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NUMBER 1

Hidden Creek Smelting Works

By C. CARLETON SEMPLE

SYNOPSIS—General description of the salient features of the new smelting works of the Granby Consolidated company at Anyox, in the Skeena Mining Division, British Columbia.

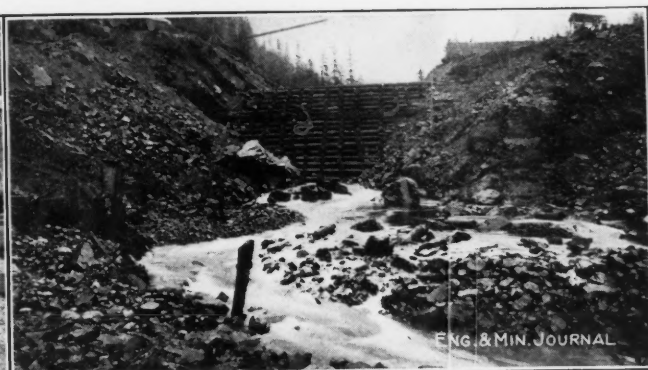
The Hidden Creek reduction works of the Granby Consolidated Mining, Smelting & Power Co., Ltd., is rapidly approaching completion, and early in 1914 is expected to be ready for blowing in on ores from the company's mines nearby, in which some 8,000,000 tons of ore containing

two miles by road. A 3-ft. gage electric railroad connects the wharf with the smelter and the reduction works with the mines, the total length of connecting tracks being $4\frac{1}{2}$ miles. The mines are at considerable elevation above tidewater, which necessitated building a switchback in the line between the smelting plant and the wharf. The direct haul from the main mine-haulage way to the works is 9600 ft. Hauling will be done by 42-ton Baldwin-Westinghouse electric locomotives drawing ore cars of 25 tons capacity.



SILLS OF HIDDEN CREEK PIPE LINE JULY 26

The pipe line is built of wooden staves; the dam is rock-filled cribwork.



THE DAM AT FALLS CREEK NOV. 13

more than 2% copper have been developed; and incidentally a much larger tonnage of lower-grade ore. The Granby company has recently acquired other mines along the coast of British Columbia, which will later ship ore to the new works, and there are possibilities of custom tonnage. Because of the higher tenor of the Hidden Creek ores, the new works of 2000 tons daily capacity will produce as much copper as the older plant at Grand Forks, B. C., which smelts more than double this tonnage.

The works are on Granby Bay, formerly called Goose Bay, an indenture in the western shore of Hastings Arm, which, with Alice Arm, merges into Observatory Inlet. The Burniston range of mountains, rising to an elevation of 5710 ft., separates Observatory Inlet from Portland Canal; the mines and reduction works are on the eastern foothills of this range. The settlement is called Anyox, and being on deep water is directly accessible to ocean-going steamers. There are usually two steamers that arrive weekly from Vancouver.

The mines are one mile in a direct line from Anyox;

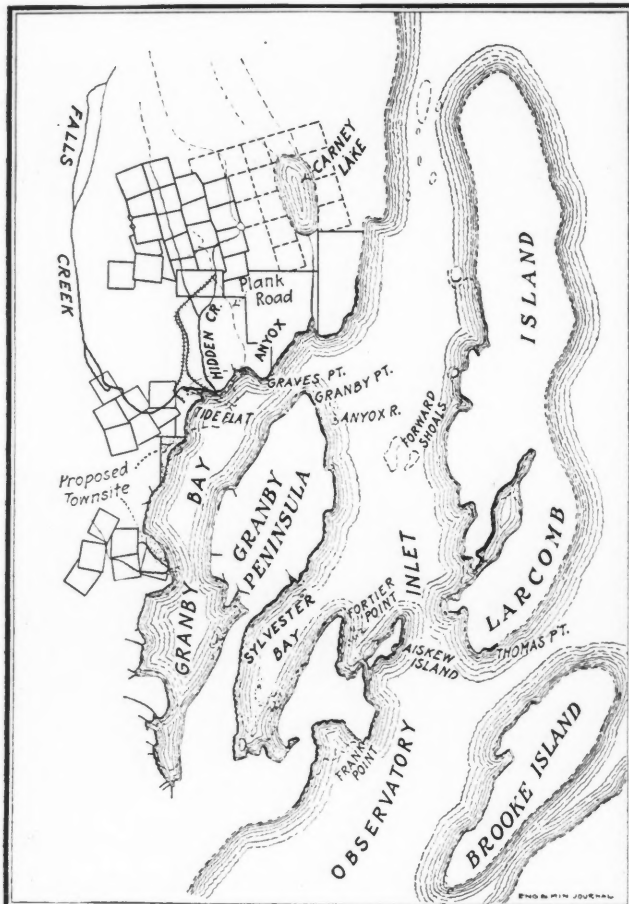
The ore is chalcopyrite and pyrite in slates and schists. Two distinct orebodies have been opened, one yielding heavy sulphide and the other siliceous sulphide ore. To date, workings consisting of 40,600 ft. of diamond drilling, 17,300 ft. of tunnels, and 4200 ft. of raises have developed 8,000,000 tons of ore containing more than 2% copper and 15,000,000 tons of ore containing over $1\frac{1}{2}$ % copper. Electric haulage is used in the mines, in which no timbering is required.

Ground clearing at the works site was begun about one year ago, and the first work consisted in cutting down and burning the forest growth. Hydraulic grading was used in excavating in loose ground, the accompanying view of the smelter site showing a monitor in operation on the cleared ground. The progress of construction work may be gaged from the progress pictures in this week's "Photographs From the Field" which show successive stages in the erection of the main smelter building.

The ore from the mines will be weighed in the 25-ton cars on a 40-ft. 80 ton capacity track scale, thence will be dumped into the ore bins of 8000 tons capacity over

the tops of which the tracks from the mine line run. The ore will be drawn from the bottom of these bins into the charge cars, running on a track 35 ft. below the grade of the mine track.

The furnaces, of which there are three, are 50 in. wide by 30 ft. long, and are the regular type of rectangular water-jacketed matting furnace made by the Traylor Engineering & Mfg. Co. The furnaces are provided with $4\frac{1}{2}$ -in. tuyeres at 10-in. centers. The slag tap is at



MAP SHOWING LOCATION OF HIDDEN CREEK PROPERTIES
Smelter site is at mouth of Falls Creek; mine claims are indicated by square or irregular outline.

the side. The converter room is in one end of the main smelter building, in which are three converter stands. The converters of the Great Falls type are 12 ft. in diameter.

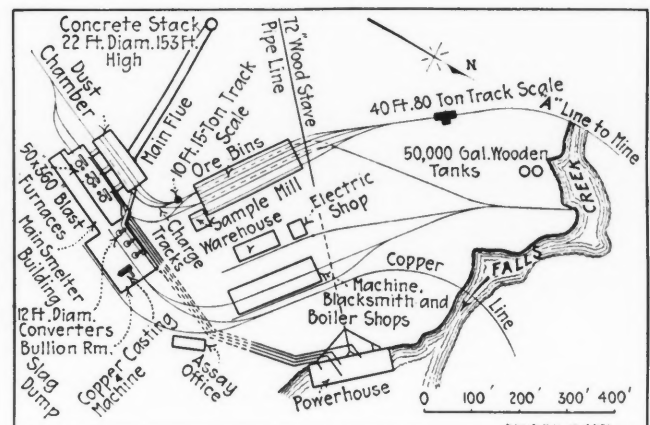
The downtakes from the furnaces, and the flue from the converter hoods, lead into a large dust chamber at the side of the main smelter building. From the center of the chamber the main flue leads up the hill to the reinforced-concrete stack 22 ft. in diameter by 153 ft. high, the top of which is about 300 ft. above the furnaces.

The Granby company has secured from the British Columbia government the right to reclaim a large area of ground by filling in a shallow-water area in Granby Bay directly in front of the smelter site with slag. Thus is a convenient dumping ground for the slag obtained, and as the dump grows, the area of the company's new-made land will gradually increase.

Power will be generated at a hydro-electric plant, on Granby Bay, just below the smelter site. The water of

Falls Creek will be impounded by a crib and rock-filled dam, one mile back of the smelter. A 6-ft. wooden-stave pipe will convey the water from the reservoir to the Pelton wheels in the power house, at an available head of 400 feet. The power-house equipment includes two electric generators, of 938 kv.-a., with exciters; two motor-generator sets of 300 kw. each; three Connersville blowers, with Pelton buckets on flywheel of blowers, with a capacity of 48,000 cu.ft. of free air per min., supplied at 3 lb. pressure; and a Nordberg blowing engine, with a capacity of 21,500 cu.ft. of free air per min., at a pressure of 16 lb. A Nordberg compressor is also installed in the building, which has a capacity of 4000 cu.ft. per min. at 100 lb. pressure. The blowing engine and compressor are provided with buckets on the flywheel, the same as the blowers.

The company will, for the present, secure coke and such coal as is needed, from the Crow's Nest Pass mines, in southwestern Alberta and also from mines near Tacoma, Wash. Later there is a possibility that the company will get its coal from a region southeast of the Portland Cement district, and there is another deposit on the northern part of Graham Island, both of which places will supply coking coal of excellent quality. Fuel from either of these sources will be cheaper than Crow's Nest Pass fuel, which has to be hauled a con-



GROUND PLAN OF HIDDEN CREEK SMELTER

The four lines running from power house to smelter building indicate blast pipes for furnaces and converters.

siderable distance by rail from the mines to the British Columbia coast. Limestone for flux will come from a deposit on the Portland Canal 25 miles below Stewart.

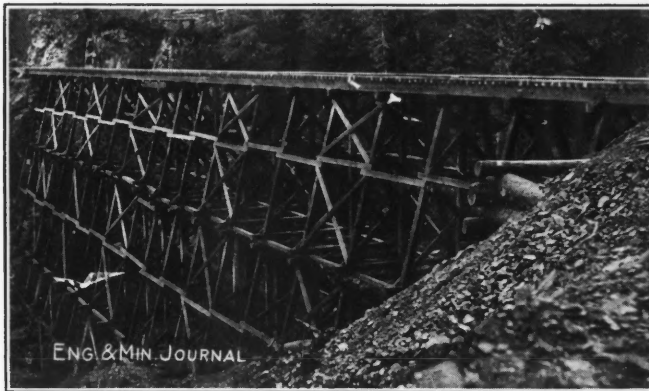
The company has built a town, Anyox, near the smelter, and a good sized camp at the mines. A hundred cottages, with mess and sleeping quarters for 600 men, with all modern conveniences, have been built for housing employees. Besides these cottages, there is an office building, telegraph office, custom office, recreation hall, hotel, a school for the children of employees in charge of a woman teacher, and a hospital. The government telegraph line to Stewart, on the Portland Canal, close to the International Boundary, passes through Anyox. The photographs illustrating this text, and the pages of "Photographs from the field," which follow, show the extent and rate of progress of the work done in this farthest north reduction works on the American continent. These notes are published through the courtesy of W. A. Williams, superintendent of smelters for the Granby Company.

Photographs from the Field



HIDDEN CREEK ORE-BIN FOUNDATIONS AUG. 15 AND POWER-HOUSE SITE JULY 11

The appearance of these structures in some of the other views shows how rapidly construction work has been carried on at this new copper smelting works of the Granby Consolidated Mining, Smelting & Power Co.



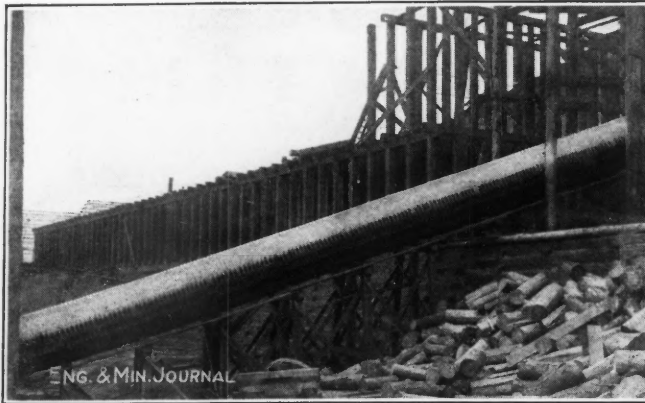
HIDDEN CREEK TRESTLE STATION 58, MAY 30, AND PIPE-LINE TRESTLE A, SEPT. 26

The trestle is on the railroad connecting mine, smelter and wharf. The 6-ft. pipe line delivers water at power house under 400-ft. head.



ELECTRIC REPAIR SHOP AND WAREHOUSE, AND INTERIOR OF POWER HOUSE NOV. 13

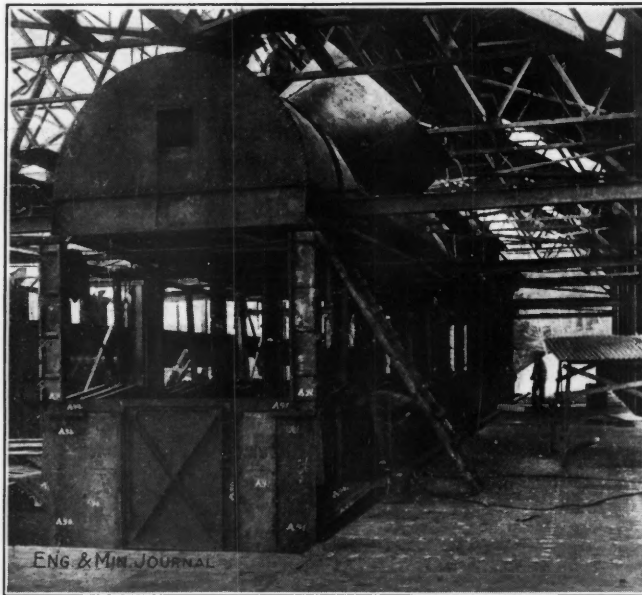
The blowers, compressors and generators are driven by Pelton wheels.



HIDDEN CREEK PIPE LINE AND ORE BINS, OCT. 13

ORE BINS AND SAMPLE MILL, NOV. 13

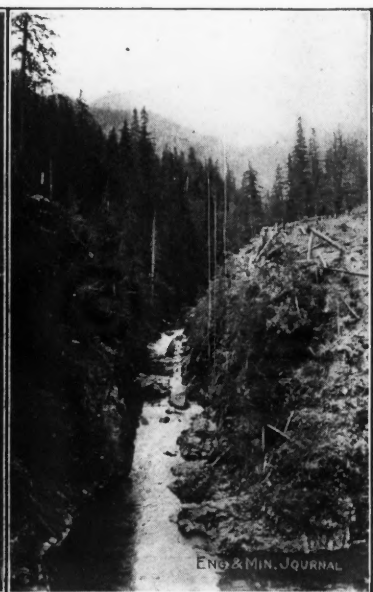
The capacity of the ore bins is 8000 tons.



BLAST-FURNACE FEED FLOOR, OCT. 25

CONVERTER STANDS, OCT. 11

The three furnaces are of 2000 tons total daily capacity. The three converters are of the Great Falls type, 12 ft. in diameter.

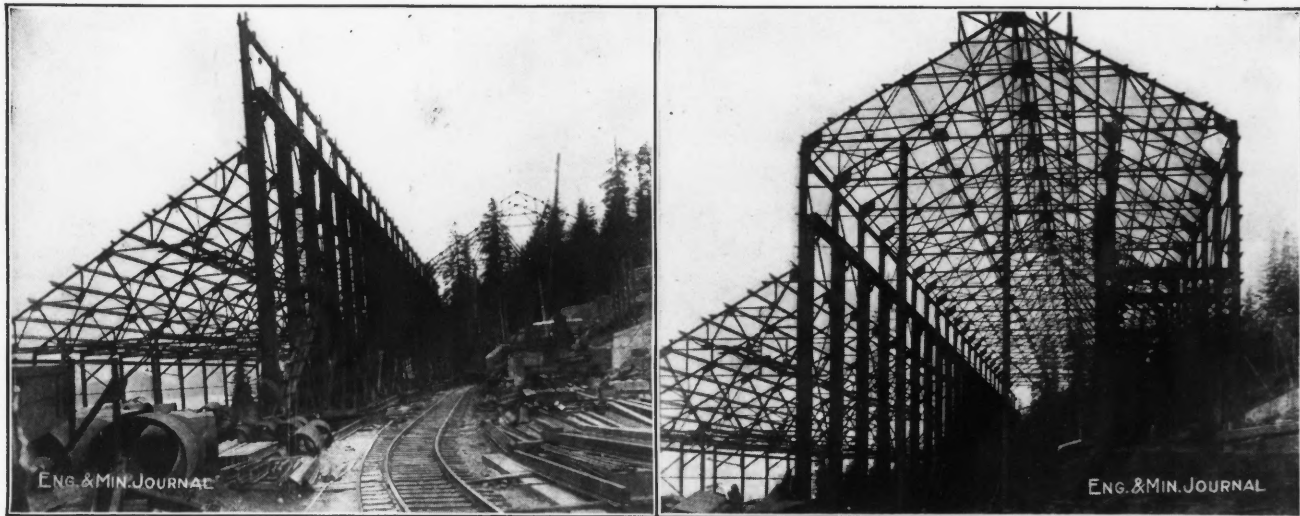


THE SMELTER SITE ON GRANBY BAY AND DAM SITE OF FALLS CREEK

A hydraulic monitor can be made out in the view of smelter site. It was used in excavating loose ground after burning off the timber.



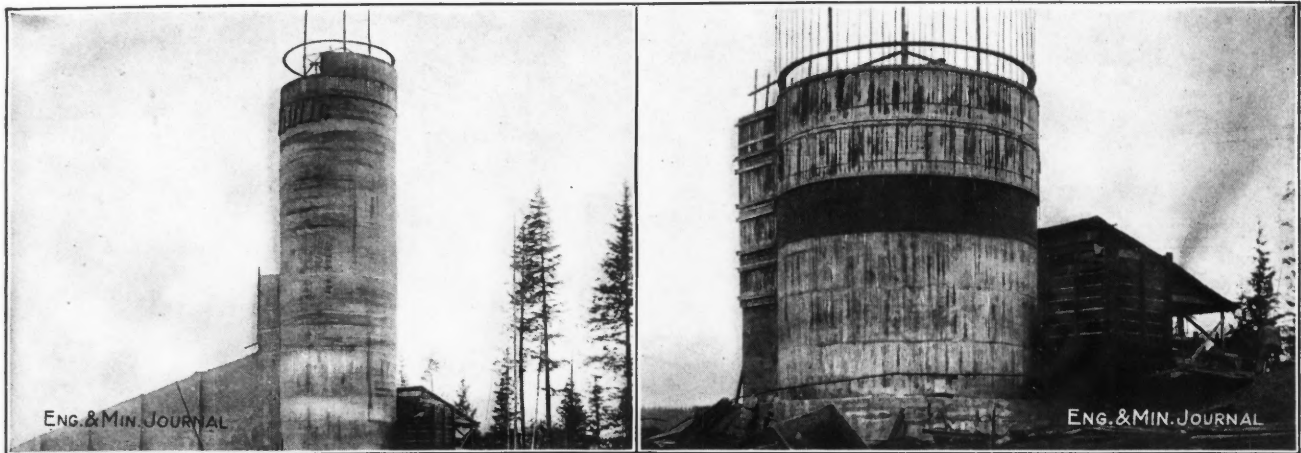
THE HIDDEN CREEK MAIN SMELTER BUILDING, DUST CHAMBER, FLUE AND STACK SITES
View at left as it appeared July 11; at right as of May 27.



