of the filling being too low-grade for profitable mining. This condition has led to much confusion in sampling. The tendency is to take samples of the entire vein between walls. The management of the Caribel was the first to recognize the existence of a definite pay streak in the veins, and what stoping was done in the course of development in 1913 was started with a view of taking every advantage for mining clean ore. Square-set mining was practiced. A mill hole is carried up between every third or fourth set, a face 7 ft. high being worked both ways from a raise. The ore is broken and shoveled into the mill hole. Where the ore is too narrow to allow room for another set of timbers, the vein matter is broken down and used for filling between mill holes, thus affecting a material reduction in the cost of hoisting waste. Most of the ore treated at the mill during June, July and August in 1913 was broken in development. The ground being easily broken with hand steel, and an abundance of timber is available. The cost for drifting and timbering averaged \$2.95 per ft. for the three months. The ore in the mine bin averaged \$15 in June, \$21 in July, and \$26 in August.

TORONTO—June 6

Control of the Calgary Oilfield, should the occurrence of oil in extensive commercial quantities be definitely established, it is practically certain will be held by the Canadian Pacific Ry., which owns the mineral rights on 288 sections of land, the bulk of its holdings being to the west and north of the Dingman well and on the fold or anticline. The Canadian Pacific in disposing of its lands to settlers, has retained all mineral rights. The Imperial Oil Co., the Canadian branch of the Standard Oil Co., has two representatives at Calgary regularly reporting on the situation. It is stated that the Imperial is planning to ship the oil from the Dingman well, should it be produced in sufficient quantities, to its new refinery on Burrard Inlet, near Vancouver and to utilize it for mixing with cruder oils imported from California and South America. A large 12,000-gal. tank is being installed at the Dingman well. The oil is being retailed to automobile users at \$13 per bbl. which is said to be the highest price ever paid for crude oil. Action has been taken by the Alberta government to prevent the display of misleading advertisements of oil company stocks either in the newspapers or in office windows. The police authorities of Calgary and other cities have been ordered to suppress them and prosecute offenders, who are liable to a penalty of \$250. The depths of the principal oil wells in the Calgary field are given as follows. Dingman, 2718 ft.; McDougall-Segur, 2450 ft.; Black Diamond, 1580 ft.; United Oils, 1570 ft.; British Alberta, 1520; Southern Alberta, 800 ft. It is reported that oil has been struck at Grouard, on Lesser Slave Lake, Alta. at a depth of 90 ft. Many claims for oil land have been filed and preparations are being made to sink several wells as soon as the equipment is obtainable.

The Mining News

ALASKA

SLUICING IN FAIRBANKS DISTRICT became general by end of first week in May. Six plants on Dome Creek commenced running gravel through boxes May 4. Two of these are No. 7 Below, one on No. 4 Below, one on Discovery, one each on Nos. 3 and 4 Above. On Cleary Creek, Nos. 8, 7 and 5 Above were reported to be working May 4; 40 men were employed on Discovery; and Nos. 4 and 5 Below were busy. On same date, one plant only was sluicing at Chatanika, but 11 others were busied with spring work. Johnson & Anderson, on 14 Below, obtain water from a ditch running up Cleary Creek and were thus able to sluice much earlier than other operators, who are dependent on water from Cleveland ditch.

SPRING BREAKUP OF ICE ON THE YUKON was one of the worst on record. The greatest damage was done at the town of Circle, where practically every business house suffered from the effects of the high water and the ice. The foundations of the wireless tower were undermined, and it was feared for some time that the tower would fall. The fact that for several days after the breakup the other stations in the interior of Alaska were unable to "raise" Circle caused much uneasiness for the safety of the residents, but this was dispelled when the operating force finally made the repairs necessary before messages could be sent and received. The water fell rapidly after the breakup, and sufficient provisions were saved so that there was no suffering from hunger. The ice on all the rivers in the interior was unusually heavy this year, owing to the long winter and the fact that the heavy snowfall was largely confined to the spring, thus affording no protection during the cold weather of the winter. The backward spring aided in delaying the breakup until there was an exceptionally large volume of water flowing. On this account, when a jam of ice did form, it backed the water high above the low banks and flooded large areas. Considerable fear was felt for the safety of Fairbanks, but the high water was a favorable factor there, since it allowed the ice to run freely without the usual jams. One jam formed on a bar six miles below the town, however, and this made a 20-ft. dam of ice across the river, inundating a large area. Several bridges in the vicinity of Fairbanks were destroyed, but that happens so regularly that it is no longer regarded as a misfortune, but is taken, along with the weather and the moon, as it comes. Sluicing was general in the Fairbanks district by the middle of May, and the cleanups were coming to town with gratifying regularity. It was estimated that the first boats for the outside would take at least \$500,000 in gold dust.

MORGAN (Fairbanks)—A hand drill has been taken to Twentymile district to test some placer claims in vicinity of recent discovery of pay.

NO. 9 BELOW, FAIRBANKS CREEK (Fairbanks)—Season's sluicing on Fairbanks Creek commenced May 5. Work on creek has been greatly delayed by backward season. It is thought that it will be June 10 before dredge, on No. 8 Above, is able to commence digging, since it is cheaper to allow machine to lie idle than to resort to artificial thawing.

WAGNER (Fairbanks)—Henry Wagner has ordered a new 3-drum American hoist for open-cut work on Goldstream. Hoist, which is expected to arrive early in July, will have 9x10-in. cylinders and steel gears. This operator already has one of the largest scraping outfits in district, consisting of two 50-hp. boilers, two 40-hp. boilers, two 4-ft. Bagley (bottomless) scrapers, one 3½-ft. Bagley scraper, two slip scrapers, and one 8½x10-in. 3-drum hoist.

NO. 2 BELOW, DOME CREEK (Fairbanks)—So called Cook-Ridenour tailings will be reworked this season by Rosenberg & Pepper under lease. Tailings piles extend from No. 2 Below down creek for nearly one mile. Claims from which they came were among richest on Dome Creek and produced a total of nearly \$2,000,000 in early days. In 1905, they became involved in litigation, which lasted until suit was settled by a decision from U. S. circuit court of appeals. Tailings piles have long been known to contain considerable gold, but they have not been worked since 1912; pending settlement of estate of Sullivan, a former owner of the ground. Lessees will use a 5½-in. Byron-Jackson pump in connection with a 20-hp. two-unit gas engine to get water for sluicing. Steel sluice-boxes have been especially constructed for the work.

ARIZONA

Gila County

INSPIRATION CONSOLIDATED (Miami)—Forms for main hoist at compressor and hoist house are completed, and pouring of concrete began last week. This foundation will contain 850 cu. yd. of concrete and will be approximately 70x40x8 ft., nearly covering entire space occupied by hoist room. Concreting of main shafts is progressing rapidly, an average daily advance of 5 ft. being made in each. At present work is being carried on at two points near 400 level, but two more crews are to be started at the bottom of the shafts. Three shifts of four men each will be worked continuously, a total of 48 men on this work. If present rate of advance is maintained shaft proper should be lined by Aug. 1, but because of varying conditions of ground through which they pass it is impossible to estimate exactly when work will be completed. All possible precautions are being taken to insure against movement of lining after it is once poured, and to this end all forms and braces are being left in place, none to be removed until two shafts are entirely finished. It is estimated that 150,000 bd. ft. of lumber and timber will have been used when job is complete. Design of forms and

bracing is such that all can be removed later and used for mine timbers. Carpenters and corrugators continue inclosing of conveyor housing, crusher plant and headframes. Last, however, are to be inclosed only as far as sheave platforms. All corrugated sheathing is to be weathered one year before being painted. That portion of the railroad passing through Geneva cut has been restored to normal conditions and possibilities of further tie-ups from slides have been reduced to a minimum. It was necessary to remove nearly 10,000 cu. yd. of rock to reduce sides of cut to required slope. Test mill is being operated at normal capacity, an average of 1000 tons daily being treated. The 66-in. Bradley crusher is installed and tests are to be made on it as soon as necessary launders and feeding conveyors are arranged. Tube mill is being subjected to rigid tests to determine its fitness for treating Inspiration ores, but results as to its efficiency are as yet too limited to allow of any final comparison between it and Hardinge mills. Several new ideas are being tried out on 8- and 12-compartment flotation machines, with idea of increasing their efficiency if possible. Riveting of main building and erection of concentrator bins continue, but, as foundations for shop extension are ready for steel, erection crew is to be taken from bin work so as to finish shop building and allow installation of various machines. Chief Electrical Engineer O. H. Ensign and staff of the United States reclamation service have completed their official inspection of the Government power line and report that the system is in good working order. With Magma Copper Co. at Superior nearly ready to start its concentrator and mine plant, the power being used from Roosevelt will be greatly increased.