STEEL FRAMEWORK OF THE MAIN SMELTER BUILDING, SHOWING TWO WEEKS' PROGRESS
View at left as it appeared July 28; at right as of Aug. 13.



HOPPERS IN FLOOR OF DUST CHAMBER AND FURNACE FLOOR IN MAIN SMELTER BUILDING
The dust chamber, built of brick, is now completed, the furnaces are now ready to be blown in.



THE REINFORCED-CONCRETE HIDDEN CREEK SMELTER STACK TO BE 153 FT. HIGH
View at the left as it appeared Oct. 25; at right as of Sept. 26, showing reinforcing used.



ORE BINS AND SHOPS, SEPT. 26
Looking toward Granby Bay.



THE WATER FRONT AND VANCOUVER STEAMERS
Steamers arrive Saturdays and Tuesdays from Vancouver.



GENERAL VIEW OF TOWN OF ANYOX, B. C., FROM ORE-BIN SITE
View as it appeared June 27. Granby company has built hotel, 100 cottages and other buildings, with all modern conveniences for housing about 600 smelter employees.

Notes on Cuyuna Range--II.

By L. O. KELLOGG*

SYNOPSIS—General conditions dictating the choice of mining methods on the Cuyuna. Typical equipment considered, and water concentration and transportation problems discussed.

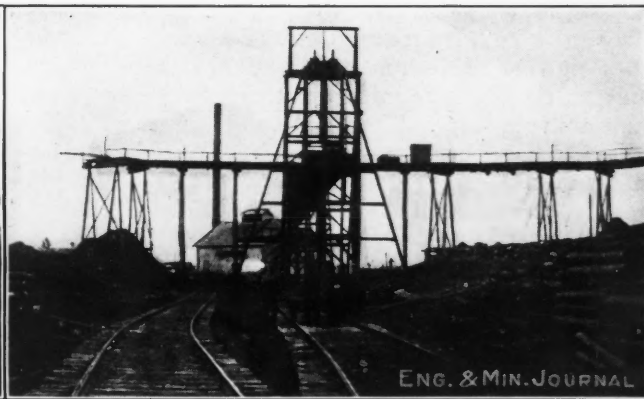
When the Cuyuna was first opened up, it was supposed that it would be a case of underground mining entirely, inasmuch as the nature of the occurrence of the ore in narrow lenses seemed to preclude stripping. It is still true that underground mining is the most important method and probably in the end will have produced by far the larger tonnage of any method. Furthermore, practically every mine will have to do more or less underground extraction. Nevertheless, stripping is being largely practiced on the north range at present. The Pennington has already shipped considerable ore mined by steam shovel after stripping. The Rowe and the Thompson are being stripped and the Armour No. 1 and the Cuyuna-

grade of the pit and replaced with another. This results in a large time loss for the shovel. It would seem as if a powerful stationary geared engine to haul the cars up with a cable would prove much more efficient than a locomotive in many cases. The overburden, as previously mentioned, is ideal for shoveling and this makes stripping economical in spite of the other drawbacks. To remove, say 75 ft. of overburden at a low cost, mine with the steam shovel 75 ft. of the ore and mill another 75 ft., can easily be far cheaper than to mine the entire 150 ft. by underground methods, even if these must be finally resorted to and even when the deposit is small.

The fact that some of the companies after sinking shafts and developing underground rather extensively, are changing over to stripping, is nothing against their management, as they will need the shafts for pumping always and for hoisting, also, when milling and strictly underground mining are going on, and, furthermore, the



POWER PLANT AND HEADFRAME OF THE CUYUNA-MILLE LACS



HEADFRAME AND TRESTLES OF IRONTON MINE (CUYUNA-DULUTH) WITH POWER PLANT IN BACKGROUND

Mille Lacs probably will be. Stripping is followed by steam shoveling and this in turn will probably be followed by milling. Stripping is possible when there are a number of lenses side by side so as to make an orebody several hundred feet in width. In such cases, when the overburden is not too heavy, it is practicable to make a long, narrow cut and expose the ore. The final cleaning up of the orebody, however, will have to be done by underground methods in practically every case. The depth to which the ore can be shoveled is limited chiefly by the increasing grades which must be overcome; the depth to which it can be milled is restricted by the fact that the lenses are inclined and the hanging must be removed in increasing quantity as depth is gained. Neither the stripping nor the ore mining can be carried on to the best advantage in pits of the size and shape imposed by the nature of the orebodies. It is impossible to use the spiral methods followed on the Mesabi; the cars must be run in and hauled out again on the same track and the grades often overcome by switchbacks. Thus at the Pennington pit at the time of visiting, the shovel was loading one car at a time, which was hauled up the steep

preliminary work gave them a much better idea of the orebodies than could be had by mere drilling.

Even the underground mining is shallow; the district is essentially a shallow one and will probably always remain so. The ore may go to 1000 ft. and even lower, but it is unlikely that the depths will ever be such as to warrant the use of the term "deep mining." This greatly simplifies the hoisting and pumping problems. Both of these operations are carried on in a manner typical of the iron country in general. The ore is hoisted in self-dumping skips and men and material are handled on long, heavy single-deck cages. The cages are about 9 ft. in the long dimension; they are always well inclosed and are fitted with the usual safety dogs. Whether one or two skips are used, depends on the size of the mine. When there are two skips, and hoisting is in balance, the ropes are sometimes wound on opposite ends of the same drum and follow each other across its face. This is practicable, of course, only when hoisting is from shallow depths and is confined to one level. An auxiliary hoist is provided for the cage; both hoists are universally geared and are driven by simple slide-valve engines. Steam is generated in return-tubular boilers. The only outside electric power furnished the district comes from a plant on the Crow

*Editorial staff, "Engineering and Mining Journal."

Wing River below Brainerd; this is used now at the Rowe for pumping in the sluicing operations and will also be taken underground to the Adams mine pumps. It is thought likely that the Northern Power Co. will bring its system into the district some time. The field for a power company would seem to be attractive and extensive.

SURFACE EQUIPMENT

Both wooden and steel headframes are used. Those of the Barrows, Ironton and Cuyuna-Mille Laes are wooden; those of the Adams, the Armour, Thompson and Kennedy are of steel. A steel headframe costs erected perhaps 25% to 30% more than a wooden one for the same size and strength. This would seem to be a cheap insurance against fire, although with the extent of the orebodies as now disclosed, a good wooden headframe ought to outlive its mine. The skips dump into a small pocket at a point about half the height of the frame and the railroad cars are filled from this. At about this point, also, two trestles are taken off, one for the waste dump and the other for the stock pile; the latter may be extremely long; both are of wood. Between the headframe and the hoist are one or more towers of steel or wood to carry guide pulleys for the hoisting cables. Such towers, when high and of steel, may be of rather elaborate design. Only at the Barrows mine are there turn sheaves and these are temporary. The usual buildings are an engine house and boiler house, a dry, an office, a storeroom, blacksmith, machine and carpenter shops. These are in general of rather substantial construction, brick being largely used.

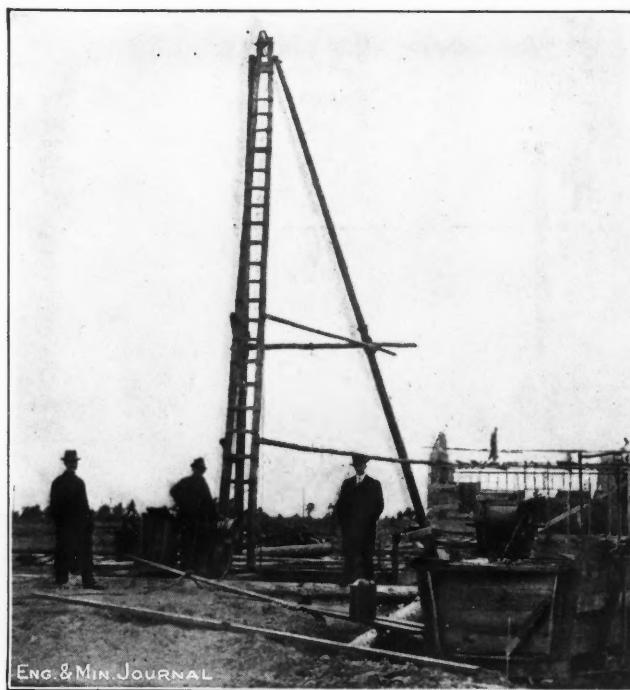
SHAFTS AND SHAFT SINKING

The shafts are lined with both wood and concrete and are approximately square. The concrete shafts are of the drop type and were put down by the New York Foundation Co., often with great difficulty. They include the Adams, the Thompson and several of the Rogers-Brown. The Adams especially was extremely difficult to sink. It is 137 ft. deep to bedrock and the water head to that point is perhaps 115 ft. It was found impossible to land it on rock by ordinary drop-shaft methods, as the skin friction became too great, and a second section was forced down with jacks inside the upper part. This necessitated the use of an air caisson and before the bottom was reached the air pressure became enormous. It was finally landed successfully at a loss to the Foundation company. The first shaft at the Kennedy, sunk by the company, was a most difficult piece of work. Especially vexatious were the "sand boils," rushes of material which in a minute or two would carry great boulders 50 ft. up from the bottom. This was a wooden drop shaft and a ladder was kept always hanging in each corner, so that the men could make a quick getaway when a sand boil started. When the company came to sink its present working shaft, it ran a drift to a point below and drove down a pipe from the surface to the drift. The pipe was in 3-ft. sections, perforated for its entire length. It served to drain the vicinity of the shaft so well that no great trouble was had from water while sinking; the shaft was excavated and timbered in the usual manner and as the successive sections of the pipe were uncovered, they were unscrewed and removed. When shafts are timbered with sets and lagging, heavy construction is necessary, 12x12-in. stuff

being used and the sets spaced often as close as 2-ft. centers.

The fact that the district is shallow would seem to point to rather frequent shafts and simple underground haulage systems, especially since surface points are unusually accessible for the railroads. As a matter of fact, there is likely to be a good deal of centralization, such as would be expected in the case of deep shafts. Thus it is planned to make the Adams shaft the hoisting and pumping point for a distance of a mile or so each way along the strike and to put in a rather elaborate haulage system. The reason for this lies, of course, in the fact that the shafts, while not deep, are, nevertheless, expensive and it is thought cheaper to keep down their number and do the ore hauling underground instead of on the surface.

The underground mining methods are not well standardized as yet. It is probable that Mesabi practice will



BEGINNING SINKING AT BRAINERD-CUYUNA WITH A DRILLING RIG

be largely followed, as it is now, in effect, at the Kennedy. While the ores are for the most part "hard," commercially considered, they rarely need the power of a piston machine for drilling. They are a little stiff for hand augers, however, and in the attempt to develop a machine suitable to the ground, two of the mines are using the Jackhammer in connection with an auger bit. These are the Barrows and the Kennedy, although at the latter the machine was modified by the makers to give more rotation and less hammering. The results obtained are stated to be remarkable. This is probably an application of the automatically rotating plugger that the originators of that little tool did not foresee. One or two machines of this type can do the drilling for an entire mine.

As much as possible of the different classes of work is done by contract. Miners are paid by the ton of ore broken for mining, mucking, timbering and tramping to the chutes from the rooms. Trammers on the main

level are paid by the car. Men on development work are paid by the foot. Timber framers are paid by the set. Good results are obtained, one well managed underground mine getting out four tons per man and another $3\frac{1}{2}$. These figures will probably be increased as operations become systematized and larger tonnages are handled. For drifting in one mine the men got \$3.50 per ft. They were furnished with piston machines but had to purchase from the company all their supplies, including tools. The rock in this case apparently both drilled and broke well. Acetylene lamps are used exclusively for lighting.

THE WATER QUESTION

The water problem on the range is an important one. One look at the surface of the country, studded with lakes and swamps, suggests an abundant ground water and underground work confirms the suspicion. The water affects operations in three ways: It renders sinking ex-



THOMPSON MINE, HEADFRAME AND STRIPPING SHOVEL

tremely difficult; it adds seriously to the costs of subsequent operations; and it raises the question of who is to do the draining of any particular area. The difficulties of sinking have been noted; the expense of pumping while mining is great, but is much less than if the mines were deep; at present, 200 to 300 ft. is all that it is necessary to raise the water. The work of draining a new district devolves upon the first company in. Since the water flows freely from a considerable area around, this is a heavy burden and one that a company is reluctant to undertake, being naturally loth to pull the chestnuts out of the fire for its successors. This fact has probably somewhat retarded the development of the range, although it is impossible to say to just what extent. Even where several mines are operating in close conjunction, the burden of pumping may be borne by one company. There seem to have been no attempts made as yet to form pumping associations or to distribute equitably the pumping charges in the various areas. The water once pumped to the surface must be carefully led away to a point whence it will not return to plague the operator or any other operator. For this purpose launders are built and these may be as much as three-quarters of a mile long. The Barrows mine is just completing a long launder to take the place of an old one, the discharge from which has been making trouble for others.

THE POSSIBILITIES OF CONCENTRATION

The question of concentration is of live interest, since many of the ores, too poor to ship as mined, nevertheless offer tempting concentrating possibilities. While it is undoubtedly true that a good deal of concentrating will be done, it is also true that the ore, as a whole, offers a more difficult problem than in such districts, say, as the western Mesabi. Experimental work is being conducted by the Minnesota School of Mines Experiment Station and also by individual companies. The ores being non-magnetic, wet concentration seems the only recourse. The exact methods require to be worked out and will vary in complexity with the different ores. It is held that some ores will wash clean in a trommel, that others will respond to log washers, while in many cases more elaborate systems will be necessary. The Pittsburgh Steel Ore Co. reports excellent results from tests with Joplin jigs. An outsider might be somewhat sceptical as to the applicability of Joplin jigging methods to these iron ores.

An interesting feature of the development of the range is the formation of stock companies for mining some of the deposits. Many of these interest local capital and not infrequently seem to be meeting with success in their operations. Being independent of furnace interests they have to rustle hard for their market.

THE TRANSPORTATION SITUATION

As is usually the case, the railroads are closely concerned with the development of the range. If, as Mr. Zapffe testified in the Steel Corporation suit, there are 300 to 400 million tons of indicated reserves, and if probably half of the \$0.60 freight charge for haulage to the Lake Superior ports is clear profit for the railroads, naturally these companies are eager to reap their golden harvest; nor does this take into consideration the return freight on coal and other supplies and the greatly stimulated traffic of the region. Two roads tap the district, the Northern Pacific and the Minneapolis, St. Paul & Sault Ste. Marie. The Northern Pacific has the south range well sewed up and is into Ironton on the north range. The Soo reaches all the north range mines but will have difficulty in ever getting to the south range, inasmuch as the Northern Pacific there owns or controls a large part of the lands.

Iron ore seems to gravitate to the Hill roads as if magnetically compelled. The parallelism between the Northern Pacific tracks and the lines of magnetic attraction on the south range is striking. That road must see divine intervention in the fact that its line from Little Falls to Brainerd to Duluth happened to run for 40 or 50 miles alongside a rich ore formation and that a good portion of that ore fell to its share in its land grants. It is now leasing its lands to operating companies, always including in its contracts a provision for the haulage of the ore mined.

It is also buying or leasing fees and mineral rights and leasing them out again and in general is overlooking no bets that will tend to increase its freight traffic. This hustling policy, combined with its control of the south range, will give it supremacy on the Cuyuna and perhaps three-quarters of the traffic will eventually go to it. It should be remembered, however, that the Soo has often been a joy to the hearts of Minnesota shippers from its habit of kicking over the traces and cutting rates in entire disregard of agreements.

Rumors of the Northern Pacific's actually engaging in mining are heard and it is also occasionally suggested that the Steel Corporation will eventually get into the Cuyuna through the medium of this road's holdings, their financial control being about the same. The last deal of the Steel Corporation with an ore-owning railroad resulted somewhat unfavorably.

FUTURE PROBABILITIES

Anybody predicting the future development and final production of the Cuyuna would be riding for a fall. It is reasonably safe to say, however, that it will not be a Mesabi and equally safe to say that it will be comparable with any of the other ranges. Its lateral and vertical extent, the availability of the low-grade ores and the value of the manganese are points remaining to be determined. But whatever the event, the range will be an immense aid to the Mesabi in maintaining Minnesota's dazzling preëminence as our leading metal-mining state.

Comparative Cost of Gas and Steam Plants

A favorable opportunity to ascertain the relative costs of producing electric power with producers and gas engines and with boilers and steam engines has been afforded in a small lighting plant on 24-hr. service, not far from New York City, says L. B. Bent, in *Power*, Sept. 9, 1913. For several years the station equipment consisted of two anthracite gas producers, two vertical three-cylinder gas engines and two 60-cycle two-phase 2200-volt alternating-current generators, one generator being direct-connected to a 100-hp. engine and the other generator belted to a 60-hp. engine. Each producer was rated at 75 hp.

The load on the gas plant was small during the day and built up to a maximum during the lighting period in the evening.

The different characteristics of the two generators, which were of different make, and the difficulty of closely regulating the two gas engines made it almost impossible to operate these generators in parallel with any degree of assurance. Therefore, it was the practice to carry a part of the load on each machine by dividing the distribution circuits.

Unsatisfactory experiences incident to operating at maximum capacity led to a decision to build a new station on another site instead of increasing the capacity of the old station. This new station was accordingly built during 1911 and equipped with steam apparatus. The equipment consists of two 200-hp. horizontal return-tubular boilers, delivering their gases through an 80-tube economizer to a radial-brick stack 125 ft. high. Steam is delivered to two 14x20-in., 200-hp. simple non-condensing engines at 150 lb. pressure. The engines are direct-connected to 60-cycle, two-phase, 2200-volt alternating-current generators, the exciter units being driven by belts from a pulley on the main shaft of each engine. The usual auxiliary equipment of a feed-water heater and duplicate boiler-feed pump is augmented in this station by a motor-driven fan for furnishing forced draft to the ashpits of each boiler.

The fuel supplied to the gas plant was anthracite pea coal, costing approximately \$3.90 per ton, and that at

present supplied to the steam station is anthracite No. 3 buckwheat, costing approximately \$3.50 per ton at the plant.

The load carried by the steam plant is of the same character as that carried by the gas plant, but it is larger during the entire 24-hour period. All the operating conditions in the steam plant are so similar to those in the gas plant as to make a comparison of the cost of power a fair one. In fairness to the gas plant, it should be stated that the operation was not so economical as was possible. All examination of the ash from the producers showed that considerable fuel passed through unconsumed and other conditions of operation made the fuel consumption higher than it should have been.

COSTS

The first cost of the gas plant was as follows:

Building.....	\$3,033.03
Gas-power equipment.....	11,537.64
Electric generators.....	2,490.08
Accessory electric equipment.....	670.37
Miscellaneous equipment.....	81.38

	\$17,812.50
Cost of plant equipment without building.....	14,779.47

The rated capacity of the gas plant is 160 hp., or about 100 kw. The cost per kilowatt of rated capacity is therefore \$178.13, including the building and \$147.79 without the building.

The detailed cost of the steam plant was:

Building.....	\$22,001.15	
Boilers, accessories, economizer, stack and flues (stack cost \$2,800).....	13,653.35	
Main engines.....	7,210.31	
Electric generators.....	3,969.90	
Switchboard and auxiliary electric equipment.....	2,185.48	
Miscellaneous plant equipment.....	199.71	
General equipment (not specified in the company's accounts).....	823.45	
Engineering and superintendance.....	2,334.97	52,378.32

The rated capacity of this plant is 250 kw. The cost per kilowatt, including the building, is therefore \$209.51, and \$121.50 per kw., not including the building. A comparison of first costs may be made more readily if the figures are arranged as follows:

	Including Building	Not Including Building
Cost of gas plant per kilowatt.....	\$178.13	\$147.79
Cost of steam plant per kilowatt.....	209.51	121.50

The superior character and high cost of the building housing the steam plant constitutes an excessive burden on the operating charges, even though the rate of depreciation charged is only 2 per cent. A building cost of nearly 50% of the total plant cost seems to be unwarranted, especially as the cost of building materials and labor was not above the average.

The cost figures for the years 1909, 1910 and 1911 were accurately kept up to the time of starting the steam station, which was about the first of October, 1911. The principal items making up the total costs are as follows:

	1909	1910	1911 (Jan.—Oct.)
Station labor.....	\$2,234.18	\$2,892.88	\$2,499.94
Fuel.....	1,097.67	1,611.75	1,356.15
Supplies and expenses.....	219.91	353.16	299.81
Repairs.....	587.40	940.30	183.51
Total.....	\$4,139.16	\$5,798.09	\$4,339.41

A distribution of the repair account should be instructive and is as follows:

	1909	1910	1911 (Jan.—Oct.)
Building.....	\$31.06	\$128.33	\$46.53
Gas-power equipment.....	512.66	561.31	136.98
Electric equipment.....	22.86	147.97	.....
Water supply.....	.....	20.68	.....
Miscellaneous.....	20.82	82.01	.....
Total.....	\$587.40	\$940.30	\$183.51

It is possible that one reason for changing to steam power is shown in the cost of repairs to the gas-power equipment.

The amount of power developed in the gas-power station was ascertained from the daily log in which the power was entered for each half hour of the day. No recording wattmeter was used in this station. During the year 1910, the total load for the year amounted to 176,660 kw.-hr. The daily load was distributed approximately as follows: An average of 11 kw. for a period of 10 hr., an average of 15.2 kw. for 10 hr., and an average of 55 kw. for 4 hr., with a maximum of about 75 kw. for 1 hr. The load factor was small, only slightly over 20 per cent.

The cost per kilowatt-hour, not including fixed charges, for the year 1910 was $\$5798.09 \div 176,660 = 3.28c$. Of the items constituting the operating expense, station labor constitutes 50%, fuel 28%, supplies, 6%, and repairs about 16%. The repairs to the gas machinery during this period amount to nearly 4.9% of the first cost.

The fixed charges are calculated on the following assumed percentages of the first cost: Depreciation on building, 2%; on all machinery in the building, 5%; interest on investment, 5%; taxes and insurance, 3%. On these percentages the yearly amounts are:

Depreciation, building.....	\$60.66
Depreciation, machinery.....	738.97
Interest on investment.....	890.63
Taxes and insurance.....	534.37
Total.....	\$2,224.63

TOTAL OPERATING COST OF GAS PLANT

The total operating cost of the gas plant for the year 1910 is the sum of \$5798.09 and \$2224.63, or \$8,022.72. The total cost per kilowatt-hour is therefore nearly 4.54c.

For the year ending Dec. 31, 1912, the cost of operating the steam plant was as follows:

Station superintendence and labor.....	\$3,614.64
Fuel.....	4,126.95
Supplies and expense.....	570.87
Repairs of building.....	114.02
Repairs of steam equipment.....	54.20
Repairs of electric equipment.....	43.84
Repairs, miscellaneous.....	21.57
Total.....	\$8,546.10

These itemized expenses are very nearly the following percentages of the total expense: Superintendence and labor, 42%; fuel, 48%; supplies and expenses, 6.7%; repairs to building, 1.3%; repairs to steam equipment, 0.63%; repairs to electric equipment, 0.51%, and miscellaneous repairs, 0.36%.

The amount of power developed in the steam plant during the year 1912, as measured by the recording wattmeter, was 263,150 kw.-hr. The load factor for the entire year was higher than that of the gas plant, being nearly 29%. The maximum load came in November and December and was about 115 kw. The operating cost per kilowatt of power developed was therefore $\$8546.10 \div 263,150 = 3.25c$ per kw.-hr.

The fixed charges against the steam plant are calculated on the same percentages as those on the gas plant, except for a known charge for boiler insurance which does not affect the propriety of the percentages for taxes and insurance. The amounts of the fixed charges for the steam station therefore become as follows:

Depreciation, building.....	\$440.02
Depreciation, machinery.....	1,518.85
Interest on investment.....	2,618.91
Taxes and insurance.....	1,571.35
Total.....	\$6,149.13

TOTAL OPERATING COST OF STEAM PLANT

The total operating cost for the steam plant for the year 1912 is therefore the sum of \$8546.10 and \$6149.13, or \$14,695.23. This sum divided by the load in kilowatt-hours (263,150) gives a total cost per kilowatt-hour generated of very nearly 5.6c. Of the total cost of operation, the fixed charges amount to nearly 42%. In the gas plant, the fixed charges amount to only 27.7% of the total cost of generation.

It may be noted that no mention has been made of the value of the land in either case. The value is so relatively small and so nearly equal in both cases that no appreciable error is made in disregarding it in the calculations.

Comparative data for the two plants will be best shown if arranged in the form of a table and this is done as follows:

	Gas	Steam
Cost per kilowatt-hour of rated capacity, total.....	178.13	209.51
Cost per kilowatt-hour of rated capacity, without building.....	147.79	121.59
Rated capacity of station, kilowatts.....	100	250
Load factor for year considered.....	20 per cent.	29 per cent.
Size of anthracite fuel.....	Pea	No. 1 Buckwheat
Price per ton at the plant.....	3.90	3.50
Total cost of generation, cents per kilowatt-hour.....	4.54	5.6
Cost of generation, without fixed charges.....	3.28	3.25
Percentage of generating to total cost.....	72.3 per cent.	58 per cent.

It is the opinion of the author that some of the figures shown depart from what may be considered average practice, and these abnormal conditions have considerable influence on the cost of generation. The large amount of unburnt fuel and the excessive repair charges in the gas plant undoubtedly make the generation cost of 3.28c. higher than the average.

The high fixed charges against the expensive building of the steam plant makes the operating cost excessive.

The fairer basis of comparison is perhaps the cost of generation without the inclusion of fixed charges. The figures of 3.25c. for the steam station might be considered very fair for the conditions of operation, while the figure of 3.28c. for the gas station is, in the writer's opinion, higher than could have been obtained by better operation which was easily possible.

Chief Consolidated

The semi-annual report of the Chief Consolidated Mining Co., Tintic District, Eureka, Utah, covering period from Jan. 1 to June 30, 1913, shows shipments of 30,854 tons of ore averaging 0.084 oz. gold, 21.37 oz. silver and 0.41% lead or a gross value of \$14.85 per ton. The net profit after payment of all charges was \$83,792.60, or approximately \$2.72 per ton of ore, indicating costs as follows: Mining and other charges, \$4.26 per ton; smelting, freight and sampling, \$7.87 per ton. Operating costs at the mine amounted to about \$3.80 per ton. The company began the year with a balance of \$303,023.05 on hand, received \$206,568.77 from ore sales, \$2859.96 from interest. The company paid a dividend of \$87,645.30 and ended the period with a balance of \$281,462.61. Development consisted of 3650 ft. of drifting, 52 ft. of winzing, 174 ft. of raising, 132 ft. of widening shaft, and 56 ft. of shaft sinking, total 4064 ft. The footage of development work for this period is over three times that for the same period last year and the ore production nearly four times greater. It is stated that the ore reserves now exposed in the mine are very satisfactory and such as to give assurance of a steady production and earnings for the regular payment of dividends.

Hardinge vs. Chilean Mills

Referring to the paper published in the August "Bulletin" of the American Institute of Mining Engineers, on "Hardinge and Chilean Mills," by Robert Franke, Arthur O. Gates, of Purdue University, Lafayette, Ind., makes some observations in the November "Bulletin," in which he suggests a simpler way of making comparison of efficiencies. This comparison he bases upon the crushing-surface diagram, as published by him in the JOURNAL, May 24, 1913. He says:

Such a diagram based on the data given in Table II of Mr. Franke's article is submitted herewith in Fig. 1, cumulative percentages being plotted as abscissas and reciprocals of diameters (theoretical mesh per inch) plotted as ordinates. Such a diagram averages the diameters without calculation, and areas upon it are proportional to surface produced, and, in accordance with Rittinger's law, to energy spent on crushing alone.

The Chilean-mill diagram has been superimposed upon that of the Hardinge mill, the excess area of the latter measuring the excess of work done, based upon equal capacity. Measuring these areas up to 200 mesh, and multiplying by the tons per horsepower-day, the writer gets a production of 392 mesh-tons¹ per horsepower-day for the

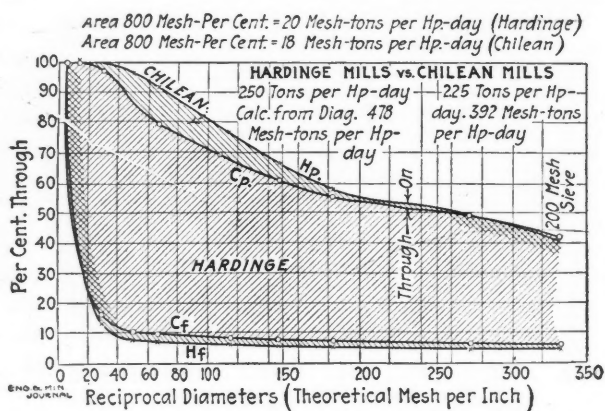


FIG. 1. CRUSHING-SURFACE DIAGRAM OF EFFICIENCIES OF HARDINGE AND CHILEAN MILLS

Chilean mill, and 478 mesh-tons per horsepower-day for the Hardinge, an increase of about 22% in favor of the Hardinge.

While the 22%, in favor of the Hardinge mill checks with Mr. Franke's results, I wish to question his adoption of the value 400 as the reciprocal of average size of the material passing the 200-mesh screen. From the way the curve of product is running in the plotted crushing-surface diagram, there is every indication that there is 1000 and 10,000 reciprocal, theoretical mesh material present, so, of course, the average size is much smaller than he has indicated. The field beyond 200 mesh of ordinary screen has been so little explored that it would seem advisable to limit calculations on efficiencies to the +200-mesh sizes.

If the results of Mr. Franke's sizing analysis in Table

¹The term mesh-ton represents the increased surface produced by crushing all particles of a ton of rock to a diameter whose reciprocal is one greater than its previous condition. Diameter should be in inches, although, of course, it can be adapted to other units. For example, a ton of evenly-sized pieces 1 in. in diameter would have 1 mesh-ton of surface; a ton of similar pieces just passing a hole 0.01 in. and retained on a screen with holes the reciprocal of whose diameter was 101, would have 100 mesh-tons of surface; the difference between two lots of 1 ton each, whose diameter reciprocals were, respectively, 99 and 100, is 1 mesh-ton.

II are plotted on logarithmic paper instead of the crushing-surface diagram, the last two points will be found in a straight line for both machines, with this difference; the Hardinge line is steeper than the Chilean line, as shown in Fig. 2. I have started similar straight lines as a result of plotting other results, indicating a law by means of which the —200-mesh material may be studied. It will be sufficient to state here that the straight line indicates a hyperbola for the screen analysis plotted reciprocals against weights or percentages as in the crushing surface diagram, and further, that the steeper line on the logarithmic plotting indicates the more efficient work.

In spite of the commercial success of the Hardinge mill, and the increased economic results accomplished by its introduction in the concentrating mill, I wish to criticize the statements that, as in this paper, are so frequently

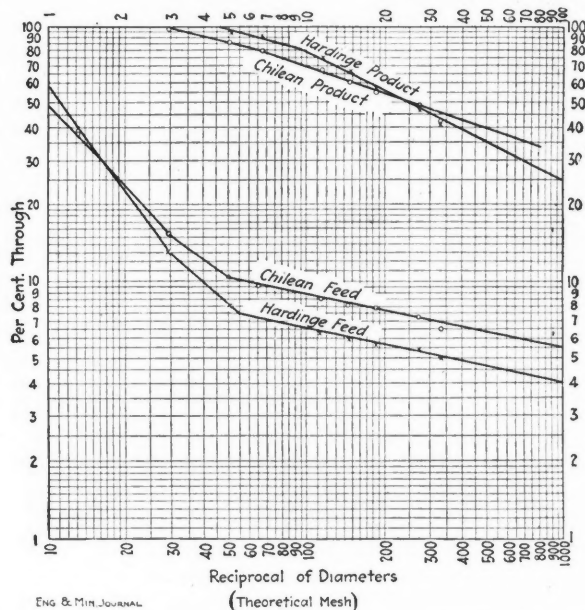


FIG. 2. LOGARITHMIC PLOTTING OF CRUSHING EFFICIENCIES OF HARDINGE AND CHILEAN MILLS

made as to the value of the cone, its segregating action on the pulp, and the graduation of forces, intensities of energy, or inertia so that each particle gets just the right blow. I have never seen any public results of screen analyses of material taken at different points along the cones, and I do not think that screen analyses taken at these points will bear out the claims made for this feature.

Analyzing the mill on the assumption that the greatest diameter is to produce the greatest effect in crushing, we find that the weight of crushing pebbles is proportional to the square of the diameter, with the machine half full; that the energy per unit pebble weight is something nearer the square than the first power of the diameter; and that the velocity with which the ore or pulp being crushed passes through the mill is inversely proportional to the square of the diameter. The result is that the energy applied per pound of pulp at various points along the cone is inversely proportional to about the sixth power of the diameter. This means that half way toward the apex of the cone, only 1/64 as much work is done as at the cylindrical portion, while 3/4 of the way toward the apex only 1/4000 is done. This means that the energy applied

along the cone is so small that the force exerted by the falling or rolling pebbles is not sufficient to break the coarser particles, with the result that the work in the cone is largely done on the fines. This is as logical as the generally accepted explanation.

The Hardinge mill runs at such a speed (750 ft. per min. peripheral speed for the 8-ft. diameter size, according to Mr. Hardinge) that centrifugal force at the periphery is about 1.2 times that of gravity, and there-

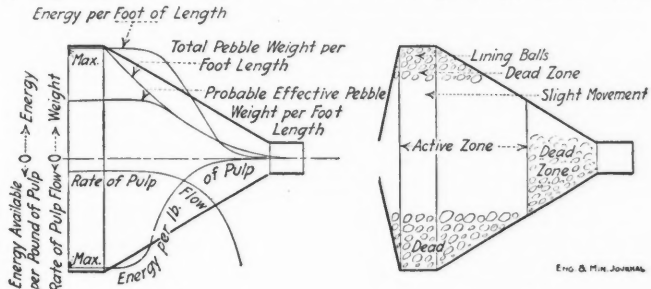


FIG. 5 CURVES OF ENERGY ZONES OF THE CONE MILL

fore at least one layer of pebbles in the periphery is useless except for the purpose of lining. For at least a foot in, the possible fall of the pebbles is so slight as to be valueless for crushing. The result is, neglecting part of the apex of the cone where the energy is too small to be effective, the Hardinge mill resolved itself automatically into a short tube mill, the 8-ft. size producing about the same effect as a 5x5- or a 6x6-ft. tube mill, as in Fig. 3.

The segregation of pebbles is reasonable, but how can the fines separate themselves from the coarse in the turmoil taking place within the crushing zone? The particle must go where it is knocked, as the agitation is too great for it to follow any laws of classification, and it with the others passes through by displacement and chance, perhaps getting through without being hit at all. Or, again, a single particle in the final pulp may be the result of perhaps 100 blows.

In Figs. 4 and 5 are plotted some graphical results of calculation of what goes on inside a tube mill, particularly of the Hardinge type. The concentric circles in Fig. 4 represent planes through the cone. The velocity of each of these circles, based on 29.75 r.p.m., is indicated in the lower right-hand quadrant. Applying the principles of mechanics, it will be found that pebbles will become free to fall when reaching the half circle shown in the upper right-hand quadrant going up, and their paths from that time on will without interference follow the paths P_2, P_5, P_8 , etc. The centrifugal force is too great on the outer ring of pebbles to let them move. Supposing pebbles to leave this half circle along each of the concentric circles at the same time, lines of equal interval of time has been drawn so that one may judge velocities. I have not attempted to locate the landing place of the pebbles very accurately, although I have shown possible landing places by curved lines across the parent line. When these landing places are located properly, the resultant velocity can be determined graphically, energy then being proportional to the square of the velocity.

In Fig. 5 are plotted away from the horizontal axis of the mill, weights and energy available per foot of length, for different positions along the length of the mill, and below, the rate of flow of pulp to the mill and the energy per pound of pulp imparted by the action of the

pebbles. The curves are plotted to relative units, not absolute.

I predict that the fine crushing machine of the future concentrating mill will be a short tube mill, followed by an efficient sizer to remove more of the fine material than is done at present, and followed by a second short tube mill. By short tube mill I mean really short, 1 or 2 ft. long, and perhaps of large diameter, the pulp traveling through it rapidly so that the fines are not subjected to repeated crushings.

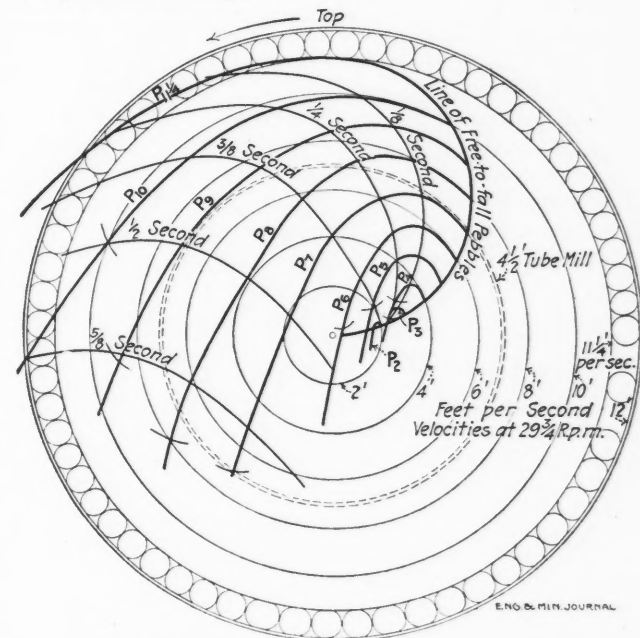


FIG. 4. DIAGRAM OF ACTION IN A TUBE MILL

The great advantage of the Hardinge mill is in its capacity, reliability, and low operating charges, as Mr. Franke has so clearly shown, and most operators are interested in these features. His comparison of efficiencies is one of the first real quantitative comparisons made in this country. It is my opinion that the day is coming when such comparisons of efficiency will be made from day to day in our milling plants, just as in the power plant, indicator cards are taken and worked up at frequent intervals.