CALIFORNIA

Amador County

KEYSTONE (Sutter Creek)—Twenty stamps of mill are being overhauled and are to be put in commission in June.

ARGONAUT (Jackson)—Vein has been encountered on 4050-ft. level and compares in size and character with ore shoots of upper levels.

CENTRAL EUREKA (Sutter Creek)—It is reported that an assessment of 3c. per share has been levied. Recently a good body of ore was developed at lowest level of mine and it is believed that with assistance of assessment, mine can be again placed on a paying basis.

Butte County

STRAUSS (Chico)—This mine on Butte Creek 23 miles from Chico will be reopened by George Henderson and Z. C. Corbett. Mine has been a producer. It is developed by tunnel 300 ft. long.

UNDINE CONSOLIDATED MINE OPERATING CO.—Following new officers have been elected: G. F. Dyer, president; E. Goble, vice-president; Charles Hudson, secretary and treasurer. Company has taken over Dyer mine on Butte Creek, 12 miles from Chico.

Eldorado County

UNION (Eldorado)—New mill was put in commission May 1.

EUREKA (Eldorado)—Mine has been bonded to W. J. Neale, of England. Property produced in early days, but was abandoned at 750-ft. level.

Kern County

SUNSHINE (Randsburg)—A new vein has been disclosed on 500-ft. level. This is said to be richest ore ever found in Stringer district. Grade of ore has not been made known.

SUMNER (Kernville)—The 240-ft. station has been completed and old five-compartment shaft will be open to 2000-ft. drainage level. Several lessees have applied for contracts.

Nevada County

HUDSON RIVER (Snow Point)—This drift gravel mine for several years under development by G. F. Clark, of San Francisco, has been temporarily closed down. No reason has been stated.

MURCHIE (Nevada City)—Drain tunnel is being cleaned out and it is reported that a large number of men will be put to work on development. A purchase option has been agreed upon by H. W. Miller, of New York.

NORTH STAR (Grass Valley)—Mine is maintaining an average production of \$100,000 per month. Main shaft has an incline depth of 6000 ft. First quarterly dividend of \$50,000 for year 1914 has been distributed. Last annual report showed that enough ore was blocked out to insure operation of two 40-stamp mills for several years.

Placer County

NATURAL GAS is reported on property of the Lincoln Clay Products Co., at Lincoln.

NEPTUNE (Josephine)—A new two-stamp mill is being installed. Water ditch is being cleaned out and development of mine is progressing.

GOLD BLOSSOM (Auburn)—Charles E. Bugg, of Rochester, Nev., is reported to have taken a purchase option. He will begin immediately to unwater mine and deepen 500-ft. shaft.

Mine is in Ophir district and is equipped with two 30-stamp mills.

Plumas County

ROSE QUARTZ (Quincy)—Mine and mill has been leased to H. Weil, of Sacramento. Development indicates that mine will become a profitable producer.

PLUMAS BONANZA (Onion Valley)—It is reported a new tunnel will be driven to tap the ore at greater depth, and that ore will be trammed direct to mill, saving hoisting.

PLUMAS-EUREKA MINES CO.—A suit has been brought in superior court at Oakland, by William C. Pershaker, a stockholder, for an accounting. It is alleged that mine has been a producer for some time, but pays no dividends.

Solano County

ST. JOHNS MINES CO. (San Francisco)—Stockholders of St. Johns Consolidated Quicksilver Mining Co. have been notified that company is being reorganized. Capitalization is to be scaled down from 300,000 to 50,000 shares. More than 50% of capital stock is owned by John Martin, Eugene J. de Sabla Jr. and associates. Clifford G. Dennis is reported to have taken a lease for 18 months, and will undertake development. Mine was for many years a large producer of quicksilver.

COLORADO

Clear Creek County

GEM (Idaho Springs)—Von Tilborg Leasing Co. continues active development and production on Newhouse tunnel level. Company is producing 1200 tons of ore per month, of an average value of \$15 per ton. Old Shaffer lease has been taken over by John R. White and associates and development is in progress.

Conejos County

SNOW IN PLATORO DISTRICT is going fast, and the roads are becoming passable again. Prospectors and mining investors are coming in to look for desirable properties.

GLACIER (Platoro)—A tunnel has been started at water level to cut known ore shoots at a lower level.

CHELAN (Platoro)—A blind vein has been uncovered that shows high-grade ore and property promises to become a shipper.

MAMMOTH & FOREST KING (Platoro)—Workings are being cleaned out and placed in shape for a thorough examination by prospective purchasers.

VALLEY QUEEN (Platoro)—Owing to a breakdown of pump and an unusual flow of water, operation of unwatering shaft to bottom level has been delayed.

Gilpin County

NINETY-ONE (Russell Gulch)—Work of sinking shaft has resumed after troubles with water.

ETHEL ALLEN (Central City)—Kramer Bros. have suspended operations owing to heavy inflow of water.

I. X. L. (Central City)—Water rose 40 ft. in two days owing to unusually wet weather and has stopped work in lower levels.

SARATOGA (Central City)—New mill, intended to cyanide dump and low-grade ore, was given preliminary run and will soon start up for continuous service.

FIFTY GOLD MINES (Black Hawk)—Through malicious interference of an unsuccessful bidder in recent bankruptcy sale of this large property, delivery of deeds to John B. Selvidge, of Denver, and beginning of new operations have been delayed. An early termination of this dispute is hoped for since resumption of work in these mines will be of tremendous benefit to county.

NOTAWAY (Central City)—Development continues on 750-ft. and 850-ft. levels with favorable results. Both headings on 850-ft. level are in pay ore. Vein has been opened a distance of 60 ft. on a 2-ft. vein of 2½-oz. gold ore. On 750-ft. level vein has been opened for a distance of 250 ft. in pay ore. Main shaft is now within a few feet of new 950-ft. level. Sinking has been temporarily discontinued on account of recent abnormal flow of surface water.

Lake County

MAID OF ERIN stock has been target in a suit started by Mrs. H. A. W. Tabor against estate of David Moffatt. Accounting was demanded by Mrs. Tabor for 71,000 shares said to have been given to Moffatt, in 1893, for a loan of \$40,000, but in Denver County court, Judge Rothberger denied this. Mrs. Tabor contends that accrued dividends should have liquidated loan.

Park County

HILL TOP (Fairplay)—Heavy summer shipments will commence soon as Colorado & Southern Ry. spur from Leavick to mine is cleared of its snow blockade. This will be about June 1.

San Miguel County

TOMBOY (Telluride)—Excavation is being done for new 400-ton cyanide mill.

SMUGGLER-UNION (Telluride)—It is reported that Sterling tunnel, being driven by Phil Flinn in interest with company has encountered good ore on striking Richmond vein at great depth on Galena Mountain, Cunningham Gulch.

San Juan County

GOLD KING (Gladstone)—New model, multiple-deck Wilfley slimer is being placed in commission by George Wilfley, son of the inventor A. R. Wilfley, after a winter's shutdown.

IDAHO

Coeur d'Alene District

SUCCESS (Wallace)—It is reported that mine has been offered for purchase to Butte & Superior company of Butte, Mont.

MICHIGAN

Iron

PEWABIC (Iron Mountain)—This mine is again working on full time and shipping from shafts and stockpile. About 15,000 tons are going forward every week. The ore movement from the Menominee range was heavier last week than during any similar period this year, though far below normal.

STATE TAX COMMISSION—Because an error was made by the state tax commission in placing a value on the Chapin mine of the Oliver Iron Mining Co., at Iron Mountain, it has been decided to revise the valuation of the entire city in order to make the proportions equal. The work will be started immediately.