Mineral Production of Victoria

Official statistics of the mining industry of Victoria for 1912, are given below, in long tons, unless otherwise stated:

	1912
Gold, oz. fine.....	480,131
Silver, oz. fine.....	17,424
Coal.....	589,143
Antimony ore.....	2,430
Gypsum.....	2,078
Magnesite.....	211
Diatomaceous earth.....	850

Of the total gold output, estimated at 505,319 oz. crude, 31% came from alluvial workings, most largely in Beechworth and Maryborough districts, and 69% came from quartz mines, from the treatment of 769,153 tons of ore; nearly half the total from quartz mines was obtained in the Bendigo field.

In addition to the above, the following output of mineral salts was recorded in 1912: Rock salt (from mining operations), 527,275 tons; carnallitic potassium salts,

3,287,177 tons; kainite and sylvite, 4,256,476 tons; sodium chloride (from brine), 343,883 tons. The combined salt industries (both mining and brine works) employed 26,950 persons in 1912. The gross value of the mineral production of 1912 is estimated at 2,107,792,727 marks, exclusive of metallurgical products, the output of which is not stated in the official report at hand.

Selective Mining on the Rand

The term "selective mining" is capable of more than one interpretation. The first inference conveyed is that of robbing the mine of its best grade of ore; or it may be taken to mean stoping from the ore reserves of the mine a grade of ore higher than the general paying average of those ore reserves demand. Such a policy may be dictated by financial reasons or by the desire to give present shareholders the benefit of higher returns, leaving poorer ore to be extracted at some future time, when it is hoped working costs will be more favorable.

From an engineering point of view, the policy governing mining operations should be to extract the total value from the profitable ore which a given block of ground contains, at the lowest possible cost, without regard to higher dividends or stock prices, and a mine following this policy could hardly be accused of selective mining even if at times it were thought necessary to draw upon higher-grade ore reserves than the average, to bridge over a temporary period of depression in development or a momentary advance in working costs, or to maintain a fair profit while completing the necessary extraction of low-grade but still profitable ore from abandoned or caving stopes.

If a mine on the Rand could be developed to its boundaries and thoroughly equipped before milling operations began, something in the nature of a definite policy could be laid down at the start and followed more or less closely, subject, of course, to varying local factors. But since this is impossible, any policy adopted by a mine may at times have to be modified, and I know of no mines particularly among low-grade gold mines, in which at times a process of selection is not necessary; this applies to all the mines on the Rand, and particularly to some of our lowest-grade ones. At such mines, at times large blocks of ground are being attacked which, as stoping proceeds, vary in value; here the margin of profit is small, and a small and temporary variation may affect the profit from these blocks for the time being. In such cases it is often necessary to draw upon the higher-grade sections of the mine to maintain regular monthly profits until an improvement takes place, although the general policy may be to mine as near as possible the general average of the ore reserves, or the indicated paying development of the mine; but it should be understood that while mining ore of average value from reserves, the mill grade will be somewhat depreciated, due to the inclusion of low-grade ore from other sources, such as reclamation and development faces.

One of the most important factors affecting the working of a mine is the extent and value of the paying tonnage kept developed ahead of the requirements of the reduction plant. Where the average value of such ore is

Note—Extracts from report by H. H. Webb on the operations of the Consolidated Goldfields of South Africa for the year ended June 30, 1913.

maintained over large areas, the best policy for working each individual mine is not difficult to carry out; but when the average grade is slowly falling, the difficulties of policy and management are increased. The erection of large plants and the increase in the capacity of smaller existing ones, resulting in lower operating costs from enlarged scale of working, have generally been accounted the cause for the lower average grade of ore sent to mill, and this has been so in some cases, by affording an opportunity to extend the life of a mine by reducing the paying limit of its profitable ore. But there are mines on the Rand at which a reduction of working costs has been necessary to meet the impoverishment of ore developed; under this heading may be classed the Knights Deep, Simmer Deep, and Jupiter. This necessity which, through strenuous effort, has brought about working economies, has set an example of what might be accomplished by other more favored ones.

A reduction in average grade does not necessarily mean a diminution in output or dividends, but it does mean working on a larger scale to maintain them, coupled with close management and low costs, which, besides bringing this low-grade ore within the margin of profitability, also secures increased profit from the higher-grade ore formerly constituting the reserve, as well as that arising from the treatment of larger tonnages.

One cannot always take the nominal workings costs at a mine as the limit of profitability for all the ore exposed in that mine. There are certain fixed charges, the total of which is not greatly affected by the scale of working, but their rate per ton increases or decreases, according to the scale of operations; on the other hand, the total charges for reduction plant, and certain others, are not only affected by the scale of operations, but their rate per ton is also lower on account of the increased tonnage treated. But mining, especially as regards breaking costs per ton, is affected by local conditions, especially at the points of attack. Ore having a value even below the average costs of the mine, under favorable local conditions, of mining or handling, may easily pay to break and send to the mill.

Mineral Output of Prussia in 1912

The output of mining products in Prussia during 1912 and 1911, are officially reported as below, in metric tons. Statistics of labor relate only to 1912:

Coals, etc.:	1911	1912	Changes	Workmen, 1912
Bituminous.....	151,324,030	165,302,784	I. 13,978,754	596,960
Lignite.....	60,531,943	65,803,959	I. 5,272,016	57,886
Asphalt.....	19,956	21,241	I. 1,285	42
Petroleum.....	98,611	87,443	D. 11,168	1,192
Ores of:				
Iron.....	4,948,711	5,238,766	I. 290,055	21,353
Zinc.....	696,903	647,081	D. 49,822	14,571
Lead.....	139,235	140,158	I. 923	7,904
Copper.....	868,495	967,785	I. 99,290	14,411
Nickel.....	9,609	12,113	I. 2,504	172
Manganese.....	86,902	92,474	I. 5,572	358
Arsenic.....	4,476	4,870	I. 394	224
Pyrites.....	203,249	233,397	I. 30,148	764

New York's Mineral Production—According to D. H. Newland, Assistant State Geologist of New York, the production of the mines of New York in 1912 was 2,722,648 tons of ore and mineral, divided as follows: 1,430,998 tons of iron ore, 500,181 tons of gypsum, 145,167 tons of pyrites, and 646,302 tons of salt, talc and graphite. These figures refer only to materials obtained by mining underground. In addition to the salt and gypsum that is mined, there is a production of the former from wells and of the latter from quarries.

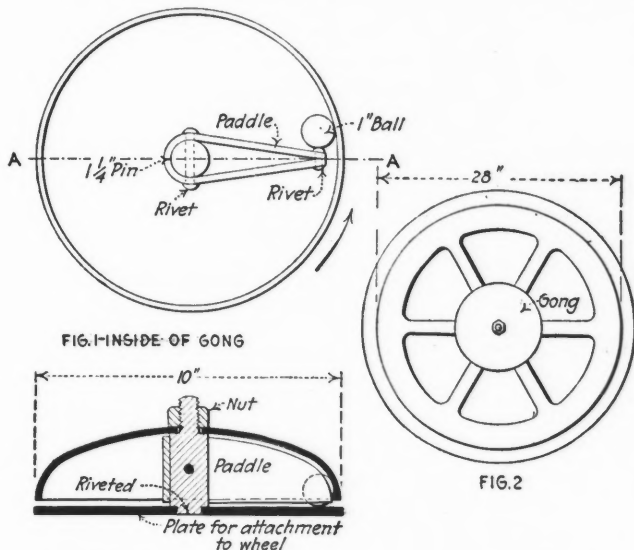
Details of Practical Mining

Automatic Gong for Under-ground Motor

The excellent safety device herewith illustrated consists of a gong so attached to the wheel of an underground electric locomotive as to ring whenever the wheel revolves and thus automatically signal the motor's approach to anybody in the haulageway. The gong in the form illustrated was developed at the Oliver mines in Ely on the Vermilion range after a good deal of experimenting. The first gongs used for the purpose involved a spring and

the paddle and drops from the pin, striking the lower edge of the gong and ringing it. The device seems perfect except in one respect: At 55 to 60 r.p.m., centrifugal force is sufficient to overcome the force of gravity and the gong revolving at that speed will not ring. With the 28-in. wheel used on the motor, this corresponds to about five miles per hour. The company's mechanical department has expended considerable ingenuity in the attempt to overcome this defect and has tried various devices. One of these worked successfully at high speeds, but failed at low speeds and furthermore was so complicated as to destroy the chief merit of the device, its simplicity and strength. Five miles per hour, it should be noted, is fast enough for underground tramping under most conditions.

The design shown is that used where the wheels are outside the motor casing. When the wheels are inside, the casing is pierced at a point corresponding to the center of the wheel and the pin of the gong extended through the hole and into the wheel center as a bolt, the device thus revolving on the outside of the casing.



SECTION A-A, INCLUDING PLATE
GONG FOR ATTACHMENT TO WHEEL OF UNDERGROUND MOTOR

trigger arrangement which required constant attention and repair. In the effort to avoid this difficulty the scheme to be described was hit upon.

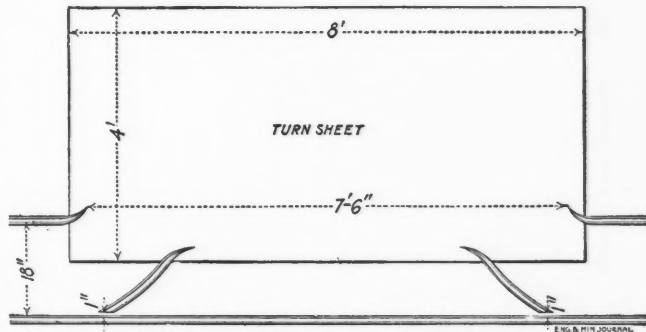
The gong is attached to the center of the wheel on the outside, as shown in Fig. 2. The details of construction are exhibited in Fig. 1. A 1 1/4-in. piece of round iron is turned down at each end to form two shoulders and one turned portion is threaded. This is slipped through the hole in the center of the 10-in. gong and fastened to it with a nut. The other end is riveted to an iron plate, 10 in. in diameter to correspond to the gong and about 1/8 in. thick. The length of the pin is such that the plate clears the gong about 1/8 in. A piece of flat iron is wrapped partly around the pin and its ends shaped to correspond roughly to the inside of the gong. This is riveted through the pin and the ends are also riveted together, forming a paddle. An iron or steel ball about an inch in diameter completes the device. The plate is fastened to the wheel with two bolts, not shown in the illustration.

The gong, plate, pin and paddle revolve with the wheel, the ball being the only loose part. The paddle catches the ball and lifts it to a point near the top, when it rolls down

A Turnout for Narrow Drift

BY ALBERT G. WOLF*

In the accompanying illustration is shown a cheap and simple turnout, designed by John B. Sommers, foreman of the Blue Jay mine of the Mason Valley Mines Co. One rail is unbroken while the other is left open for a space of 7 ft. 6 in. and the ends turned out for about 3 in. and pointed. Two pieces of rail about 2 ft.



TURN SHEET AND SWITCH POINTS FOR TURNOUT

long, cut and bent, as shown, are placed at the proper distance from the points to give the gage. A clearance of 1 in. between the ends of these pieces and the through-rail is sufficient to allow the passage of the wheel flanges. An 8x4-ft. turn-sheet is placed as shown, giving ample room for a car to sidetrack.

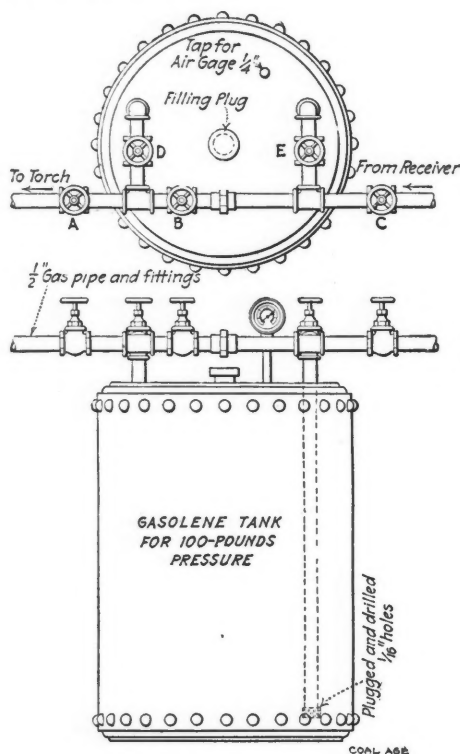
This turnout is in use in a narrow drift where the loaded and empty cars must pass each other in going to and from the shaft. Its great advantage is the elimination of switch points and the overturned loads due to

*Mason, Nev.

them. The loaded car follows the through-rail, while the empty is easily sidetracked, and the flaring ends of the rails make it easy to run the car on again.

Removing Steel Tires from Mine-Motor Wheels

When tires must be removed from a mine locomotive, the usual custom is to heap burning coals over the entire wheel until the desired degree of heat is obtained, then cool the central portion, or all parts but the tire, and pull off the latter. This process is both slow and expensive, and frequently results in breakage of the cast portion of the wheel, since the spokes cool much more rapidly than either hub or rim. At the Tennessee State coal mine, the apparatus here described was installed to facilitate the removal of tires.—*Coal Age*.



THE GASOLINE TANK AND ITS CONNECTIONS

A Westinghouse locomotive air compressor was bolted to two 6x12-in. upright posts in the boiler house. This machine required little space, being only 30 in. high, and 14 in. wide. An old boiler 30 in. in diameter and 7 ft. high was used as an air receiver, and connected by 1½-in. pipe to the compressor. A suitable air-pressure gage and safety valve were provided and installed on the receiver. The air was conducted to the mine a distance of about 1200 ft. by 1-in. pipe, connected to a gasoline tank as shown in the accompanying drawing.

A torch was made by bending a ½-in. pipe in a circle, the internal diameter of which was about 2 in. larger than the outside diameter of the tire to be handled. The ends of this circular pipe were then connected by means of a tee, provided on the run with right- and left-hand threads. Into the outlet of the tee a piece of pipe, about 5 ft. long, was screwed and connected to a hose which in turn was connected to the gasoline tank. The inner side of the circular torch was drilled with ⅜-in. holes spaced

1½-in. centers. In order to keep the blast uniform, however, those holes diametrically opposite the tee were drilled slightly larger than ⅜ inch.

The method of operation is as follows:

The gasoline tank is placed at least 40 ft. from the locomotive wheel, a safe distance from the flames, and connected upon the inlet side to the line from the main air receiver. The discharge pipe is connected to the torch and after all pipe fittings and connections have been made, the receiver is filled with as much gasoline as is necessary to do the work, ordinarily about three gallons. After this is done, the compressor is started and valves marked *C* and *E* are opened, until a pressure of between 35 and 40 lb. is registered by the pressure gage attached to the gasoline tank. Valve *E* is then nearly closed, valve *A* opened fully, and valve *B* slightly opened. Valves *A* and *D* are so adjusted that a mixture of air and gasoline is caused to flow through the pipe to the torch. The adjustment should be such as to furnish a continuous blue flame.

The air used in the gasoline tank should be as dry as possible in order to keep water out of the fuel. Filling the reservoir about two-thirds full of excelsior will help to remove moisture from the air, and adds materially to the work of the same.

In shutting down, valve *A* should be entirely closed in order to prevent a back suction, which might blow up the reservoir. Valve *C* is placed in the line so that the connection from the main receiver can be cut in case of trouble at that point. After the torch is burning properly, it requires only a few minutes of heating before the tire is ready to remove. Generally speaking, 40 or 50 tons pressure is sufficient to take off a tire.

Disadvantage of Bevel Framing for Round Timber

Of the three forms of framing round timber which have been tried and used extensively in the Butte mines, the present so called step-down system is the only one which, after a year's trial, appears to give as much satisfaction as any framing used on 10x10-in. sawed timber. Mine foremen and miners use the sets framed after this pattern without opposition and the mines generally are visited with fewer caves than when the highest grade of sawed fir timber was plentiful and used exclusively (*"Bull. A. I. M. E.,"* November, 1913).

The framing first adopted, in the so called mitered sets with beveled surfaces, prior to the adoption of the square-cornered, step-down form of framing, failed completely in its practical application in the mines. This was due to the impossibility of blocking the sets rigidly enough to withstand the shock of ordinary blasting, and it took considerably more time to stand and block them even insecurely into position.

As the wall rock of many of the principal veins is never solid material, but to a greater or less degree mineralized granite, which on exposure to air disintegrates and falls down from the walls, the most careful blocking of the sets of any style of framing is found in a short time to have dropped from place, the ground having fallen from behind the blocking. A slight weight of ground settling on the timbers had the effect of moving laterally the beveled posts and to such a degree that a cap or girt would fall out of its position, and when this happened, even if in only

one set of a large stope of 50 or more sets, the concussion of a blast caused all the sets to fall to the floor of the stope. On this account, following the regular timbering gang, it was necessary to employ extra crews whose duty it was to examine and reblock the sets. On the other hand, with the square-corner framing the experience has been that with the falling out of the blocking of even several sets of a stope the weight of the ground takes effect more nearly vertically, and instead of the posts easily sliding laterally on the beveled surfaces, the weight binds the sets tightly together, and no amount of blasting ever sweeps down any great number of sets of a large stope, as was the common and usual case with the mitered sets.



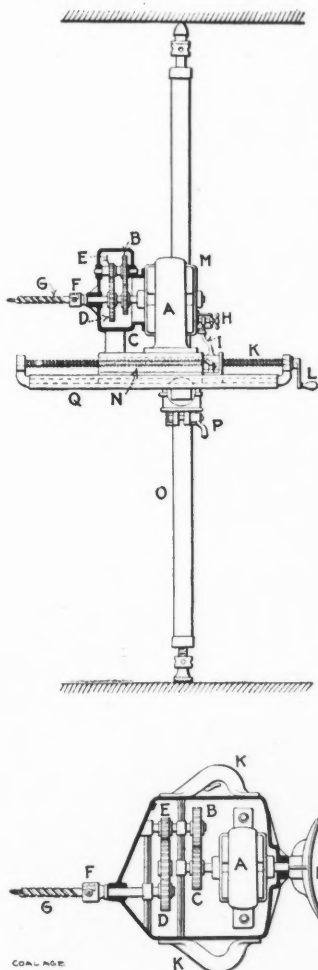
German Soft-Ground Drills

From an article on Prussian mining practice during the year 1912, in the "Zeitschrift für das Berg- Hütten- und Salinenwesen," the following information is obtained (*Coal Age*, Dec. 13, 1913):

At the Bismarck mine of the Königsgrube in the Königshütte district, trials have been made with electrically driven column drills of the type illustrated. A three-phase-current motor *A* of one horsepower and 120 volts, drives, through the gearing *C, B, E, D*, the drilling head *F*, in which is seated the auger bit *G*. By turning the handle *H*, which is seated on an eccentric shaft, through 180 deg. the feed nut *I* engages or is released from the feedscrew *K*. This screw is turned by the feed crank *L*, which causes the nut *I* to move the housing *M* forward or backward on the slide *N*. The drilling machine is mounted as shown.