CLIFFS SHAFT (Ishpeming)—This property of the Cleveland-Cliffs Iron Co., is the only mine on the Marquette range that is doing very much shipping. Considerable lump ore is going out daily from the big stockpile. The ore was sold on a five-year contract several years ago, and the company has made few sales thus far this season.

CLEVELAND-CLIFFS IRON CO.—J. H. Sheadle has been elected vice-president of the Cleveland-Cliffs Iron Co. He has held the office of secretary for a number of years and of late has been looking after the ore sales and lake transportation. S. Livingston Mather, son of S. M. Mather, of Pickands, Mather & Co., has been chosen as secretary, with offices at Cleveland.

REPUBLIC (Republic)—The Cleveland-Cliffs Iron Co., which purchased this mine from the Cambria Steel Co. on June 1, has placed John Bush, of Iron River, in charge, succeeding W. A. Siebenthal, who was transferred by the Cambria company to Vulcan. Mr. Bush was superintendent of the Ashland mine at Ironwood during the time that the Cleveland-Cliffs operated it, going to Iron River for the same company when the lease was surrendered. At Iron River, he looked after exploratory work being conducted there. Captain Peter Pascoe will remain as underground captain at the Republic.

MINNESOTA

Cuyuna Range

FIRST SHIPMENT OF CUYUNA ORE down the lakes was loaded during latter part of May from Northern Pacific dock at Superior into S.S. "G. A. Flagg" and barge "S. D. Warriner" of M. A. Hanna & Co. At Two Harbors approximately 170,000 tons has been shipped thus far this year and volume is increasing somewhat; 100 men were added during last week in May to Iron Range Ry. ore-handling crews.

A PESSIMISTIC TONE PREVAILS in this district, as in all other iron districts. No mine is operating three full shifts, and most but one. A peculiar condition is that not an open-pit mine is shipping ore, although a number of underground operations are shipping regularly. Rowe mine recently reduced to one shift; 150 men were thrown out by closing down of Barrows mine. In spite of this, development work goes on throughout district. Brainerd-Cuyuna shaft at Brainerd is being completed and Wilcox shaft east of Brainerd is working a full crew. At that shaft new town of Woodrow is flourishing, many new structures now being erected. Adams mine, further east but still on South range, is stockpiling steadily. Exploratory work is continued by Longyear & Co., on county poor-farm, but to date no merchantable iron ore has been encountered. Crosby, center of North range, is quiet, with many unemployed men. Recent developments at northern end of town indicate that another underground mine will no doubt be started before long, as Cuyuna Realty Co. has shown up a large tonnage of good ore on Chisholm & Williams tract adjoining Jamison & Peacock "forty." To west, much drilling is being done on land adjacent to Pennington pit. Jones & Laughlin, C. M. Hill Lumber Co. and Cuyuna Iron & Manganese Ore Co. are doing this work. Minneapolis, Mille Lacs & Northern Ry. has a number of representatives in district preparing to get into shape their proposed electric line from Minneapolis to Cuyuna range. Route planned traverses a large area of county's best agricultural land, which at same time presents good mineral possibilities, according to magnetic indications, but having scarcely been touched in an exploratory way.

BRAINERD-CUYUNA MINING CO. (Brainerd)—Quicksand strata overlying ore deposit has just been penetrated in No. 2 shaft. Steel piling was driven ahead of sinking.

ROWE (Riverton)—Two 2-stage pumps of 2000-gal. capacity each, will be installed for use in connection with hydraulic stripping, operating on a 12-in. main. Pit is ready for shipments.

CUYUNA-MILLE LACS (Crosby)—Loading has started from 25,000-ton stockpile. Lake Superior Iron & Chemical Co. has purchased 5000 tons for delivery to its various plants in Michigan and Wisconsin. Men are being taken on and it is announced that operations will begin at once.

AMERICAN MANGANESE MFG. CO. (Duluth)—Consolidation of various subsidiaries into this company has at last been completed in detail, and a directors' meeting was held at Philadelphia, Penn., June 8 to complete organization. Iron-ore shaft is stockpiling ore daily, and it is stated that both shafts will ship regularly in near future.

BARROWS (Barrows)—M. A. Hanna & Co., operating this mine through subsidiary, Virginia Ore Mining Co., have served notice on fee owners, Brainerd Mining Co., of cancellation of mining lease under which they have been operating. Mine has been closed down and operating company is preparing to ship its equipment to Michigan iron ranges. Reason assigned for this action is fact that operating company has recently developed an exceedingly large body of iron ore of similar grade in Michigan, which deposit can be mined by steam shovels. Barrows being an underground operation, cost of ore is higher, furthermore, unfavorable conditions at present exist in iron-ore circles, and low price of ore prevails. Barrows is pioneer of South range and has just completed

shipping a stockpile of over 50,000 tons. It has one of the best orebodies on South range, both as to size and grade, and will beyond doubt be opened again upon resumption of normal conditions in iron-ore trade.

Mesabi Range

GENERAL MESABI RANGE CONDITIONS—Hawkins mine at Nashauk of Wisconsin Steel Co., started up in full June 1 with a crew of 300 men. Washing plant was also started. Quinn mine at same place is working full time, but Pearson is inactive and La Rue nearly so. Forest fires have menaced some operations; Oliver Iron Mining Co. has had difficulty keeping fires away from Cypress mine at Buhl, but fires have now been quenched by rain.

CROSBY (Nashauk)—Boiler house, engine house, dry house and laboratory were completely destroyed by fire May 31; damage \$25,000.

STEEL CORPORATION—First semiannual instalment of 1913 taxes of corporation in St. Louis County, being half of total, were paid May 29, amounting to \$2,050,061.87. This was distributed as follows:

Active mines	\$1,301,313.94
Inactive mines	733,518.30
Duluth office building (Wolvin Bldg.)	2,389.94
Timber lands	2,098.05
Minnesota Steel Co. (steel plant at Duluth)....	10,751.54
	\$2,050,061.87

Steel Corporation is largest tax payer in Minnesota.

MISSOURI

Madison County

MINE LA MOTTE—Option on property has been turned over to a new company composed, so it is said, of some National Lead Co. stockholders together with certain Boston men. New company has already started development work with diamond drills.

MONTANA

Deer Lodge County

ANACONDA COPPER MINING CO. (Anaconda)—On morning of May 27, fire destroyed mill, drier, carpenter and blacksmith shops of company's brick plant, causing a loss of \$35,000. About \$20,000 of this amount is covered by insurance. It was stated that a temporary plant would be in operation within a few weeks to carry on work during present busy season.

Lincoln County

BIG CHERRY CREEK PLACERS (Libby)—Negotiations are under way for purchase of 2000 acres of placer ground on Big Cherry, owned by Howard Bros. and associates and situated 15 miles south of Libby on Snowshoe road. For last two months ground has been thoroughly prospected by drill holes which revealed presence of gravel carrying on an average 30c. in gold. It is expected that before end of season all necessary machinery and appliances will be in place to start work.

Madison County

FLORIDA-GIANT GOLD MINING CO. (Twin Bridges)—This will be name of company formed to take over properties owned by A. R. Jones, located in Bear Gulch, 12 miles from Twin Bridges. They are at present worked through two shafts each 900 ft. deep, from which orebodies are opened by crosscuts and drifts; 12,000 tons of ore are blocked out and 2800 tons are on dump ready for treatment as soon as cyanide plant is capable of taking care of output. Ore assays \$12 in gold and \$1 in silver. Capacity of cyanide plant is to be increased to 250 tons per day. Experiments at old plant have demonstrated that by crushing ore to ¼ in., 90% of gold can be saved.

Missoula County

TARBOX (Saltse)—A carload of machinery for this mine has been purchased at Butte and operations will be started as soon as installed. Shaft will be sunk from present depth of 400 ft. to 700-ft. level, and development work will be done.

Silver Bow County

TUOLUMNE (Butte)—In accordance with directors' decisions at last annual meeting, shaft sinking has proceeded to a point 75 ft. below 2400 level. When 2600-ft. level has been reached a station will be put in and crosscutting will be started toward vein. Cost of this development work is at present borne by funds on hand, having exceeded earnings from operations of mine.

BUTTE & LONDON (Butte)—Electric pump, having a capacity of 600 gal. per min., has arrived and will be installed on 1100-ft. level as soon as shaft has been unwatered to that level. Although present method of unwatering by skips is rather slow, 600 ft. of water have been removed or about two-thirds of entire amount. Normal flow of water is less than half capacity of new electric pump so that after its installation no troubles on account of water are anticipated.

BUTTE-MILWAUKEE (Butte)—A special meeting of company has been announced for June 29 at which proposition will be submitted to stockholders of selling property and dividing proceeds. At present over 93% of Butte-Milwaukee stock is owned by Butte & New York Copper Co., forming only assets of that company. This makes interest of both companies identical and there seems therefore no reason for existence of two companies, involving double expense for corporate maintenance.

CORBIN COPPER CO. (Butte)—It has been announced by company that on June 9 all stock on which owners have failed to pay assessment will be sold. Assessment of \$1 per share was levied by board of directors and made payable Nov. 14, 1913, in order to provide funds for continuing operations at company's properties. A number of shares of stock advertised for sale show names of President Edwards, of well known brokerage firms and Butte mining men. It is explained that this does not mean that these men refused to pay the assessment but that present owners of such stock failed to have change of ownership recorded in stock books.

MINERS' UNION—At a meeting held May 26, which packed Miners' Union Hall to overflowing, Socialist element in union was decisively defeated in voting for clerks and judges for annual election to be held June 3. Upon withdrawing majority of their candidates for office, Socialists or radicals announced their plans to bolt from regular organization of Western Federation of Miners and form a separate local of miners in Butte. This, if accomplished, will be without sanction of Western Federation and local will not be recognized by it. It is rumored that leaders of radical movement are planning to start a campaign over the state to form an organization in opposition to Moyer ticket in Western Federation. Departure of William Sullivan, the "Red" Socialist, for Canada, started rumor that radical element in Butte Union has a plan to affiliate with an element in British Columbia locals of Western Federation which is opposed to Moyer regime. Effect of this split in union, if successful, on future activities of Western Federation is looked forward to with a great deal of interest.

NEVADA

Churchill County

DISCOVERY OF LEAD ORE NEAR BROKEN HILLS DISTRICT has been made. This ore also assays well in silver, some specimens running over \$100 in lead and silver. Discovery is easily reached by auto from Fallon.

Douglas County

NEVADA DEEP MINES CO. (Como)—Pump has been installed at 300-ft. level in old shaft and is lifting water for milling. Mill was started recently and will be operated steadily. Several months' supply of ore is blocked out and development will be continued on this oreshoot. Further prospecting will also be done.

Elko County

EDGEMONT (Edgemont)—After having a careful examination of property made, English syndicate doing development has stopped all work.

Esmeralda County

TALLMAGE (Goldfield)—Development work at this property on Vindicator Mountain is opening some good-grade ore, from which ore of shipping grade is being sorted.

FLORENCE GOLDFIELD (Goldfield)—Stoping is again being done in hanging-wall shoot in south drift of 200-ft. level. Shoot is from 1 to 4 ft. wide and assays from \$15 to \$60. Returns on three cars shipped recently were from \$28 to \$36 per ton.

GOLD MOUNTAIN MINING & MILLING CO. (Hornsilver)—Discovery of rich gold-silver ore has been made on surface by lessees. Discoveries have also been made recently on other properties in district. It is reported that water will be piped in from Lida and that French Western Exploration Co. will build mill on its Orleans property.

JUMBO EXTENSION (Goldfield)—Ore will be treated in Goldfield Consolidated mill, arrangements having been completed. Some slight alterations are being made to section of mill which will handle this ore. Daily shipments will be from 80 to 100 tons. This ore was formerly treated in leased mill at Bonnie Clare. Shipping-grade ore will go to Millers' sampler as before.

Esmeralda County

TIN-GOLD PLACER NORTHWEST OF CARLIN has been discovered, it is reported. Good pinnings of gold have been made. Goldville Placer Co. has been formed. Dredging is considered.

Humboldt County

PLACER GOLD IN PINE FOREST RANGE was discovered recently. Discovery was made on tributary of Leonard Creek, 90 miles from Winnemucca and just across range from camp of Dyke. Discovery is said to be rich and shafts have proved channel to be 16 to 50 ft. deep.

HUMBOLDT CONSOLIDATED MINING CO. (Lovelock)—Vein has been cut by "Long" tunnel and is 5 ft. wide. Drifting to east will now be done. This property is in Wright's Cañon.

NEVADA SHORT LINE R.R. (Rochester)—Four miles of grading for proposed extension to Rochester has been completed and same amount is to be done. Heaviest grade will not exceed 7%. Rails are being purchased and road is expected to be completed by July.

Lander County

MILLER (Kingston)—Lessees are operating mine and mill. First shipment of bullion and concentrates was made from Austin recently.

AUSTIN-DAKOTA (Austin)—New tunnel, 300 ft. north of main incline, is being driven and is now in 50 ft. Station at bottom of incline shaft is completed and east and west drifting is under way. Drifting is also under way on tunnel level of incline shaft.

Lyon County

MONTANA-YERINGTON (Yerington)—New incline shaft has been sunk to 260-ft. level and some good-grade ore has been opened. Crosscutting to oreshoot is under way.

EMPIRE-NEVADA (Yerington)—Dexheimer lease has cut 4-ft. shoot of high-grade copper ore containing cuprite and chalcocite. Oberg lease has also cut shoot of good-grade ore in crosscut from old incline shaft. New raise has been lifted to surface, through which ore is now being hoisted.

NEVADA DOUGLAS (Ludwig)—Regular shipments are being made from Casting Copper mine and occasional shipments from Ludwig mine. Drifting on third and fourth levels and raising from 200-ft. level are being done, all in ore. New oreshoot assaying 4½% copper has been truck in raise from 700-ft. level of Ludwig mine. South drift on 800-ft. level has been driven 50 ft. in low-grade ore.

Mineral County

GOLD STRIKE NINE MILES WEST OF AURORA has been

made. Nine claims have been located in original group and surrounding ground is being rapidly staked.

ANDERSON (Luning)—Statement in these pages, issue of May 23, that Anderson mine is being worked by Mason Valley Mines Co. is in error. Option was given up by Mason Valley Mines Co. several months ago.

Nye County

TONOPAH BELMONT (Tonopah)—Regular dividend of 25c. per share or total of \$225,000 has been declared.

RAILROAD VALLEY SYNDICATE (Tonopah)—Drilling for potash and gaylussite in Railroad Valley has been abandoned.

MARRIS CHALCEDONY QUARRY (Manhattan)—Contract for tube-mill pebbles for Tonopah Belmont mill is being filled. These pebbles will be used in series of tests against Danish pebbles.

TONOPAH EXTENSION (Tonopah)—Bullion weighing 50,546 oz. and valued at \$36,390 was shipped from mid-monthly cleanup of mill. Oreshoot in Murray vein, on 950-ft. level, is now 20 ft. wide and of good grade. Dividend of 7½c. per share or total of \$71,250 has been declared.

BUCKSKIN (Millett)—Oreshoot assaying from \$10 to \$15 has been discovered in open cut, and drifting is now being done. In Park Cañon the Hattie group and the Twin River property are being worked. D. D. Sullivan mill at Millett is being overhauled preparatory to resuming operations. It is stated that this property may change hands.

Washoe County

GRANITE HILL (Reno)—Ground has been leveled for hoisting plant which will be built at once. Unwatering and retrimbering is being done.

CABIN NO. 2 (Olinghouse)—Oreshoot of milling grade has been discovered in old Dondero tunnel by lessees. Ore is being stored on dump and milling will commence soon.

PAYMASTER (Poehville)—Dumps have been sampled and will be sorted for shipment. New shaft is being sunk on adjoining property, and considerable development work is being done in district.

White Pine County

PONY EXPRESS (Ely)—Hydraulic mining is now being done on this property in Hogum gulch.

BOSTON ELY (Ely)—Diamond drilling from face of drift on 1100-ft. level of Emma shaft will be done to determine Matilda porphyry-lime contact.