The drill entire was furnished by the Schlesische Gruben & Hüttenbedarf G. m. b. H., of Kattowitz, its price being about \$600.

Experiments with this machine were successful, but the adoption of post electric drills has been limited by the new electrical hand drillers which have been placed on the market by the same firms. The design of these is fundamentally like that of the column machines. The drill is fed by the pressure of the workman against the breast plate *H* (lower illustration) and the switch is placed in the handle of the machine *K*. The weight of the entire drill is about 24 pounds.



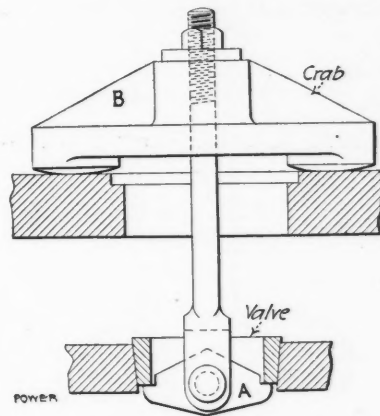
TWO ELECTRIC DRILLS IN USE IN GERMAN MINES

The output of a machine in coal is equal to that of a good hand-hammer drill. Few repairs have been found necessary so far. As to the economy of the drills, a judgment can only be formed after longer service. It is, however, to be assumed that, in spite of their higher purchase price, which is with appurtenances about \$225 each, they will be found cheaper in service than hand-hammer drills because of using less and cheaper power.



Device for Removing Pump-Valve Seats

The device shown herewith is one described by W. Wolfgang in *Power*, Dec. 16, 1913; it is useful and saves trouble in removing valve seats from the valve plate of



PUMP-SEAT REMOVER IN PLACE

pumps. When it is desired to remove a seat the pull bolt is placed in position with the head *A*, which swivels, under the seat. The crab *B* which holds down the valve cap can be used as a bar when screwing up the nut, although any bar with a hole in the center will answer the purpose. The nut is screwed down on the pull bolt and the seat will readily come out. The head *A* can be made to fit any size seat. The device can also be used for removing a water-cylinder sleeve by making the head larger, as may be necessary.



Placing Square Sets of Round Timber

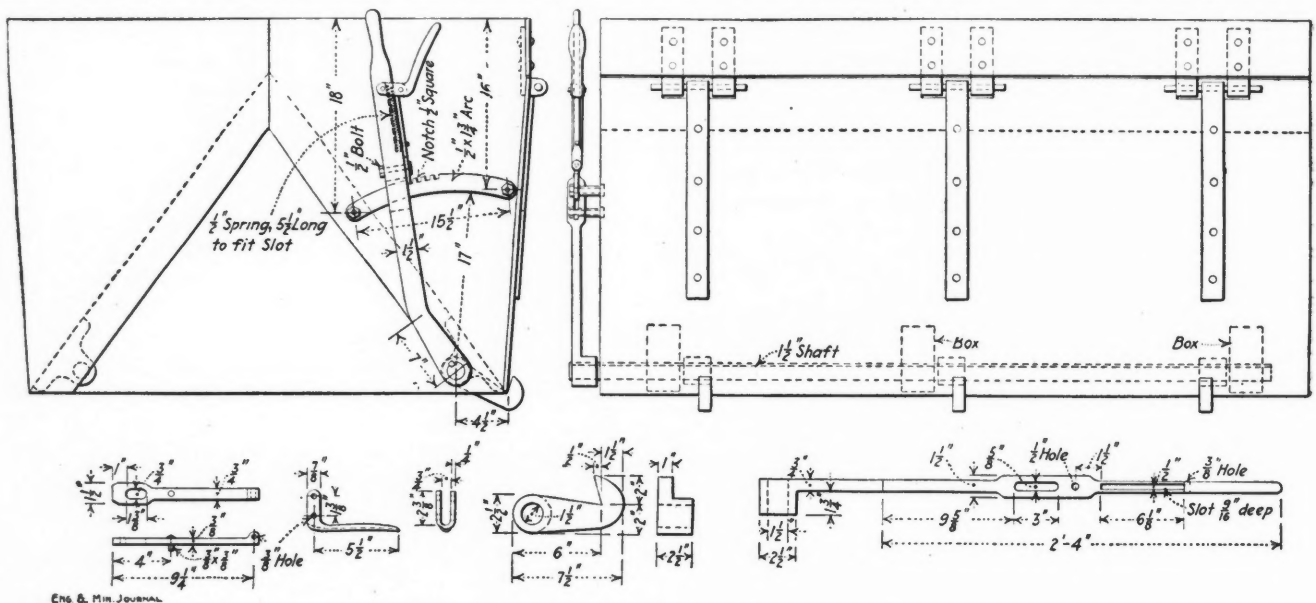
More care and time are necessary in standing a set of round timbers than with a sawed timber set, as with the latter it is an easy matter to stand a post in exact line with the sets already in place by sighting with the eye along the faces of the standing and blocked sets. With round timbers, which are always of varying sizes, this method is impossible, and the miner, after temporarily placing the several members of the set into their approximately correct positions, proceeds to block the set and by wedges brings the framed ends into a close and even fitting ("Bull. A. I. M. E.," November, 1913). The fitting of these unions is the indication of the accuracy of the square formed by the timbers. The measurement of the diagonals is a common and the best way of determining the correctness of the position of the set.

With the drift and sill-floor posts, which are flat-bottomed, being framed at the top end only, the common practice is to first place as a sill a 2-in. plank, on the ends

of which rest the posts. The position of the plank is determined by a carpenter's level or a grade-staff to obtain the correct elevation for the desired grade, 0.25 to 0.5 in. per set, the alignment being determined by bringing the center of the plank to a point in line with two plumb lines hung from the centers of caps in sets already standing in the same row. Where ore chutes are to be built in the sets, often as frequent as every 25 ft., 10x10-in. square timbers are used, instead of the round timbers, in order that a smooth surface may be had to which the 2- or 3-in. plank lining can be spiked. These 10x10-in. square sets for the ore chutes are carried from one level to another as the stope progresses, so that every fifth or sixth set, instead of being of round timber, is of 10x10-in. timber framed like the round. Round timber is sometimes hewed so that the chute lining may be spiked to it, but in heavy, moving ground the chute in square timber stands better and lasts longer, to say nothing of its greater economy.

Lever and Lock for Side-Dump Car

The typical car for underground electric haulage on the iron ranges has a gable bottom and side dump, holds



SPRING LEVER APPLIED TO SIDE DOOR OF CAR

from two to three tons and is mounted on a single truck. The devices for locking and releasing the side door are as numerous as the companies operating. One of the best is that used in the Oliver mines at Ely, Minn., herewith illustrated. Two levers with spring stops, similar to the brake and clutch levers on small hoists, are mounted on opposite ends of the car, so that one operates each door. As the train comes to the pocket, two men take position on opposite sides of the track and release the levers so as to open the doors as the cars pass, the operation being extremely rapid. The weight of the ore swings open the door so as to permit a free discharge and any material that sticks to the bottom is released by banging the doors vigorously.

Each lever is keyed to a 1 1/2-in. horizontal shaft extending the length of the car under the inclined bottom.

This shaft works in three one-piece cast-iron boxes fastened to the underside of the car bottom in an inclined position. Three hooks are also keyed to the shaft and their ends engage the lower edge of the door. A handle, spring and sliding stop are fitted to the lever in the ordinary manner, the stop engaging notches in an arc which is held out from the end of the car by bolts and spacers and which passes through a slot in the lever. In locking the door, the lever is forced well along the arc and when the stop enters a notch, there is enough spring in the lever, keys and shaft to keep the hooks tight against the door. The arrangement and dimensions are shown in the drawing.

Portable Heat and Light Plant

A device of merit for the examining engineer who has to put up at poor hotels, consists of a 60-watt tungsten lamp connected to a plug by 10 ft. of flexible cord. Hot running water is frequently lacking in second-class hotels, and while electric lighting is common, its value is greatly reduced by the inadequacy of the lamp provided, which is usually low-powered, old enough to glow red, and so hung as to be unavailable where needed. The device can be attached to the socket of such a lamp and the

cord permits extension to any wall of an ordinary hotel bedroom, where the 60-watt lamp can be used for reading, writing or for shaving, in case one follows that practice. A second function is to provide hot water for morning ablutions. If the lamp be weighted down in the water pitcher at night and the latter suitably insulated against radiation, say with newspapers or underclothing, the water will be nearly boiling by morning. The 60-watt size gives good light and heat and is within the average fuse capacity.

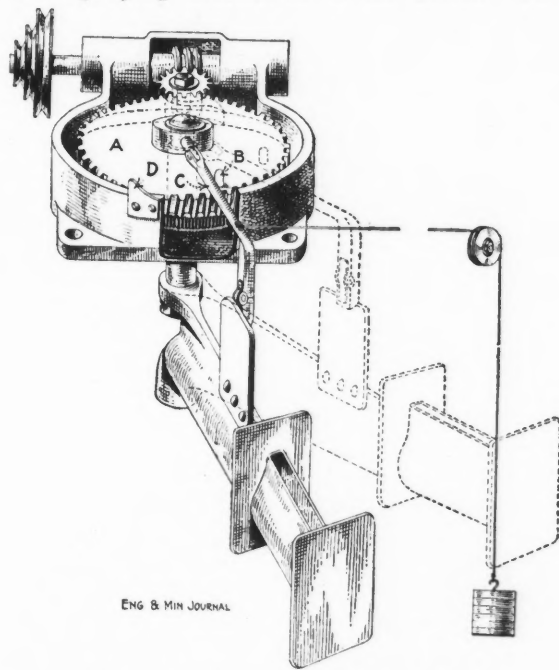
In nine hours' burning time the lamp will consume about 0.6 kilowatt-hours on 115 volts, worth about 6c. at the common rate of 10c. The scrupulous may refund this to the landlord. The outfit weighs almost nothing, occupies a space about 4x4x8 in., and costs between \$1 and \$1.50.

Details of Metallurgical Practice

A Pulp-Stream Sampler

The arrangement of a satisfactory mechanical sampler for pulp-stream work is described by Horace G. Nichols, in Bulletin No. 110, November 13, 1913, of the Institution of Mining & Metallurgy, in an article on "The Treatment of Tin Ores in Cornwall." The machine used for this purpose was originally an Elmore sampler which had been installed in the mill already, but was not found satisfactory. The feature of this sampler is the method of getting the two motions from the same drive, and the following modifications, taking advantage of this feature, were adopted and found to work perfectly.

The segment was taken off and replaced by an entire spur wheel *A*, running loose on the spindle of the toothed wheel operated by the eccentric motion. This and the following descriptions may be understood by reference to the accompanying illustration of the device. On this



REFORMED PULP-STREAM SAMPLER

spur wheel was a pin *B*, with a rounded top which engaged with an arm *C*, having a knuckle joint, also swinging on the spindle and resting on the rim of the casing of the machine. On the rim a piece of iron *D* was bolted which caused the arm to lift on its joint and allow the pin to pass below it, thus releasing it to be pulled back by a wire which passed over a pulley and to which a weight was attached. On the end of the arm *C* is a pawl engaging with a web attached to the sampler carrier. Thus there is a continual slow and fast motion. By the first the carrier is brought round until the arm, swinging back from being released from the pin in one of the latter's revolutions, carries the pawl past it. Then when the pin comes around next the arm engages with the carrier and takes the sampler across the stream. In

this way the good points of the Elmore sampler are preserved, and the uncertainty due to the engaging of the pinion with the toothed segment, which was formerly very marked, the two motions requiring nice adjustment in order to be in step, is eliminated, and the tendency of the machine to jam avoided. The sample is taken by cutting the entire pulp stream.

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Kinks for the Drafting Room

BY E. H. DICKENSON*

In drawings, such as that of a long trestle where the same dimension has to be laid off repeatedly, much time can be saved in making the pencil drawings by laying it off once for all on the triangle. In Fig. 1 this is shown; one side of the post is drawn with the *AA* edge of the triangle. The triangle is then moved up until the line *BB* coincides with the edge already drawn, and the other side of the post is drawn along *AA*. A triangle graduated to eighths or sixteenths for about one inch back from the edge will be found to be one of the most useful articles on the drafting table.

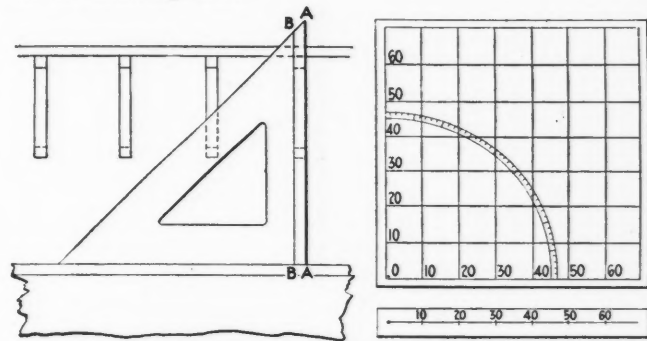


FIG. 1

FIG. 2



ENG. & MIN. JOURNAL

FIG. 3.

DRAWING-ROOM CONVENIENCES

If a square piece of celluloid is at hand, it can be cross-sectioned and graduated along two sides, away from one of the corners. This will be found very useful for locating intermediate points on maps on which rectangular coordinates are used.

Fig. 2 shows a simply made device for getting latitudes and departures from distances and bearings or horizontal and vertical distances from inclined distances and vertical angles. The protractor is laid off on a piece of cross-section paper. The arm shown below is made on a strip of tracing cloth. A few thumb tacks and a needle to hold the zero of the arm over that of the paper is all that is necessary. This is useful for rough work and also for running down errors in more accurate calculations.

*Douglas, Alaska.

Fig. 3 shows a rack for drying blueprints. An inch or so of margin is left on one side of the print and it is hung by this to a few nails driven through a square stick as shown. The ends of the stick are then caught in the rack and the prints left to dry. This is quickly and easily made and is perfectly satisfactory.

A Decanter for Slime Vats

In the accompanying illustration is shown the decanter used in some of the decantation plants of the gold mines of the Rand, as described by C. O. Schmitt, in "A Text-book of Rand Metallurgical Practice," Vol. 2. A platform giving access to the center of the decantation vat

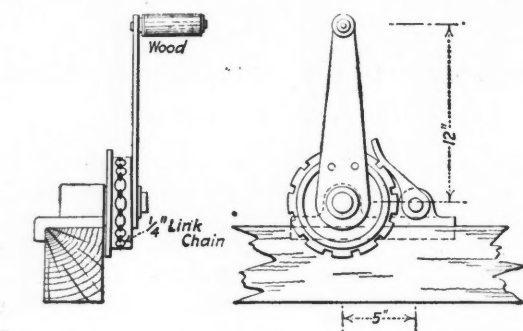


FIG. 1

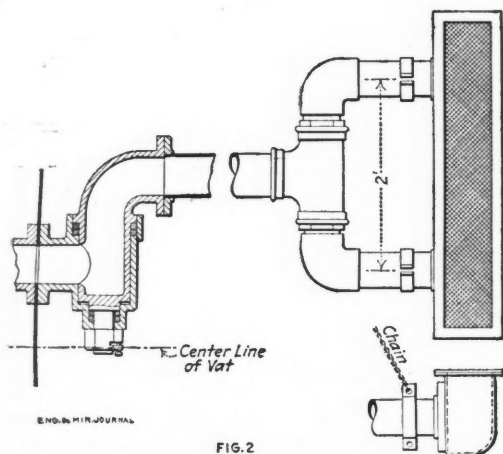


FIG. 2

DETAILS OF DECANTING DEVICE

is used to carry the decanter as well as the winch used in lifting and lowering the decanter. The details of the device are apparent from the illustration.

Testing Fire Hose

The responsibility of testing fire hose usually devolves on the engineer in charge of an institution or building, and as the matter is becoming more important, it is believed the following hint by A. P. Connor (*Power*, Dec. 9, 1913), will be of value to those on whom this duty rests.

The usual way in which fire hose is tested is by means of water and as if there were a fire. While this method has certain features which may recommend it, it has several inherent defects which make it impractical in many cases, and further opens the way to an early decay of the hose, especially as the hose is seldom dry when returned to its rack. Should the hose burst during the test, damage is sure to result which will sometimes greatly

exceed that of the value of an entirely new hose. Again, a test of the hose should be made at least once a year.

The better way is to test the hose with air at, say, 100 lb. pressure. This can be done readily in many plants having air compressors. In case there is not a compressor in the plant one may be often easily procured, and if that is impractical then the next best thing is to take the hose to a place where there is a suitable compressor. The hose will leak appreciably but not abnormally. Should there be any weak spots in the hose they can be readily detected.

An advantage of air is that the hose can be handled without danger of soiling the clothes of the tester, and in case of bursting practically no damage will be done, and immediately after the test the hose can be replaced on the rack. The test can be made in almost any part of the building, and in general is as handy and desirable as could be desired.

Blast-Furnace and Coke-Oven Gases in Metallurgy

At the Cockerill Works, Seraing, Belgium, seven blast-furnaces with a total daily capacity of 1000 tons of pig-iron, yield daily 1,800,000 cu.m. of gas, the greater part of which is used directly for the generation of power; the surplus is now used under boilers; some of this will, in the future, heat a metal mixer, according to E. Houbaer, *Trans. Iron and Steel Inst.*, September, 1913. Five batteries of coke ovens, with a total output of 800 tons of coke per day yield 3740 cu.m. of gas per hour, all practically utilized; 2040 cu.m. for power generation and 1660 cu.m. for heating two openhearth furnaces (9 and 12 to 13 tons capacity respectively), two stoves, and two reheating furnaces. A gas-holder of 50,000 cu.m. capacity is being constructed to store at least a portion of the coke-oven gas produced on Sundays and holidays; equalize the pressure and composition of the gas, and provide a reserve.