NORTH CAROLINA

Montgomery County

UWARRA MINING CO. (Candor)—Company has just been given decision by supreme court in its suit over boundary line between its property and that of Iola company. Question of damages for Iola trespass will now be heard by referee; \$50,000 has been asked.

PENNSYLVANIA

Northampton County

BETHLEHEM STEEL CO. (South Bethlehem)—Announcement is made that the company has effected traffic arrangements with European ship owners to bring to the U. S. within the next two years a total of 750,000 tons of iron ore from the Tofo iron mines in Chile, recently leased by the company. This shipping contract is to be in effect until the fleet of ore carriers now being built especially for this traffic by Swedish transportation interests, is ready. The latter arrangement is to be for a long term of years. The British steamer "Epsom," which will be the first boat to bring in a cargo of Chilean ore under the traffic contract, is expected to reach Philadelphia in a few days.

TEXAS

Cherokee County

E & G BROOKE IRON CO. (Birdsboro)—It is reported that after being idle for 15 years iron-ore mines at falls of French Creek, near here, will resume operations June 15. For six months the owner of mines, Brooke company, has been pumping water out of shaft and underground workings. New hoisting apparatus has been placed in position and storage bins to hold 5000 tons of ore have been completed. Capacity of plant will be 150 tons of ore per day.

El Paso County

COPPER QUEEN (Van Horn)—Property is being fully prospected by shafts; 40 men are being employed.

CANNON (Van Horn)—Jesse Hitson is doing development work on 13 claims in this group.

UTAH

Iron County

GOLD SPRINGS MINING & POWER CO. (Modena)—Sale of this company's property including Jenny mine, and power plant at Modena, which was to have been conducted by Charles Baldwin, master in chancery at Parowan, has been postponed until June 29.

Juab County

TINTIC SHIPMENTS FOR MAY amounted to 659 cars, as compared to 539 cars in April. May output comes next to that of January, 684 cars, which had largest production of any month thus far in 1914. Shipments for week ended May 25 were 135 cars.

VICTORIA (Eureka)—Quartz-carrying gold has been found recently on 1200, and a winze is being sunk. Lead ore is being mined from stopes between 1000- and 1100-ft. levels.

DRAGON CONSOLIDATED (Silver City)—A fissure carrying lead ore is being followed on 1000 level. Most of the ore, which is being handled at Knight mill is coming from this company's tunnel.

MAY DAY (Eureka)—Orebody opened by Mitchell & Kitt lease has been worked on company account since June 1. Property is looking well and development is in progress on 700 and upper levels.

IRON BLOSSOM (Silver City)—This company's May output amounted to 100 cars. About 150 tons of copper ore monthly is being mined from between 600- and 700-ft. levels. Drifting is being done south on 1900-ft. level.

GRAND CENTRAL (Mammoth)—Ore of good grade has been followed for 400 ft. on 700 level, and by an incline nearly to 800. Present production is 100 tons daily. There is a large tonnage of low-grade ore on dumps and in stopes.

COLORADO (Silver City)—A decision has recently been handed down by Judge John A. Marshall of U. S. district court in which it is held that J. L. Wilson and others are not entitled to recover stock sold for assessment. Decision settled four pending suits for recovery on 15,000 shares. Stock has paid \$2.60 in dividends.

UNCLE SAM CONSOLIDATED (Eureka)—Report for year ended June 1, 1914, shows that during year there were shipped 1765 tons of lead-silver ore, valued at \$18.70 per ton, which brought \$33,013. Including cash on hand June 1, 1913, total receipts were \$36,300. Cash on hand June 1, 1914, amounted to \$881. Property is being operated under leasing system. John Dern is president.

Summit County

DALY WEST (Park City)—Preparations are being made for installing a hoist. Eight men are at work clearing up. A site for mill has not yet been decided on.

SILVER KING CONSOLIDATED (Park City)—Roads are improving and teams are hauling 10 loads of first-class ore daily from accumulation at mine. Connections will be made with incline from 1550, which is now down vertically to 1600-ft. level.

AMERICAN FLAG (Park City)—At Daly-Judge mill, tests are being made on zinc-sulphide ore from 1100 level of this property. Shipping ore from Easter vein is being put in bins. Milling ore from this vein is being developed for new custom plant of Park City Milling Co.

THREE KINGS SILVER MINING CO. (Park City)—This company has been recently incorporated to take over and work Nelson and Mineola groups of patented claims lying between Silver King Coalition and Silver King Consolidated. This ground is in "Nigger Hollow" section, northeast of Silver King Coalition.

CANADA

British Columbia

NOBLE FIVE (Slocan)—Repairs are being made to tramway. T. L. McAllister has left for Coast and management of property has been taken over by T. H. Lincoln.

Ontario

CARIBOU COBALT (Cobalt)—Company has declared a regular quarterly dividend of 2½% payable in June.

DOMESTIC EXTENSION (South Porcupine)—A meeting has been called for June 19 to pass a bylaw authorizing sale of 193,993 shares at 10c. per share.

BAILEY (Cobalt)—This mine has been closed down pending consideration of a proposal for reorganization. It will be kept pumped out in readiness to resume operations.

BUFFALO (Cobalt)—Mill report for April shows 6767 tons milled averaging 17 oz. per ton, from which was recovered 85,371 oz. This is a considerable decrease from previous month.

TOUGH-OAKES (Kirkland Lake)—Electric power from Charlton is available and company can now operate 10 drills. A crossoot has been started at 300-ft. level and has cut some mill ore but has not yet intercepted any high grade.

FOLEY-O'BRIEN (Gowganda)—Some 150,000 shares of treasury stock of Homestake Mines Finance Co., which controls Foley-O'Brien, will be offered at 80c. to provide funds for erection of a mill. Development on 250-ft. level is stated to have opened good-grade ore.

DOMESTIC LAKE (South Porcupine)—Report for last five months shows that several veins have been cut underground, but grade of ore is generally low. Manager states that possibilities for discovery of other ore are favorable. A bylaw was authorized for issuing 100,000 shares of treasury stock at 50c. per share.

CANADA REFINING & SMELTING CO. (Orillia)—Plant of this company was closed down June 2 and will remain closed indefinitely. It commenced operations for treatment of Cobalt ores three years ago. It was destroyed by fire in January, 1913, but partially rebuilt and has since been operated intermittently. It will be sold or dismantled.

MCINTYRE (Timmins)—Statement for year ended Dec. 31, 1913, shows average value of ore was \$5.18 and cost \$6.60. From Jan. 1 to Mar. 31, 1914, mill treated 11,190 tons averaging \$9.83. In March, average of ore was \$12.68. Report for year ended Dec. 31 was discouraging but since then conditions have improved.

INTERNATIONAL NICKEL CO.—Report of International Nickel Co. for fiscal year ended Mar. 31, 1914, shows net profits for year after deducting depreciation, exhaustion of mineral and all other charges of \$4,792,665. Earnings for year were \$6,566,786 and after deducting administrative and head office expense, depreciation, mineral exhaustion and amount paid out in dividends, the sum of \$454,759 was carried forward. Assets of company are placed at \$53,941,207, of which current assets amount to \$9,210,442, cash on hand being \$3,243,672. During fiscal year just closed, unsatisfactory conditions obtaining in steel industry coupled with lower prices received from output of copper, resulted in earnings being slightly less than for previous year. Many improvements were made in smelter and at mines, results of which will be seen in next few years' operations expressed in increased efficiency and capacity.

The Market Report

METAL MARKETS

NEW YORK—June 10

The general tone of the metal markets has been easy, with business inclined to dullness, almost, and a disinclination to buy far ahead.

MONTHLY INDEX NUMBERS

Month	1912	1913	1914	Month	1912	1913	1914	Month	1912	1913	1914
Jan.....	111	126	108	May....	118	126	111	Sept.....	127	118	...
Feb.....	109	125	115	June....	117	117	...	Oct.....	133	114	...
March....	111	125	110	July....	114	110	...	Nov.....	129	110	...
April....	115	124	107	Aug....	120	116	...	Dec.....	129	110	...

Average for year 1913, 118; year 1912, 119; year 1911, 112; year 1910, 115. Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Copper, Tin, Lead and Zinc

Copper—So far as sales are concerned the copper market for the week ended June 10 has been very quiet and has shown a steady weakness in prices. While the largest seller has held to 14c. as its price, what business has been going has been taken at lower figures, 13.80c., delivered 30 days, being accepted, while it is said that in one or two cases even a lower price has been taken.

Some small sales of Lake are reported at 14@14½c., cash. During the past three days a better feeling has been manifested and consumers seem to be taking more interest. This feeling has not yet reached the buying point, but has manifested itself in more frequent inquiries and a closer watching of the course of the market. Apparently buyers are taking more interest in the metal at the level of prices that have now been reached, and as consumers the world over are very poorly covered, it looks as though greater activity could shortly be expected. The average of our electrolytic quotations for the week is 13.708 cents.

The London market has fluctuated within narrow limits, around £61 10s. to £61 17s. 6d. for spot and £62 2s. 6d. to £62 10s. for three months. On June 10 the market was firmer and spot closed at £62 5s. and three months at £62 12s. 6d. per ton.

Base price of copper sheets is now 19¼c. per lb. for hot rolled and 20¼c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 15@15½c. per lb., carload lots at mill.

Copper exports from New York for the week were 9651 long tons. Our special correspondent reports exports from Baltimore for the week at 5215 tons.

Tin—The market is very sensitive. On June 4 London opened at an advance of £3, only again to decline £2 at the close. Orders from this side tended to steady the London market, and the Far East offered the metal in liberal quantities. These found ready takers and further demoralization was prevented. The close is firm at £141 10s. for spot and £142 17s. 6d. for three months, and about 31½c. for June tin here.

Lead—Lead continues to be the strongest and most active of the metals. Fair sales are reported at unchanged prices and there has been a good deal of inquiry. Some small sales for export have been made at about the current New York price, or a shade over. The close is steady at 3.90c. New York, and 3.82½c., St. Louis.

The European market is also firm, Spanish lead being quoted £19 10s. and English lead 7s. 6d. higher.

Spelter—The market is dull and featureless and somewhat lower prices have been made. At the close St. Louis is quoted 4.85@4.90c., with 5@5.05c., New York.

In London good ordinaries are quoted £21 7s. 6d.; specials 15s. higher.

Base price of zinc sheets is now \$7 per 100 lb., f.o.b. Peru, Ill., less 8% discount, with the usual extras.

Other Metals

Alumina—Business remains quiet and buying has been on rather a small scale. Orders are closely watched and there is a good deal of competition. Quotations are rather easier and the price may be put at 17½@18c. per lb. for No. 1 ingots, New York.

Antimony—Business continues limited by current consumptive demand and is not especially active. Ordinary brands—Chinese, Hungarian, etc.—are held at 5.75@6c. per lb. Cookson's is quoted at 7.15@7.35c., and for other special brands around 7c. is asked.

The recovery of secondary antimony in the United States in 1913 is estimated at 2700 short tons, an increase of 200 tons over 1912. The recovery was chiefly from alloys, such as hard lead drosses, babbitt metal, solder and type metal.

Quicksilver—A fair business is doing and prices show no change. The New York quotation is \$37.50@38.50 per flask of 75 lb.; for jobbing lots 54c. per lb. is asked. San Francisco, \$37 per flask for domestic orders and about \$2 less for export lots. The London price is £7 per flask, with £6 17s. 6d. asked from second hands.

DAILY PRICES OF METALS

NEW YORK								
June	Sterling Exchange	Silver, Cts. Per Oz.	Copper		Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
4	4.8860	56½	13.70 @13.80 13.65	31	3.90	3.82½	5.02½ @5.07½	4.87½ @4.92½
5	4.8875	56½	@13.75 13.65	30½	3.90	3.82½	@5.05 5.00	@4.90 4.85
6	4.8885	56½	@13.75 13.65	30½	3.90	3.82½	@5.05 5.00	@4.90 4.85
8	4.8875	56½	@13.75 13.65	30½	3.90	3.82½	@5.05 5.00	@4.90 4.85
9	4.8885	56½	@13.75 13.65	30½	3.90	3.82½	@5.05 5.00	@4.90 4.85
10	4.8870	56½	@13.75	31½	3.90	3.82½	@5.05	@4.90

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

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

LONDON

June	Silver	Copper				Tin		Lead		Zinc	
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'd	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
4	25½	61½	13.44	62½	67	140	142	19½	4.29	21½	4.64
5	25½	61½	13.39	62½	67	138	140	19½	4.24	21½	4.64
6	25½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8	26	61½	13.36	62½	67	139	141	19½	4.18	21½	4.64
9	25½	61½	13.44	62½	67	138½	140½	19½	4.18	21½	4.64
10	26½	62½	13.52	62½	66½	141	142½	19½	4.24	21½	4.64

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

Nickel—Quotations for ordinary forms—shot, blocks, or plaquettes—are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Minor Metals—Quotations for **Bismuth** are \$1.80 per lb. for imported, \$1.72 for metal from native ores—**Cadmium**, 750 marks per 100 kg.—81c. per lb.—at works in Germany—**Magnesium**, \$1.50 per lb., New York—**Selenium**, \$3@3.25 per lb. for lots of 100 lb. or over, and \$5 per lb. for small quantities.

Gold, Silver and Platinum

Gold—While the demand for gold is still strong it was not active enough to cause any premium to be paid on the open market in London, and the price remained at 77s. 9d. per oz. for bars. The Bank of England secured some of the gold offered. In New York a total of \$11,000,000 gold was taken for shipment to Paris, and it is said that more will go.

Gold in the United States, June 1 is estimated by the Treasury Department as follows: Held against outstanding gold certificates, \$1,138,602,869; in Treasury current balances, \$177,307,660; in banks and circulation, \$615,431,580; total, \$1,931,342,109. This total is a decrease of \$11,219,998 during May.

Platinum—Trade is fair and prices are steady. There is no change, dealers asking \$43@44 per oz. for refined platinum, and \$47@51 per oz. for hard metal.

If the reports published on another page are true, the supply of platinum ought before long to be increased by an appreciable quantity from Westphalia, in Germany. It is not impossible, however, that such a supply might be controlled by the French syndicate.

Iridium—Current price remains at \$76@79 per oz., New York.

Silver—The market has recently shown more signs of activity. It is reported that a more bullish feeling prevails in India, and the buying has recently been from that quarter by those who look for some improvement in price.

Shipments of silver from London to the East, Jan. 1 to May 28, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£3,066,000	£3,380,500	I. £314,500
China.....	299,500	40,000	D. 259,500
Total.....	£3,365,500	£3,420,500	I. £55,000

About \$2,000,000 in bullion—chiefly silver from Cobalt—went down in the "Empress of Ireland" wreck. It is quite possible that part or all of this may be recovered.

Coined Silver in the United States, June 1, is estimated by the Treasury Department as follows: Standard dollars, \$565,813,263; subsidiary coins, \$181,200,547; total, \$747,013,810. Of the standard dollars, \$479,579,000 are held in the Treasury against silver certificates outstanding.

Zinc and Lead Ore Markets

JOPLIN, MO.—June 6

Blende continues at \$43 high, the base being \$39@41 per ton of 60% zinc. About a dozen cars sold on a metal base of \$36@38. Calamine sold on a base of \$22@23 per ton of 40% zinc, and the average of all grades is \$37.82 per ton. One lot of lead ore sold at \$49 per ton, the base offerings remaining at \$46 per ton of 80% metal contents. The average of all grades is \$46.44 per ton.

SHIPMENTS WEEK ENDED JUNE 6

	Blende	Calamine	Lead	Value
Totals this week...	10,945,970	734,270	1,834,380	\$263,490
Totals 23 weeks....	239,308,790	15,639,580	41,603,750	\$5,859,795

Blende value, the week, \$213,300; 23 weeks, \$4,680,880.
Calamine value, the week, \$7600; 23 weeks, \$175,195.
Lead value, the week, \$42,590; 23 weeks, \$1,003,725.

PLATTEVILLE, WIS.—June 6

The market shows practically no change from last week: 60% zinc ore sold at a base price of \$39@39.50 per ton. The base price paid for 80% lead ore was \$48 per ton.