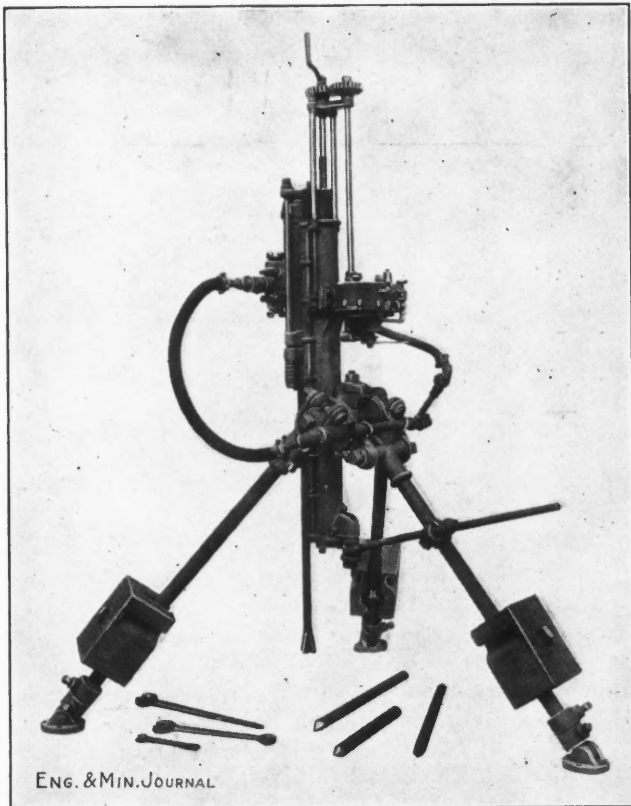
Metal mixers heated by blast-furnace or coke-oven gas, require no regenerative chambers, hot air from the Cowper stoves sufficing. The chief advantages claimed for the use of coke-oven gas in open-hearth furnaces are: (1) Increased production, (2) simplification in construction, (3) less repairs, especially to the roof and chambers, (4) possibility of using a cheaper charge, and (5) ease of working. In the working of a 12-ton furnace at Seraing, the average consumption was about 280 cu.m. of coke-oven gas per ton of steel. Coke-oven gas should not be used in engines but reserved for operations where a high temperature is required and where its calorific power can be utilized to the fullest extent. In some cases it may be profitable to use blast-furnace or producer gas for heating the coke-ovens and so recover a larger quantity of the richer coke-oven gas for special purposes. Pitch from coke-oven tar when used in special burners by means of steam and compressed air, may be used for heating furnaces of all kinds. It is estimated that for a works producing 1000 tons of pig-iron, and 1000 tons of coke in regenerative ovens, the blast-furnace gas would supply energy equal to 28,500 hp.; the coke-oven gas would serve for making 625 tons of steel in openhearth furnaces or for heating 1150 tons of ingots in reheating furnaces; and the pitch for making 150 tons of steel in openhearth furnaces.

Mining & Metallurgical Machinery

Heavy Rock Drill with Engine Feed

The Sullivan Machinery Co. has put out a tripod piston drill for quarry and open-cut work designed to do away with loss of time in changing steel. The machine drills holes up to 20 ft. long and 3 in. in diameter and fills a place between the ordinary tripod drill and the heavy traction outfit, the latter being at a disadvantage on rough ground.

The drill has a shell and feed screw unusually long so as to provide a run of 4½ ft. By this means, the number of changes of steel is largely reduced. The cylinder stands out from the shell an unusual distance, so as to al-



HEAVY DRILL WITH ENGINE FEED

low the chuck to revolve without interfering with the shell. The feed screw extends below the threads and terminates in a bearing so that the drill cannot fall from the shell, if run out too far.

Inasmuch as it takes an appreciable amount of time and effort, after finishing with a length of steel, to run a heavy machine up by hand for four feet or so, an engine feed is provided. This consists of the small two-cylinder engine shown attached to the back of the shell. It carries a shaft geared to the feed screw, the latter being suspended from a ball bearing in the yoke. The gear on the engine crankshaft is equipped with a friction device to obviate undue strains if obstructions should be encoun-

tered. The gears may be disengaged with a wrench and the cylinder raised or lowered by hand in the usual fashion, if desired. The engine itself has two oscillating cylinders and runs in both directions, so as to move the cylinder either up or down. The speed of raising or lowering is 16 ft. per min.; 15 sec. is thus sufficient to run up the cylinder when changing steel.

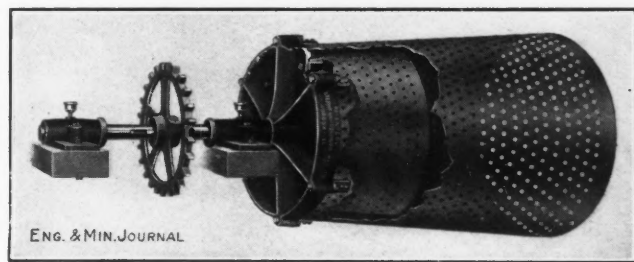
There is a lug attached to the back of the lower end of the shell, and a brace runs from this to a clamp on one leg of the tripod; this affords additional stability. The machine on its tripod weighs 1760 lb. It is of the Sullivan Hy-Speed type and is designated as FP-33.

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Improved Type of Gilbert Washing Screen

An improved type of Gilbert conical screen is being generally adopted by washed sand and gravel producers, which is claimed to reduce the expense of screen renewals more than 50%. The Gilbert screen is a truncated, conical screen entirely open at one end and supported on a horizontal axis. In operation, a chute delivers the gravel and water to the extreme interior of the screen and the material thus agitated by the revolution of the screen works its way out against a jet of water and is thus thoroughly washed and screened.

The greatest wear on these screens is naturally at the small end where the material is delivered and where the greater part of the screening is done. To relieve this, the improved Gilbert screen is fitted with a short inner skirt concentric with the larger screen, slightly smaller in diameter and about one-third the length. Material from



IMPROVED GILBERT SCREEN

the chute is delivered directly to this inner skirt which, consequently, takes the greatest wear, effects the preliminary separation, and distributes the material evenly to the outer screen.

This arrangement practically triples the life of the large screen. The life of the small inner skirt is the same as that of the large screen plate in the old-style Gilbert, while the expense of renewals is reduced to about one-third. Furthermore, where desired, the small skirt may be made of manganese steel and its life prolonged indefinitely.

The time required to change or renew the screen plates is inconsiderable. Angle clips riveted to the screen coin-

side with the lugs on the cast-iron head, and it is thus a simple matter to bolt the screen to the head casting in a few minutes. This same method of attaching the inner skirt is also used. The holes in the angle clips are drilled from a template after the clips are riveted to the screen so that the bolt holes are sure to coincide. The improved Gilbert screen (patented) is manufactured by the Stephens-Adamson Manufacturing Co., Aurora, Ill.

A Large Electric Mine Locomotive

The Carnegie Coal Co. has recently installed at the Charleroi (Penn.) coal mine two large mine locomotives. These locomotives weight 30 tons each and are of the Baldwin-Westinghouse "Barsteel" type. It is estimated that each locomotive can haul 100 cars, each loaded with 3 tons of coal, over the local grades. The Carnegie company recently acquired possession of the Charleroi mine, which is of considerable size and well developed. A large production is desired from it, but the haul is about two miles long with the grade largely against the load. Hence the average haulage locomotive of from 15 to 25 tons would not be sufficiently large to keep production up to the desired tonnage.



30-TON DOUBLE-UNIT ELECTRIC MINE LOCOMOTIVE

The new locomotives possess a number of interesting features. Each consists of two separate units which can be separated and used as 15-ton locomotives if desired. In the "barsteel" construction, the frames are not built up of plates, but are formed of a grid of steel bars of heavy cross-section. The side frame of each unit is cast separately, forming an extremely strong and rigid construction. The openings in the frame give ready access for inspecting and adjusting, and also provide thorough ventilation to the electrical apparatus.

Air brakes are used, but each unit is also equipped with hand-brakes, which can be operated together from the operating stand of the leading unit. An auxiliary reservoir is provided on the trailing unit, the main reservoir and compressor being on the leading unit. The hand brakes are operative on both units when disconnected for independent operation.

The controller for the tandem is of the individual magnetic-blowout type and handles all four motors at once. When the tandem is split, the four-motor controller handles the two motors of its unit without change in connections, while the other unit has its own two-motor controller. In addition to the two large haulage units the

Carnegie company has installed at Charleroi 10 traction-reel gathering locomotives or "crabs," also of the Baldwin-Westinghouse "barsteel" type.

Ever-Ready Acetylene Lamp

The distinctive features of the "Ever-ready" acetylene-burning miner's lamp, made by the Charles Hoppe Co., of Cincinnati, Ohio, are: The water feed is through a tube extending from the water reservoir direct to the bottom of the carbide container. The flow of water is controlled by a cap tightly fitting over the lower end of the tube and carried upon a rod that passes up through the feed tube to a lever, which, extending outward horizontally through the side of the water reservoir, lowers the cap and admits water to the carbide when turned down. When turned up, the cap is drawn tightly up on the tube, shutting off the feed. Two carbide containers are supplied with each lamp. One is furnished with a screw cap so that it may be carried in the pocket and exchanged for the other when its carbide is spent. To facilitate making the change the lamp is supplied with an oil-burning miniature lamp which may be screwed into the top of the acetylene lamp and lighted when the other lamp is not burning at the time when the change of carbide containers is made. The lamps may be purchased with or without this oil-burning pilot.

The "Ever-ready" lamp is of the usual shape of the lighter sheet-metal acetylene lamps. It is made of light spun brass lined with tin, weighs three ounces, is about 4 in. high and 2½ in. in diameter overall. It sells for \$22.50 per doz. with the oil lamps, or \$18 per doz. without. The water reservoir is spherical, opening into a screwed flange at the bottom and constitutes the body of the lamp. A short curved tube leads from just above the flange outwards through a 2½-in. reflector rigidly attached to the body, and carries the lava tip constituting the burner.

A light piece of felt surrounds the inner top portion of the flanged part of the body, down through the center of which extends the water-supply tube. The felt is a filter, to prevent solid matter spattering up into the burner tube. A hook handle is attached to the back of the body and each lamp is supplied with a burner cleaner that may be carried over the hook handle or in the pocket, thus eliminating the necessity of using a piece of wire to clear the burner when clogged.

The water tube is the most commendable feature of this light and should prove more satisfactory than drip devices with their needle valves. The oil-burning miniature or pilot strikes one as being a ridiculous refinement, somewhat like carrying a lamp in order to be able to find one's matchbox. Anyone competent to carry a light underground ought to be able to perform the simple operation of changing carbide containers in the dark.

Small Single-Stage, Power-Driven Air Compressors are now put on the market by the Sullivan Machinery Co. In type WG-3 a single horizontal air cylinder is bolted to one end of a frame carrying a crankshaft on one end of which is a flywheel and on the other a drive pulley. The moving parts are inclosed and are oiled by the splash system. An air unloader is provided on the inlet valves, which, like the discharge, are of the poppet type. The machine is built in capacities of 43, 98, 181 and 314 cu.ft. or free air per min. Types WK and WK-2 are modified to permit gear drive by a motor mounted on the same base. WK-2 is portable, motor, starter, receiver and compressor being mounted on a truck or mine-car bed to make an exceedingly compact and handy unit. The machine comes in the 98 and 181 cu.ft. sizes. It would appear an excellent machine for use in inaccessible places in a mine.

The Mining Index

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

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Wolfram Deposits of Badajoz, Spain

SYNOPSIS—Interesting deposits of wolfram minerals are found in the province of Badajoz, Spain. Their general geology is mentioned and a detailed description of the complex minerals found in the Virgen de Gracia mine is given.

The wolfram deposits of the district of Oliva de Jerez and Zahinos in the province of Badajoz, Spain, are found in the western part of the stratified, crystalline rock deposits in the vicinity of Jerez de Los Caballeros. Widely distributed in all parts of the region, is found gneiss characterized by gray and greenish colors, full of crystals of tourmaline and in a confusing mixture with mica and quartz sometimes found in the same stratified bed, except in a small section, faintly represented, which is probably the most recent of the rocks. In this appears flesh-colored gneiss in which mica predominates and which contains very little feldspar and practically no tourmaline. Glandular gneiss is abundant, the micas of clear color being scarcer, but by no means rare.

MINERALS OCCUR IN GNEISSIC BEDS

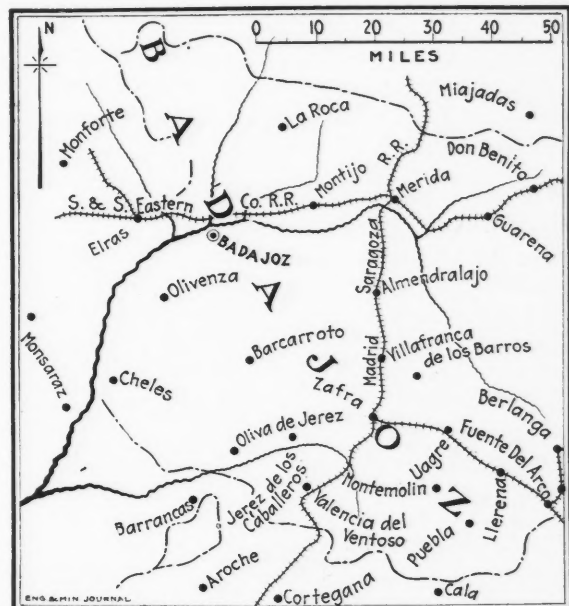
The general direction of strike of these beds varies from N 0.20° W to N 0.15° W, and is much more upright in the part south of the village of Oliva de Jerez and to the north of Zahinos. In this region there is also an indication of dark green diorite and much gneissic granite with a larger proportion of quartz than feldspar and with an abundance of black mica, crossed occasionally by small veins of pegmatite in which the flesh-colored feldspar predominates, having little or no black mica and much muscovite. In the village of Oliva de Jerez, on the road to Encinasola, can be seen the indications mentioned, whose direction coincides with that already given for the beds of gneiss and slate. This condition, together with the fact that in the Castillejo hill, about three kilometers to the south of the village of Oliva, the dip of the slate, which appears there without indication of any great movement, is 58° and 35° S, while that in the pasture of Gamonosa, 2½ km. to the north of Zahinos, is 60° E and 20° N, aside from other circumstances which are obtained upon studying the Virgen de Gracia mine, would induce one to presuppose that an anticline originated in these rocks, which also appear in the road from Oliva to Zahinos about a kilometer before reaching the latter village and also in its streets. The right wing of the anticline includes all of the eastern part of the districts of these villages, while the left occupies a large space to the west of them.

Interstratified between the layers of gneiss and subject to the same laws, appear layers of quartz in which the wolfram itself appears. If we take into account that granite is the matrix of tin, and that to the group of tin deposits should be added the wolfram veins which are barren of cassiterite, as in the class now under consideration, then the two classes of deposits show the same character, and it is not too much to conclude that the

rocks mentioned as characteristic of the district have carried with them the mineralizing element of the deposits of wolfram of this region.

VIRGEN DE GRACIA IS PRINCIPAL MINE

Having thus described the general character and the geological details of the region in which the veins of wolfram appear, we will proceed to describe with some detail the principal mine, La Virgen de Gracia. This property, which has an area of about 21 hectares, lies about a kilometer to the north of the village of Oliva de Jerez. Within its boundaries the layers of slate and gneiss, as with the beds of quartz have only faint outcrops and the surface is covered for the greater part with a mass of recent formation, the character of which clearly shows its alluvial origin. Its elements are pebbles of quartz of gravel size, wolframite, sometimes pure and



WOLFRAM-MINING PORTION OF BADAJOZ, SPAIN

sometimes mixed with quartz, a few boulders of gneiss, hematite, specular iron, and a red clayey earth, which covers all of the rocks.

The thickness of this bed varies from one place to another in accordance with the general topography of the country, but it would be correct to assume a general average of about 60 to 70 cm. The ditches made to investigate the bed of quartz, and other auxiliary work performed with the object of exploration permit the taking of a large number of samples which, methodically washed, show the existence of wolfram in larger or smaller proportions in the whole mass of alluvium. There are, of course, some places richer than others, among which we may mention a portion of land containing about 30,000 eu.m., situated in the northwestern part of the property, whose average richness is about 6 kg. of wolframite per eu.m. Although the usual size of the wolframite stones and pebbles are about 1 to 5 cc., there are many of pure wolframite much larger, weighing

Note—Translation of an article by Julio Sacristan, of the mining faculty of the Escuela de Mieres, in "Boletín del Instituto Geológico de España," and reprinted in "Revista Minera, Metalúrgica y de Ingeniería," October, 1913.

from 1 to 2 and more kg. Stones have been found weighing as high as 255 kg.

VARIETY OF MINERALS FOUND IN BEDS

In the property there are 10 different beds, the upper one outcropping at the southeast angle in the top of the hill of Alcornocosa. The lowest beds were cut in the course of work which was done on the level ground immediately to the east of that hill. The thickness of the first bed is practically constant at 70 to 80 cm., although in the higher parts of the Alcornocosa hill it reaches as much as 2 m. Its composition is principally white and rose-colored crystalline quartz, some of the crystals of which are 50 cm. long and 15 to 20 cm. in diameter and smaller quartz crystals, full of native sulphur. Minerals which occur with the quartz usually are pyrite, hematite, spathic iron, pyrolusite and wad, native gold having been observed on one or two occasions.

The wolframite sometimes appears in the body of the quartz, but more usually covering the wall of the bed and associated solely with hematite, and shows preferably in those places in which the underlying rock is more metamorphosed and when its stratification is crossed by cracks or tiny faults or when it is formed into small folds. The mineralization per cubic meter, if one takes into account the sterile parts, is not more than two or three kilograms of wolframite, equivalent to a pure streak of about 5 millimeters.

SECOND BED IS THIN BUT WELL MINERALIZED

The second bed, the thickness of which rarely passes 50 cm., has a mineralogical composition similar to the first, with the difference that it has, associated with the quartz, a great deal of which is black, crystallized tourmaline, which sometimes passes into light, clear colors, and also a variety of oligoclase feldspar, with a mixture of albite, greisen, zwitter¹ and amorphous scheelite, there having been found also crystals of oligoclase feldspar which have been completely changed into scheelite. This bed is separated from the upper one by a zone, 2 or 3 m. in thickness, consisting of soft sericitic mica, often having pink tints, and sometimes occurring clear and colorless, and also gneiss which is much metamorphosed and charged with tourmaline, with frequent transitions to greisen and zwitter.

The wall of this bed is formed of gneiss, much resembling the bed which overlies it, but is more metamorphosed. Greisen and zwitter occur together with a great deal of wolframite. Aside from the zwitter, wolframite occurs in the gneiss which lies near the surface. It is in the form of lenticular nodules surrounded by the stratification of the beds or separated from them by a shell of quartz. It has a dark gray color and in density and hardness is inferior to that wolframite which occurs in quartz. Scheelite accompanies it in the quartz at times, but it is rare.

WOLFRAMITE IN QUARTZ IS ALWAYS AMORPHOUS

In the quartz, wolframite is found in nodules of various sizes, always amorphous. Often when the bed thins to 15 or 20 cm., the mineral is more abundant until sometimes the seam is of the pure mineral. In this case it may be taken out in large plates and is so brilliant as to resemble a mirror. In an exploratory cut, there was

¹A twin-crystal variety of cassiterite.

obtained from 450 cu.m., more than 17 tons of wolframite, corresponding to 38 kg. of mineral, with 70% tungstic acid, per sq.m. of the bed. It is to be noted that the mineral does not occur in pockets, but is distributed with some regularity; much more so than is usually the case with deposits of this class.

The beds underlying this one are full of small planes and little transverse faults, and are folded like little hills whose crests run generally N 15° W, corresponding approximately with the axis of anticline which has been already described.

THREE COLUMNS CONTAIN MINERALS

As the explorations made a few hundred meters to the north and to the south of the workings above mentioned have shown the continuation of the bed forming the same folds with the same mineralogical character, it is estimated that the whole forms a perfectly defined mineralized column. According to observations made at different workings and at different times, the existence of two other columns, analogous in direction, character, origin and mineralogical composition, occur. It is only in the second bed, however, that the existence of these rich columns has been observed, and then only when the zone which separates the two beds is crossed by faults, or when its thickness diminishes and allows the two beds to come into contact. Then only is the upper bed mineralized in the part directly above the rich zone of the lower one, a clear indication that the mineralizing agent comes through the passage which the second bed offered, and passed into the first.

If one takes into account that in several properties in the territory of the Oliva de Jerez and Zahinos, two beds of quartz are to be found, the second, wherever it has been encountered, showing native wolfram with the same geological characteristics which are seen in the Virgen de Gracia mine, it will be understood that we estimate as particularly interesting the wolfram deposits of the region.

Phosphate, Petroleum and Potash Claim Laws

WASHINGTON CORRESPONDENCE

Secretary of the Interior Franklin K. Lane, in a report for the interior department, made public on Dec. 24, discusses the question of petroleum, phosphate and potash mining and the laws governing it. He calls attention to the absurdity of applying the placer-mining law to petroleum lands and notes that the claimant who has gone upon lands for the purpose of making mineral location, and is engaged in work looking to the discovery of minerals, is protected against adverse agricultural claimants on the ground that the land which he occupies is not vacant and open to settlement. The extent of his protection against adverse mineral claimants is, however, a matter of serious doubt. He cannot be ousted by the forcible or fraudulent entry of another mineral claimant, but if such adverse claimant enters peacefully, openly, and in good faith, prospects the claim and first discovers minerals, thus perfecting his location, his title is superior and he dispossesses the original occupant.

On the other hand, in some of the fields large areas are held indefinitely by assessment work, which makes little pretense of exploring the claims or developing them.

Useless roads which make the claims no easier of access, drilling rigs incapable of reaching the oil sands, building-stone locations where no building stone is to be found, and locations on worthless deposits of gypsum are among the subterfuges adopted to hold possession of land prospectively valuable for oil. Thus, where occupancy without discovery is respected, large areas are withheld from exploration and development, and where such occupancy is not respected, the oil prospector must assume undue risk of the loss of his investment prior to discovery.

Mr. Lane urges the development of a new plan whereby licenses allowing oil prospecting on government lands for limited periods shall be issued.

As to potash and phosphate rock he urges action and says that:

Some years since this department announced the discovery within the United States of a deposit of potash which it was hoped would render our farmers independent, for a time at least, of all other sources. This deposit still lies unused. No proper laws have been passed by which it can be put into use. A common-sense view of the matter would be to treat these lands as it has been suggested we should treat coal lands.

So, too, should our vast deposits of phosphate rock be brought into the world's supply. We are giving a constantly increasing volume of thought to the scientific methods by which the fertility of our soils may be increased. And the time is likely to come when the deposited phosphorus in our western lands will be regarded as of almost priceless worth. Few appreciate how extensive these deposits are. They run for hundreds of miles through Wyoming, Utah, Montana and Idaho, and in other States similar deposits of lesser extent are known to exist. We have millions of acres of phosphate lands which are estimated to contain several billion tons of phosphate rock; undoubtedly the world's largest known reserve. In 1910 the United States produced 52% of the world's output of phosphate rock, and last year over 40% of our product was exported. It would certainly be well if we could insure the preferential use of this fertilizer on American farms and export it in the form of farm products rather than as raw material.

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Broken Hill South Silver

The report of the Broken Hill South Silver Mining Co., Broken Hill, N. S. W., Australia, for half-year ended June 30, 1913, shows that 151,836 tons of ore were raised from the mine, averaging 14.4% lead, 6.5 oz. silver and 13.7% zinc. The average weekly extraction of

BROKEN HILL SOUTH CONCENTRATION RESULTS

Product	Net Weight Tons	Proportion %	Assay Value			Metal Contents			Proportion of Metal Contents		
			% Pb.	Oz. Ag.	% Zn.	Tons Pb.	Oz. Ag.	Tons Zn.	% Pb.	% Ag.	% Zn.
Concentrates.....	24,417	16.1	70.2	22.7	6.7	17,141	554,266	1,632	78.3	56.2	7.9
Tailings—zinc.....	109,098	71.8	2.9	2.9	15.5	3,156	319,660	16,832	14.4	32.4	81.3
Tailings—quartz.....	1,413	1.0	2.0	2.1	7.9	28	2,847	111	0.1	0.3	0.5
Slimes.....	16,814	11.1	9.3	6.7	13.3	1,559	108,835	2,151	7.2	11.1	10.3
Totals.....	151,742	100.0	14.4	6.5	13.7	21,884	985,608	20,726	100.0	100.0	100.0

crude ore was at the rate of 5840 tons. This ore was obtained in the following manner: Stopping on contract, 97%; stopping on wages, 1.3%; development, etc., 1.7%. Almost the whole of this ore, or 98.6%, was conveyed to the shaft on contract. The development work, including 553 ft. of shafts and 685 ft. of diamond drilling, amounted to 5522 ft. for the period. Quantities sent down for stope filling were as follows: Tailings, 38,198 cu.yd. loose; ashes, 1623 cu.yd.; development waste, 13,905 cu.yd.; total, 53,726 cu.yd. of loose material. The cost of purchase, handling this material on surface and conveying to stopes, was \$1.04 per cu.yd. of filling, or 36c. per ton of crude ore extracted.

Contractors employed underground earned the following amounts: Miners on development, \$4.82 per 8-hr. shift; miners stopping, \$3.92; average of miners, \$4.21;

truckers, ore, \$3.43; truckers, mullock, \$3.10; average for truckers, \$3.26 per 8-hr. shift. Employees on the payroll averaged 1399, of whom 399 were on the surface. The average daily attendance was 1143, of whom 356 were surface men. The tabulated statement given herewith shows the tonnage treated and the classification effected by the treatment plant for the half-year.

The costs were as follows:

BROKEN HILL SOUTH SILVER COSTS

	Per Ton Milled
Mining.....	\$3.23
Filling depleted stopes.....	0.36
Development.....	0.90
Concentrating.....	1.01
Total working cost.....	\$5.50
Other expenses, office, taxes, fees, etc.....	0.25
Depreciation.....	0.18
	\$5.93

Depreciation as charged was almost double the amount actually spent during the year and charged to capital accounts. The working costs for half-year ended Dec. 31, 1913, amounted to \$4.68 per ton. It is stated that the increased cost was due to reduced tonnage delivered on account of a strike of tramway employees. The water consumption was apparently about 197 gal. per ton treated at the concentrating plant.

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Electrolytic Recovery and Refining of Gold and Silver

The *Revue Electrique* gives the following generalized data regarding the use of electrolytic processes for the precipitation of the precious metals from cyanide solution, and for their refining. The processes described are in regular use at different works and mints in the United States, and the information is not new, but is here reproduced for convenient reference.

ELECTROLYTIC PRECIPITATION FROM CYANIDE SOLUTION

The ordinary zinc-precipitation method works to best advantage on solutions containing about 0.35% cyanide; weaker solutions can be precipitated satisfactorily only by treating the zinc with lead acetate until about 5% of the zinc is replaced by lead. The Siemens-Halske elec-

trolytic process, however, treats these weak solutions. The anodes are of sheet iron, and the cathodes of lead, which absorbs from 1 to 12% of gold. Neumann has proposed carbon cathodes; the carbon plates thus coated with impure gold could then be transferred to other tanks, as anodes, for the refining of the gold in chloride electrolyte, as described below.

Peletan and Clerici designed a process aiming to extract gold from ore and precipitate it from solution all in one operation in a single apparatus. An upright vat contains an iron cylinder, the anode, and a copper cathode, separated from the anode by a distance of 10 to 16 cm. Rotation of the anode causes a thorough mixing of the pulp, which consists of three parts of cyanide solution to five parts of crushed ore. With a current density of 16 amperes per square meter, at 5 to 14 volts, a vat of 2 to

7 meters diameter will treat about five tons of ore per day. The process was not a commercial success.

REFINING OF CRUDE GOLD

The usual impurities of crude gold are lead, platinum, silver, palladium, yttrium and ruthenium. The Wohlwill process involves electrolysis from hydrochloric solution containing about 30 grams gold per liter, warmed to 50 or 55° C. Lead dissolves first, and can be precipitated by sulphuric acid; most of the silver chloride goes to the bottom of the vat; platinum is not deposited on the cathode until it reaches a concentration of 50 to 60 grams per liter of electrolyte; nor palladium until it reaches 59 grams per liter. If the current density does not exceed 1000 amp. per sq.m., and if the electrolyte is regularly renewed, the deposited gold may easily reach a degree of 999.8 fine. Alaskan gold contains so much copper, 4%, that the electrolyte must be renewed after treating 50 kg. of bullion.

REFINING OF CRUDE SILVER

The classic Moebius apparatus was a wooden vat containing as electrolyte a solution of 0.5 to 1% silver nitrate with 0.1 to 1% nitric acid. The anodes of crude silver, 95% fine, were 12x25 cm. in area, and the cathodes, thin sheets of pure silver, were 5 or 6 cm. distant from the anodes. To permit constant discharge of the refined silver, Moebius designed a shallow vat, in which the anodes were suspended horizontally; the cathode consisted of an endless belt of pure silver, traveling at a rate of 10 cm. per minute around wooden rollers, and emerging from the electrolyte at one point of its circuit. The cathode being smeared with a thin coat of grease, the electrolytic silver was easily detached.

The Balbach apparatus is somewhat more simple than the Moebius; it consists of a porcelain vat 60x60x18 cm., with horizontal arrangement of the electrodes. No agitating device is used. The cathodes are of graphite, from which the deposited silver is readily detached. The consumption of energy is greater than in the old Moebius apparatus, but the anodes are completely dissolved, leaving no residue to be remelted, and the manipulation of the process is easier than with the older type.

EXTRACTION OF GOLD AND SILVER FROM COPPER BULLION

The best known process for this operation is that of Dietzel. The electrolytic vat is divided into two compartments by a horizontal diaphragm. In the lower is placed the anode, consisting, for example, of gold, 5 to 7%; silver, 25 to 50%; copper, 40 to 65%; tin, lead, iron, etc., 5%. The upper compartment contains two cylindrical copper cathodes, rotating horizontally. Between them flows the electrolyte, a slightly acid solution of copper nitrate, containing 2 to 5% copper, and 0.4% HNO₃. Passing through the diaphragm, the electrolyte attacks the anode, dissolving the copper, the silver, and a little iron and lead. The solution, now rich in copper and silver, passes through several cementation vats containing scrap copper, where the silver precipitates, thereby adding to the burden of copper in the liquid. Finally a part of the solution, properly diluted, now exclusively cupriforous, returns to the electrolyzing vat. The anode residue contains the gold, a little silver, and traces of copper, lead and tin.

December Mining Dividends

Dividends of United States mining companies making public reports reached the remarkable total of \$9,230,918 for December, paid by 41 companies. Metallurgical and holding companies paid \$14,016,551, while 14 Canadian and Mexican companies paid \$1,174,110.

Dividends have not been without some humor recently. One mine declared a stock dividend of 700 shares on each 1000 outstanding, then assessed the entire issue; another, Bullion Coalition, raised 12,000 bu. of potatoes, and threatened a dividend in them.

United States Mining Companies		Situation	Per Share	Total
Alaska Treadwell, g.	Alas.	\$1.00	\$200,000	
Baltic, c.	Mich.	2.00	200,000	
Brunswick Con., g.	Calif.	0.06	23,400	
Bunker Hill & Sullivan, l.s.	Ida.	0.25	81,750	
Bunker Hill Con., g.	Calif.	0.05	10,000	
Calumet & Ariz., c.	Ariz.	1.25	745,441	
Calumet & Hecla, c.	Mich.	6.00	600,000	
Chino, c.	N. M.	0.75	583,194	
Cliff, g.	Alas.	0.05	5,000	
Doe Run, l.	Mo.	0.76	49,995	
Daly Judge, s.l.	Utah	0.15	45,000	
Federal Min. & Sm. Co., pfd., l.	Ida.	1.50	179,791	
Fremont, g.	Calif.	0.02	4,000	
Gemini-Keystone, g.s.	Utah	5.00	50,000	
Golden Cycle, g.	Colo.	0.03	45,000	
Gold King, g.	Colo.	0.01	10,000	
Hazel, g.	Calif.	0.01	9,000	
Hecla, l.s.	Idaho	0.02	20,000	
Homestake, g.	S. D.	1.65	413,254	
Ingot, g.	Utah	0.0014	750	
Iron Silver, s.l.g.	Colo.	0.10	50,000	
Nevada Con., c.	Nev.	0.874	1,749,510	
New Idria, q.	Calif.	0.10	10,000	
North Star, g.	Calif.	0.60	150,000	
Portland, g.	Colo.	0.02	60,000	
Ray Con., c.	Ariz.	0.374	542,757	
Silver King Coalition, s.	Utah	0.15	187,500	
Silver King Con., l.s.	Utah	0.25	155,000	
St. Joseph, l.	Mo. f	0.10	100,000	
Stewart, s.l.	Ida.	0.10	123,826	
Superior & Pittsburgh, c.	Ariz.	0.38	569,922	
Tennessee, c.	Tenn.	0.75	150,000	
Tomboy, g.	Colo.	0.48	150,660	
Tom Reed, g.	Ariz.	0.06	54,573	
Tri-Mountain, c.	Mich.	2.00	200,000	
United Verde, c.	Ariz.	0.75	225,000	
Utah, c.	Utah	0.75	1,186,695	
Yukon, g.	Alas.	0.074	262,500	
Yellow Aster, g.	Calif.	0.05	5,000	
Yellow Pine, z.c.s.	Utah	0.02	20,000	
Yosemite Gold Dredging, g.	Calif.	0.10	2,400	

Iron, Industrial and Holding Companies		Situation	Per Share	Total
American Sm. & Ref., com.	U.S.-Mex.	1.00	500,000	
American Sm. & Ref., pfd.	U.S.-Mex.	1.75	875,000	
Crucible Steel, pfd.	U. S.	1.75	427,638	
General Development.	U. S.	1.50	44,982	
Greene Cananea.	Mex.	1.00	486,209	
International Nickel, com.	N. J.	2.50	948,133	
International Sm. & Ref.	U. S.	2.00	200,000	
Lackawanna Steel, pfd.	N. Y.	1.75	612,115	
National Lead, com.	U. S.	0.75	619,660	
National Lead, pfd.	U. S.	1.75	426,433	
Phelps-Dodge.	U.S.-Mex.	5.00	2,250,000	
Pittsburgh Steel, pfd.	U. S.	1.75	112,500	
St. Mary's Mineral Land, c.	Mich.	1.00	160,000	
U. S. Steel, com.	U. S.	1.25	6,353,781	

Canadian, Mexican and Central American Companies		Situation	Per Share	Total
Beaver, s.	Ont.	0.03	59,989	
Caribou Cobalt, s.	Ont.	0.024	25,000	
Chontalpan, g.s.l.z.	Mex.	0.50	3,500	
Crown Reserve, s.	Ont.	0.02	35,376	
Granby, s.g.c.	B. C.	1.50	222,721	
Hedley, g.	B. C.	1.50	180,000	
Hollinger, g.	Ont.	0.30	180,000	
Kerr Lake, s.	Ont.	0.25	150,000	
Lucky Tiger, g.	Mex.	0.06	42,920	
N. Y. & Hond. Rosario, g.	C. A.	0.20	40,000	
Seneca-Superior, s.	Ont.	0.124	59,604	
Standard, s.l.	B. C.	0.05	100,000	
Trethewey, s.	Ont.	0.05	50,000	

A full review of the year's dividends will appear in the annual statistical number, issued on Jan. 10. The accompanying table gives the details of the December disbursements.

Texas Iron-Ore Deposits

In the article by Robert Linton, on this subject, a typographical error in the caption of the fourth halftone makes it read "lead ore," when it should be "ledge ore." Also, for the sake of additional clearness, the heading on the first table of analyses on page 1156 should specify "carbonate" ores.

New Mining Experiment Station Bill

WASHINGTON CORRESPONDENCE

A somewhat ambitious bill for the establishment of 10 mining experiment stations has been introduced in the House of Representatives by Mr. Taylor, of Colorado (H. R. 11098). This bill requires the Secretary of the Interior to appoint at each such station a superintendent who shall be an experienced mining engineer and shall receive \$4000 per annum and a metallurgical chemist at \$3000, and any other necessary employees. The bill goes on to provide:

And for the establishment and maintenance of said mining experiment stations, including the purchase of land, the payment of rent and salaries, the purchase of equipment and supplies, and for other necessary expenses in connection with and incident thereto, the Secretary of the Interior is hereby authorized to expend annually the sum of \$25,000 for each of said mining experiment stations, for which purpose there shall be appropriated, out of any moneys in the United States Treasury not otherwise appropriated, the sum of \$250,000 for each year: Provided, That the Secretary of the Interior is hereby authorized, in his discretion, to accept and use or expend such contributions of land, buildings, supplies or moneys as may be made by any state or territory coöperating in the establishment of any such mining experiment station or in carrying on the work contemplated by this Act; the acceptance of such contributions, however, shall involve the United States in no expenditure beyond that authorized by Congress.

The purpose of the experiment stations is to carry on scientific experiments and investigation with a view to improving mining methods and aiding in the development of mineral resources but no work is to be done for private individuals.

Another bill of the same general description providing for a station at Flat River, Francois Co., Mo., has been introduced by Representative Hensley.

Tomboy Gold Mines

According to the annual report of the Tomboy Gold Mines Co., Telluride, Colo., for year ended June 30, 1913, the company milled 129,618 dry tons of ore, yielding an average of \$8.02 per ton. A summary of receipts and expenditures from figures given in the report is as follows:

Receipts:	Per Ton
Bullion produced.....	\$2.76
Concentrates produced.....	5.26
Boarding house, rents, etc.....	0.07
Total receipts.....	\$8.09
Expenditures:	Per Ton
Mining.....	\$1.45
Development.....	0.74
Milling.....	0.52
Concentrating, including transportation to railroad.....	1.03
Water supply.....	0.16
Assay office.....	0.04
General expenses.....	0.30
Taxes.....	0.15
Total working cost.....	\$4.39
Directors' fees and London office expenses, etc.....	0.09
Depreciation of plant charged.....	0.20
Cost of tramway written off.....	0.10
Income taxes etc.....	0.19
Total cost of production.....	\$4.88

The Montana mine, recently purchased, furnished 41% of the ore milled. The average contents of the ore from this mine was as follows: Au, 0.48 oz.; Ag, 4.51 oz.; Pb, 1.03%; Zn, 2.18%; Fe, 4.13%, and Cu, 0.28%. It is stated that since the erection of an aerial tramway from the Ophir tunnel to the railroad, a distance of 1¼ miles, a saving of about \$4000 to \$4500 per month has been

made. Before the erection of this tramway the freight on concentrates and supplies by wagon haulage had ranged from 45 to 50c. per ton of crude ore.