SHIPMENTS WEEK ENDED JUNE 6

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,664,290	80,000	598,800
Year	65,172,900	2,569,000	19,216,830

Shipped during week to separating plants, 2,811,340 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—June 10

The iron and steel trades do not show any notable change from recent reports. New business is coming forward slowly and production is not increasing largely.

So far as sentiment is concerned, there seems to be a somewhat better feeling. Business is closely watched and there is likely to be pretty sharp competition for any new orders of importance. Here and there, perhaps, there are some signs of improvement in a substantial way.

Quite a number of bridge orders have been placed, including some of considerable size.

Pig-Iron Production in May showed a considerable decrease from April. The reports of the furnaces, as collected and published by the "Iron Age," show that on June 1 there were 197 coke and anthracite stacks in blast, having a total daily capacity of 64,500 tons; a decrease of 6600 tons from May 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in the United States in May was 2,120,700 tons; for the five months ended May 31 it was 10,418,700 tons. Of this total 7,388,600 tons, or 70.9%, were made by the furnaces owned or operated by steel companies.

PITTSBURGH—June 9

A decidedly better tone is manifested throughout the iron and steel market, while the inquiry is much broader and there is some improvement in the actual volume of bookings.

Purchases of some 75,000 tons of Southern pig iron by the leading cast-iron pipe interest are likely to be followed by more general buying of Southern iron as in the past many consumers have followed the lead of this important interest.

The leading interest in sheets and tinplates reports bookings thus far this month considerably heavier than in the corresponding portion of May, and several other interests report slight increases. While the general view has been that steel bookings decreased continuously until the end of May, a few interests report that their bookings were heavier in May than in April, and reports are that the total bookings of the Steel Corporation began to increase early in May.

Steel mill operations probably average somewhat above the 50% which has been so commonly reported. It is difficult to see how steel mills could be operating at only one-half capacity when trustworthy figures show pig-iron production to be at a rate not under 24,000,000 tons a year, for the full capacity is certainly not 48,000,000 tons, and is hardly in excess of 35,000,000 tons.

The broader inquiry for steel products now noted runs both to prompt business, which is eagerly sought by the mills, and to contract business, which is much less eagerly sought. On desirable prompt orders the common figures are 1.10c. for plates and 1.12½c. for bars and shapes, but for third-quarter contracts the mills are disposed to hold out for 1.15c. on all three products. In sheets prices have suffered a trifle due to the more tempting business offered, and black sheets are frequently sold at 1.80c., the usual minimum having been 1.85c. Galvanized sheets remain at 2.75c. Wire nails have sold at \$1.50 and plain wire at 1.35c., the nominal quotations being \$1.60 on nails and 1.40c. on wire.

Pig Iron—The local market continues quiet, but with furnaces quite firm in their views as to prices. A sanitary ware interest has just bought 500 tons of No. 2 foundry at \$13.75, delivered Pittsburgh, from a furnace with a 75c. freight rate. There has been considerable business in malleable grades. One producer which normally makes basic iron has sold a fair tonnage of an off grade, suitable for some classes of malleable work, at \$12.75, Valley, but on straight malleable the market is not under \$13. The Valley market is as follows: Bessemer, \$14; basic, \$13; malleable, \$13@13.25; No. 2 foundry, \$13@13.25; forge, \$12.50@12.75, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market continues practically stagnant. There does not appear to be any variation from the regular quotation of \$33, Baltimore, for English or German.

Steel—The concession of 50c. from old nominal quotations of \$20 on billets and \$21 on sheet bars, noted lately as being possible, is now so well recognized that the market is being openly quoted at \$19.50 for billets and \$20.50 for sheet bars, at maker's mill, Pittsburgh or Youngstown. No sales are reported at any prices and there does not seem to be any inquiry. While most contracts nominally expire June 30, a great deal of tonnage will be carried over as consumers have not been taking out their full quotas. Rods are about \$25.50, Pittsburgh.

German Foreign Iron Trade, four months ended Apr. 30, included exports of 2,264,057 tons iron and steel; 176,161 tons machinery; total, 2,440,218 tons. Imports were 167,645 tons iron and steel and 32,146 machinery; total, 199,791 tons. This shows an increase over last year of 89,627 tons in exports, and a decrease of 37,114 tons in imports.

IRON ORE

Ore shipments from the Lake Superior region in May were 3,852,063 tons only. For the season to June 1 the total shipments were 8,150,599 tons in 1913, and 4,121,749 in 1914; a decrease of 4,028,850 tons. Shipments continue light, and a number of vessels are not in commission yet.

According to the "Iron Trade Review," some of the shipments of Chilean iron ore, for which charters recently were made, by the Bethlehem Steel Co. between Cruz Grande and Philadelphia, it develops, will be diverted to Europe, where some sales of this ore have been made at a reported price of 11c. per unit, delivered. The remainder of the tonnage of the three cargoes will come in at Philadelphia, as reported, and the first lot is expected to arrive in about a week. The shipments to this country will not come through the Panama Canal at this time, since only barge lots now may be handled.

Imports at Baltimore for the week included 4680 tons of manganese ore from Poti, Russia.

Iron-Ore Imports in Germany, four months ended Apr. 30, were 4,245,860 metric tons; exports, 650,471 tons. Imports of manganese ore were 233,140 tons; exports, 2234 tons.

COKE

Coke production in the Connellsville region again decreased last week, the total being reported by the "Courier" at 244,028 short tons; shipments, 252,437 tons. Production in the Greensburg and Upper Connellsville districts was 33,943 tons.

Connellsville Coke—The market continues stagnant. While many furnace coke contracts expire this month the buyers are indisposed to negotiate for fresh contracts, and may buy from month to month.

Prompt furnace is quotable at \$1.75@1.85 and contract at \$1.85@2, per ton at ovens. The "Big Four" producers of standard foundry coke had been quoting \$2.65 on contracts for deliveries beginning July 1, but lately one of them has dropped to \$2.50 and it is a question whether the other three will meet the new quotation. Some less well known brands are offered at \$2.50 down possibly to \$2.35 per ton.

Anthracite Shipments in May were 6,281,553 long tons, an increase of 285,811 tons over May, 1913. For the five months ended May 31 the total shipments were 28,881,807 tons in 1913, and 26,815,603 in 1914; a decrease of 2,066,204 tons this year.

German Exports of fuel for the four months ended Apr. 30 were 11,962,916 metric tons coal, 23,502 tons brown coal or lignites, 1,786,377 tons coke and 1,085,051 tons briquettes. Imports were 2,934,902 tons coal, 2,131,097 tons brown coal, 183,790 tons coke and 55,251 tons briquettes.

CHEMICALS

NEW YORK—June 10

The general markets remain rather inactive, and business is approaching the usual summer quietness.

Arsenic—The market continues slow, with a light demand only. The prices are unchanged, however. Quotations are \$3 per 100 lb. for both spot and futures.

Copper Sulphate—Business remains on a fair scale. Prices are unchanged, \$4.65 per 100 lb. being quoted for carload lots, and \$4.90 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is seasonably moderate, but prices are steady, at 2.15c. per lb. for both spot and futures.

NEW CALEDONIA ORES

Exports of ores from New Caledonia, three months ended Mar. 31, as reported by the "Bulletin du Commerce" of Noumea, were 21,709 metric tons of nickel ore and 15,336 tons of chrome ore. Exports of metals were 1244 tons of nickel matte and 24 tons of cobalt matte.

PETROLEUM

The Royal Dutch Petroleum Co. has declared dividends amounting to 48% for the year 1913. The Shell Transport & Trading Co., which is combined with the Royal Dutch in opposition to the Standard, is expected to pay 35% for the year.

It is announced that the British government will take \$32,000,000 stock in the Anglo-Persian Oil Co. It will hold a

controlling interest and its representatives on the board will have power to veto any action taken.

OTHER ORES

Imports and exports of ores, other than iron and manganese, in Germany, three months ended Mar. 31, are reported by "Glückauf" as below, in metric tons:

Ores:	Imports		Exports	
	1913	1914	1913	1914
Gold and silver.....	537	411	1	1
Copper.....	6,654	8,098	6,149	3,259
Tin.....	4,075	4,413	.....	.....
Lead.....	33,921	48,970	1,368	902
Zinc.....	77,972	85,712	4,964	9,362
Nickel.....	2,602	7,551	.....	.....
Wolfram (tungsten).....	1,240	1,318	87	95
Minor metals.....	4,650	5,188	2,928	4,475
Chrome ore.....	2,548	830	146	51
Pyrites.....	214,205	225,356	7,197	6,188

Imports of slag and slag products were this year 238,922 tons; exports, 37,051 tons.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	January	February	March	April	May
Alaska shipments	2,701,258	1,803,579	2,069,960	1,279,537	.....
Anaconda.....	24,400,000	21,300,000	23,800,000	22,900,000	23,500,000
Arizona, Ltd.....	3,474,000	3,062,000	3,286,000	3,570,000	.....
Copper Queen...	8,796,358	6,987,366	7,637,042	7,562,723	8,388,203
Calumet & Ariz.....	5,975,000	5,596,850	5,875,000	5,450,000	.....
Chino.....	6,488,220	5,642,426	5,399,814	5,526,591	.....
Detroit.....	1,590,681	1,814,214	1,973,725	1,790,926	2,105,034
East Butte.....	1,256,000	1,193,960	1,546,180	1,178,000	1,179,962
Giroux.....	148,411	90,017	287,980	45,948	.....
Mason Valley.....	944,000	1,254,000	1,250,000	862,000	916,000
Mammoth.....	1,625,000	1,400,000	1,800,000	1,850,000	1,750,000
Nevada Con.....	5,791,122	4,588,243	5,218,257	4,880,043	.....
Ohio.....	700,728	582,000	597,520	610,518	.....
Old Dominion....	2,797,000	3,066,000	2,997,000	2,779,000	3,302,000
Ray.....	5,705,000	5,432,000	6,036,908	6,089,362	.....
Shannon.....	937,432	903,761	1,082,000	1,012,000	1,056,000
South Utah.....	275,569	333,874	406,381	247,641	.....
Tennessee.....	1,474,890	1,232,812	1,262,184	1,370,800	1,336,950
United Verde*....	3,000,000	2,700,000	3,100,000	3,000,000	.....
Utah Copper Co....	10,329,564	9,207,111	12,323,493	12,739,757	.....
Lake Superior*....	7,400,000	8,500,000	11,000,000	13,000,000	.....
Non-rep. mines*..	8,200,000	7,600,000	8,200,000	8,000,000	.....
Spray, etc.....	2,500,000	2,500,000	2,500,000	2,500,000	.....
Total prod.....	106,600,238	96,790,213	107,036,667	108,554,846	.....
Imp., bars, etc... Total blister... Imp. ore & matte..	24,504,249 131,104,482 10,893,969	19,918,448 16,708,661 9,713,164	22,676,605 129,713,272 7,029,646	...............	...............
Total Amer.....	141,998,968	126,421,825	136,742,918	.....	.....
Miami.....	3,258,950	3,316,482	3,361,100	3,130,772	3,347,000
Shattuck-Arizona	1,276,636	1,134,480	1,136,458	1,886,594	.....
Brit. Col. Cos.: British Col. Cop.. Granby..... Mexican Cos.: Boleof..... Cananea..... Moctezuma..... Other Foreign: Braden, Chile.... Cape Cop., S. Af. Kyshtim, Russia. Spassky, Russia..	607,930 1,793,840 2,369,920 3,460,000 3,024,556 2,430,000 519,680 1,559,040 902,720	1,661,212 1,984,080 2,688,000 2,642,543 2,362,000 459,200 1,534,400 902,720	1,775,852 2,535,680 4,260,000 2,882,884 1,810,000 660,800 896,000	1,692,102 2,204,720 2,632,000 2,654,926 2,720,000 468,160 904,960	..... ..... ..... ..... 2,834,616 2,480,000
Exports from Chile..... Australia..... Arrivals—Europe†	5,488,000 5,712,000 8,599,360	6,720,000 7,952,000 18,354,560	6,944,000 8,176,000 17,572,800	9,072,000 7,168,000 17,299,520	...............

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.
‡ Does not include the arrivals from the United States, Australia or Chile.

COPPER STATISTICS

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
VI, '13	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.....	138,074,602	58,904,192	78,480,071	52,814,606	77,904,000	124,808,606
VIII.....	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX.....	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X.....	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI.....	134,087,708	48,656,858	70,067,803	32,566,382	48,787,200	81,353,582
XII.....	138,290,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr. '13	1,622,450,829	767,261,760	869,062,784	.....	.....	.....
I, 1914	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,355,667
II.....	122,561,007	47,586,657	83,899,183	87,296,685	50,108,800	137,405,485
III.....	145,651,982	69,852,349	89,562,166	78,371,852	47,376,000	125,747,852
IV.....	151,500,531	63,427,633	82,345,216	64,609,319	46,435,200	111,044,519
V.....	142,308,287	55,592,170	72,710,477	70,337,001	62,371,200	122,708,201
VI.....	.....	.....	.....	84,342,641	61,062,400	145,405,041

Note—Visible supplies in Europe do not include copper afloat.

Mining Companies—United States

Table listing Mining Companies in the United States with columns for Name of Company and Situation, Shares (Issued, Par), and Dividends (Total, Latest, Amt.).

Mining Companies—United States—(Continued)

Continuation of Mining Companies in the United States with columns for Name of Company and Situation, Shares (Issued, Par), and Dividends (Total, Latest, Amt.).

Iron, Industrial and Holding Companies

Table listing Iron, Industrial and Holding Companies with columns for Name of Company and Situation, Shares (Issued, Par), and Dividends (Total, Latest, Amt.).

Canadian, Mexican and Central American Companies

Table listing Canadian, Mexican and Central American Companies with columns for Name of Company and Situation, Shares (Issued, Par), and Dividends (Total, Latest, Amt.).

*Previous to reorganization, \$5,258,881. †Previous to January, 1910, \$324,644.

Assessments table with columns: Company, Delinq., Sale, Amt. Lists various companies like Argenta, Bellerophon, Buffalo, etc.

Monthly Average Prices of Metals

SILVER

Silver price table with columns: Month, New York (1912, 1913, 1914), London (1912, 1913, 1914). Lists monthly prices from January to December.

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

COPPER

Copper price table with columns: Month, New York (Electrolytic, Standard, Best Selected), London (1913, 1914). Lists monthly prices from January to December.

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

TIN

Tin price table with columns: Month, New York (1913, 1914), London (1913, 1914). Lists monthly prices from January to December.

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

LEAD

Lead price table with columns: Month, New York (1913, 1914), St. Louis (1913, 1914), London (1913, 1914). Lists monthly prices from January to December.

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

SPELTER

Spelter price table with columns: Month, New York (1913, 1914), St. Louis (1913, 1914), London (1913, 1914). Lists monthly prices from January to December.

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

PIG IRON IN PITTSBURGH

Pig Iron price table with columns: Month, Bessemer (1913, 1914), Basic (1913, 1914), No. 2 Foundry (1913, 1914). Lists monthly prices from January to December.

STOCK QUOTATIONS

Stock Quotations table with columns: Name of Comp., Bid. Lists companies like Acacia, Beck Tunnel, Black Jack, etc.

TORONTO June 9

Toronto stock table with columns: Name of Comp., Bid. Lists companies like Bailey, Conlacas, Peterson Lake, etc.

SAN FRANCISCO June 9

San Francisco stock table with columns: Name of Comp., Bid. Lists companies like Comstock Stocks, Alta, Belcher, etc.

N. Y. EXCH. June 9

New York Exchange stock table with columns: Name of Comp., Clg. Lists companies like Adventure, Ahmeek, Alaska Gold, etc.

N. Y. CURB June 9

New York Curb stock table with columns: Name of Comp., Clg. Lists companies like Beaver Con., Big Four, Boston Montana, etc.

BOSTON CURB June 9

Boston Curb stock table with columns: Name of Comp., Bid. Lists companies like Bingham Mines, Boston & Corbin, Boston Lyon, etc.

LONDON May 29

London stock table with columns: Name of Comp., Clg. Lists companies like Camp Bird, El Oro, Esperanza, etc.

Last Quotation.