The increase in tonnage for the year was brought about by the use of coarser screens in the batteries, and the re-grinding of that portion of the pulp that is sent to the middlings mill, by two Hardinge conical mills. This has decreased the recovery of free gold by amalgamation, and to remedy this the company is contemplating installing two additional Hardinge mills below the batteries. Recent experiments have been made with flotation and electrostatic processes. These tests were still in progress and indicated that a better recovery could be made on the zinc-middlings product. The ore reserves are estimated at 426,000 tons; 264,000 tons of which are contained in the Argentine group, and 162,000 tons in the Montana property. Dividends amounting to \$263,655 were paid.

Chronology of Mining for December, 1913

Dec. 1—Federal indictment of 25 officers of United Mine Workers of America active in Colorado coal strike.—Five men entombed in Golden Cycle mine, Cripple Creek district, Colorado; two were rescued.—Eight-hour day for miners and mill men in Lake Superior copper country.—Globe Consolidated Mining Co.'s 20-stamp mill at Dedrick, Calif., began operations.

Dec. 2—Sunnyside tramway terminal at Silverton, Colo., destroyed by fire.

Dec. 3—Wharton Steel Co. closed down iron mines at Hibernia, N. J.

Dec. 6—Two men killed by cave in Little Jonny mine, Leadville, Colo.

Dec. 9—Cave in Creighton mine, Sudbury district, Ontario; one man killed.

Dec. 11—Attempt to assassinate Sir Lionel Phillips at Johannesburg.

Dec. 16—Explosion in Vulcan colliery, Newcastle, Colo.; 38 men killed.

Dec. 18—Renewal of International Zinc Syndicate, running to April, 1916.

State and Federal Co-operation in Mine Safety Work

The California Industrial Accident Commission has requested that one of the expert engineers of the Federal Bureau of Mines, H. M. Wolfen, be designated to co-operate with the commission on a half-and-half basis as to salary and traveling expenses, all reports and conclusions to be submitted both to the state commission and to the Interior Department. The work proposed will include an extensive study of mine-safety conditions in the state, with such investigations, research work and recommendations as will tend to the conservation of human lives as well as mining property.

Marking Inferior Jewelry "Platinum," "Pure Platinum" or "Solid Platinum" will be made a misdemeanor in New York if the legislature passes a bill prepared by a committee of the National Jewelers' Board of Trade. This bill requires that wares carrying such stamps must be made of platinum at least 950 fine. The word platinum is to be construed to include other metals of the platinum group—iridium, osmium, palladium, rhodium and ruthenium—or any combinations of those elements. An effort will be made to bring a similar law before Congress.

Correspondence and Discussion

Calculation of Extraction Cyanidation

With reference to W. J. Sharwood's communication, in your issue of Nov. 15, 1913, it is important to note that his observations refer to a percentage of extraction obtained as follows:

From amalgamation.....	76.59
From cyanide treatment.....	23.41
	100.00

That is to say, two independent processes were employed, each of which would have incurred some loss. Mr. Sharwood, however, appears to assume that there was no loss in amalgamation, possibly because the sands, after amalgamation and dewatering, went to the cyanide plant direct, and therefore the only loss would have taken place in cyaniding. It is possible that this assumption might be right if the ore had been stamped in cyanide solution, but it was stamped in a large quantity of water, which it was afterward necessary to get rid of before the sands could be cyanided, and this would have led to considerable loss in float slimes, owing to the impossibility of collecting them in dewatering cones. In addition, there was a large loss of quicksilver in amalgamating, and this would have carried off gold.

It is unnecessary here to enter into the possible loss which might arise from the sources mentioned, as this has been indicated by the writer in a previous communication¹, but it must be evident that if such losses are liable to occur, the weight and assay value of the recovered tailings must be considerably less than they otherwise would be, and therefore any extraction percentage founded upon such data must be considerably higher than the actual extraction.

WILLIAM L. WELTON.

London, Dec. 8, 1913.

Copper Leaching

I notice in the *JOURNAL* of Nov. 22, under your partial catalog of copper leaching, that you omit from your list of plants, that of the Royal Basin Mining Co. This is the first plant in the United States, I believe, that successfully made electrolytic copper by leaching the ores with sulphuric acid.

I also note your statement in regard to the crude arrangements at the Butte & Duluth. This is the only plant in the country that is operating and shipping electrolytic copper on a commercial basis. By reading through the list that you publish, the rest of them, except the Henderson, are "going to make copper," so a word in regard to the Butte & Duluth may be interesting.

There is good reason for the tanks being made in wedge shape and being placed in cascade. This was done in an attempt to solve the economic problem involved in copper leaching and the arrangement is a great improvement over the ordinary round tanks in use at the Royal Basin Mining Co.'s plant. They by no means

¹Eng. and Min. Journal, July 12, 1913.

solve the problem, but have acted as indicators whereby it might be solved. In that "rather crude" plant, Capt. A. B. Wolvin, who has had sufficient experience in leaching to know what is necessary to make a success of it, has been conducting a line of experiments with such good results that he has placed orders for machinery and equipment to increase the capacity of the plant to 1000 tons a day.

The plant of most importance to those engaged in mining copper ores, and which is now under construction, you failed to give a place in the list. This is the plant of the Wagner Azurite Copper Co., of Luning, Nev., where it is proposed to treat an ore containing 3% copper and \$2.50 per ton in gold and silver.

As I understand it, until the Royal Basin and Butte & Duluth plants were placed in operation, the precipitation of copper by the electrolytic method, from solutions obtained by leaching copper ores, had been a complete failure, due to the polarization of the anodes. And when I started these plants, the technical press was not very enthusiastic over their probable success. Then a little later a series of articles appeared admitting that it was possible to leach copper ores, but questioned the cost of production.

Now, according to the list you publish, the process in some instances is being taken over bodily and heralded as something new, but in none of the articles that have thus far appeared in either the *JOURNAL* or the other technical papers, has there been any discussion of the real problems involved, and which have necessarily to be solved before copper leaching is a success. It may be accepted as a foregone conclusion that the failure of all processes, designed to precipitate electrolytically, that involve chlorine as a factor in the leaching of ores containing considerable amounts of aluminum, soda or potash, or the introduction of sodium into the pulp during the process of treatment, no matter how interesting they are from an experimental standpoint, is sure.

JOHN D. FIELDS.

Maxville, Mont., Nov. 26, 1913.

The Explosion in the Kennedy Mine

The article on the "Dynamite Explosion in the Kennedy Mine," in the *JOURNAL* of Dec. 13, 1913, was in error. As a matter of fact, there is not now, nor has there ever been a time, when the fuse, caps and powder were stored together in the same magazine. They are stored separately, and at distances apart of from 50 to 150 ft. The rules of the mine governing the use and handling of explosives were being violated at the time of the accident. The explosion did not take place in the magazine, but occurred in the main crosscut, a distance of nearly 50 ft. from it.

WEBB SMITH,

Superintendent, Kennedy Mining & Milling Co.
Martell, Amador County, Calif., Dec. 19, 1913.

Editorials

Nationality in Mine Strikes

In discussions of the present trouble in the copper country, the question of the nationality of the strikers constantly recurs. The Finns are stated to be the irreconcilable element and the managements are quoted as determined to hire none of them hereafter. Finns seem possessed with an inextinguishable desire to start something whenever occasion offers, a characteristic which overbalances their undeniable intelligence and skill so far as their desirability underground is concerned. This fact has been recognized for years and has led to the practice in most Lake Superior districts of tempering the Finnish contingent in any one mine with a certain number of Austrians, Italians, Montenegrins, etc. In the slight strike trouble at Mineville, N. Y., last spring, Witherbee, Sherman & Co., found that the Poles were the ringleaders and the most difficult element to handle. This tendency of the Poles and Finns to get off the reservation is well confirmed by some figures recently sent us by the Hollinger Gold Mines, Ltd., of the Porcupine district of Ontario. It will be remembered that about a year ago the strike in Porcupine which the Western Federation backed and lost was just nearing its lingering end. The Hollinger company tabulated according to nationality and occupation the behavior of its employees during the strike. The results are of great interest and rather instructive.

The number of men covered by the tables as in the employ of the company at the time of the strike is 507, of whom 155 were English-speaking, 114 Italian, 110 French, 109 Poles and 19 Finns. Their behavior is described as loyal, semiloyal and disloyal, the loyal men being those that stuck by their jobs throughout the strike unconditionally and beligerently; the semiloyal, those who quit for a week or 10 days but returned to work on finding that a large number had refused to strike; and the disloyal, those who struck and stayed out.

Of the English-speaking, 31% were loyal and 10% semiloyal; of the Italians, 28% were loyal and 41% semiloyal; of the French, 18% and 33%; of the Poles, 2% and 34%; while of the Finns 100% were disloyal. Of the total number of employees about 20½% were loyal and 26½% semiloyal. The confirmation of the reputation of the Finns and Poles is striking. In the case of the English-speaking the figures give an unfair aspect, considering the element as a whole, since just before the strike, the company had increased its timber gang and the union had made it a point to have men ready to fill every vacancy. Furthermore, it was discovered after the strike that the foreman of one of the departments was a Western Federation man and that he had supplanted all of his nonunion men with members of the union in order to help make the strike stick. Many of the old men also, largely English-speaking, avoided trouble by pulling out of camp altogether when the strike began, and have been gradually returning since that time.

The behavior classified by occupations is also interest-

ing. Of the laborers, 34% were loyal and 41% semiloyal; of the miners, none were loyal and 33% semiloyal; of the timbermen, 6% were loyal and none semiloyal; of the carpenters, 10% were loyal and 26% semiloyal; of the teamsters, 7% and 23%; of the mechanics, 26% and 9%; the millmen were 59% semiloyal; the blacksmiths all semiloyal; and the electricians and miscellaneous all loyal. Evidently the strike derived its greatest strength from the more skilled underground men, namely, the timbermen and miners, largely from the fact that these classes had been previously packed by the union as explained.

We are not informed whether any records of this nature are being kept by the Lake Superior copper companies but if so they cannot fail to be of value to the companies as well as mining interests in general.

The Case of Mr. Moyer

Mr. Moyer, the president of the Western Federation of Miners, moved or was removed from Hancock, Mich., one day last week, and was badly mauled in the operation. He learned then how it feels to experience the treatment that he is supposed to have been administering, vicariously maybe, to other persons during many years.

This has become one of the questions of the day, which has been referred to Washington, viz., "Who man-handled Moyer?"

If it were representatives of the Citizens' Alliance who committed the crime against Mr. Moyer, let them pause and reflect on what they have done. They have made a martyr of him. The story of Lawrence, Mass., is demonstration enough of how such deeds may aggravate labor troubles. Mr. Moyer's person should be inviolate. He should be tended with the same concern and deference that the British Government exhibits toward Mrs. Pankhurst.

The Business Prospect

The change in the commercial atmosphere, which occurred during the last 10 days of December, was remarkable. Where previously there had been gloom and pessimism of the deepest dye, there began to be optimism and even some buoyancy of spirit. This shows the bearing of the sentimental factor. Economic conditions remained as they were previously, but the passage of the currency bill and the assurance of Washington that the trust question would be handled in a fair and friendly way, relieved vague fears. The successful weathering of a trying year by American finance has also dissolved the haunting forebodings of a panic, which, during 1913, obsessed many minds. American business feels that it can now go ahead without seeing ghosts.

The strain on the world's capital resources, which is considered to be the fundamental cause of recent troubles, has probably been relieving itself by natural processes for some time. The focus of this difficulty was

always in Europe, the American market having been all along the strongest of any of the great markets. The ease with which America met the prolonged liquidation of Europe was always impressive.

Business in the United States in 1913 did not suffer from over-speculation in industrial enterprises, or in commodities. Stocks of the latter have probably been low all along and lately have become very low. The feelings of uncertainty respecting the future, which prevailed until lately, caused merchants to proceed with caution and abstain from buying, except to cover hand-to-mouth requirements. Their abstention from buying was felt keenly in the basic markets, including the metal markets, but while producers have had to accumulate some stocks the conditions seem now to be ripe for a rapid depletion of them.

The spurt of the last week may turn out to be a false start, or it may be the beginning of a steady upward movement. The recovery from the depression in 1904 occurred in just the latter way. As to how it will turn out in 1914 it must be left to time to tell. Anyway, there is ground for confidence in the ideas that we enter 1914 with business in a sound condition and good prospects for an improvement in activity.

Platinum in Germany

A reported discovery of platinum-bearing placers in Germany may be of some importance to users and dealers in that metal. An account is given of this discovery in a recent consular report, from which it seems that the find was accidental, in drilling conducted for other purposes. The supposed platinum deposits are near Wenden in Westphalia, and the metal was found in analyzing the borings. It is said that nine holes were drilled on a tract of 500 acres, and that platinum was found in each case. The results so far seem rather indefinite, but our consul is informed that more systematic exploration is to be undertaken. The deposits are within easy reach of abundant supplies of fuel, cheap labor and other elements which will enable them to be worked at low cost.

Much of the supposed value of the deposits seems to rest upon a new process—details unexplained—for treating the complex ore in which the platinum is said to be found. A syndicate organized at Düsseldorf has secured the patent rights of this process, and has already organized three subsidiary companies to mine and produce the metal.

While the real value of the supposed platinum deposits seems to be still somewhat problematical, the Germans are taking it so seriously that the question has been brought up of organizing a platinum Kartel, or syndicate, somewhat on the lines of the potash syndicate a German correspondent suggests, apparently not realizing what a distinguished non-success that has proved.

British Iron and Steel

The figures for the make of iron and steel in great Britain for the year 1912 have just made their appearance, the delay of nearly six months over the usual time being probably due to the sickness and death of J. Stephen Jeans, who was the moving spirit in the British Iron Trade Association, which collects and compiles the figures. At this late date only brief comment can be made.

The industry was unfavorably affected in 1912 by the coal strike and other labor troubles. This was most apparent in pig-iron, steel and finished-material output being kept up by the use of imported pig, chiefly from Belgium and Germany. The production items given compare with 1911 as follows, the figures being in long tons:

	1911	1912	Charges
Pig iron made.....	9,718,638	8,839,124	D. 879,514
Wrought or puddled iron.....	1,118,893	1,326,917	I. 208,024
Bessemer steel.....	1,461,140	1,522,487	I. 61,347
Openhearth steel.....	5,000,472	5,273,657	I. 273,185
Total steel.....	6,461,612	6,796,144	I. 334,532

The unusual circumstances of the year are shown by the fact that the decrease of 9% in the make of pig iron was accompanied by an increase of 18.6% in wrought iron, and of 5.2% in steel. England adheres more than any of the other important iron-making countries to the use of puddled iron.

The Catastrophe at Calumet

The calamity at Calumet on Christmas Eve, when a fool cried "Fire" in a crowded hall, which cost the lives of 72 persons, mostly children, was heart-rending, and excited the sympathy of all decent people, as such misfortunes must always do. More is the pity that the Western Federation of Miners has sought to make capital out of this painful tragedy. They would have the world believe that the Citizens' Alliance, knowing that the miners' little children were having a celebration around a Christmas tree, sent a man up the stairs to shout "Fire" in the doorway of the hall, while men stood at the foot of the stairs and beat back those coming out of the hall. Could anything be more preposterous? What should be said of an organization that can even think of such a thing?

A good many remarks have been made on reported heavy sales of Welch tinplate for shipment to this country, and in some quarters these sales have been attributed to the new tariff. The fact is that the tariff has had nothing at all to do with these sales. The tinplate—or nearly all of it—is used in making the cases in which oil is exported for the Eastern trade, and as a drawback is allowed on the tin of which these cases are made, there has been all along practically no tariff on the material so used. Last year American makers underbid the Welshmen and secured the contracts; this year, it seems, the low bids have come from the other side, and the orders have gone there. The orders have gone abroad, but not on account of the tariff changes; simply because the Welsh makers were hungry enough for trade to name the lower figure, and the chief, or only, buyer is accustomed to consider the smallest fraction in its costs.

The American consumers of copper seem to have added one more confirmation to the saying that they never buy copper when it is cheapest. On its last movement, copper went close to 14c. American buyers talked boldly about what they would do if the price went under 14c., but if it had done so they would probably have waited to buy at a quarter of a cent less than the market at any given time. In the meanwhile, European buyers made up their minds that copper was cheap, and bought a lot of it, not worrying about whether they were getting it at the absolute bottom of the movement, or not. The market wavered for a time longer, and then started upward. The American consumer has bought on the way up.

BY THE WAY

An engineer says he has received a query for a sample of "industrial earth." The recipient of the request has been advised by kind friends to refer it to the State Agricultural College. Is the advice sound?

✂

The Government of India has appointed a committee to consider the standardization of Indian weights and measures, an operation which, if carried out successfully, cannot fail to be of great assistance to internal trade. Its desirability is shown by the fact that the maund of sugar weighs $48\frac{1}{2}$ seers in Cawnpore, 40 in Muthra, $72\frac{1}{2}$ in Gorakhpur, 40 in Agra, 50 in Moradabad, $43\frac{1}{4}$ in Saharanpur, 50 in Bareilly, 46 in Fyzabad, $48\frac{1}{2}$ in Shahjehanpur, and 51 in Goshangunge. In other weights and measures there is an endless local variety.

✂

A new electric steel plant has just been started on the Pacific Coast at Redondo, Calif., by the Warman Steel Casting Co., which is producing small and medium-sized steel castings. The furnace employed is the pure Stassano type and said to be the first one in the United States. The company, according to "Metallurgical and Chemical Engineering," was organized three years ago and has been producing crucible-steel castings, but decided to adopt another process. It desired to produce castings of at least 1600 lb. in weight, which is almost impracticable in a small crucible plant.

✂

The mining laws have frequently been resorted to by saloon men endeavoring to secure business locations within National Forests, says the annual report of the U. S. Forester. During the construction of the Chicago, Milwaukee & St. Paul R.R. across the National Forests of northern Idaho, on its way to the coast, a practice was made of locating saloon sites under the mineral laws at various points near the large construction camps, remote from police jurisdiction. In every instance it was shown clearly that the land located had no mineral possibilities, and the claims in question were declared invalid by the Commissioner of the General Land Office.

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The U. S. Civil Service Commission announces an examination for laboratory assistant in petrography, Jan. 21 and 22, 1914, to fill vacancies in the Bureau of Standards, at salaries of \$1200 per annum. Competitors will be examined in the following subjects: (1) Elementary chemistry, physics and mathematics, 15 points; (2) translation into English of scientific matter, either French or German, 10; (3) general geology and mineralogy, 25; (4) petrography, 20; (5) education, training and experience, 30 points. An education equivalent to that required for graduation from a college or university of recognized standing, such training to have included courses in geology, is a prerequisite for consideration for this position. Applicants must have reached their twentieth birthday on the date of the examination. Persons who desire this examination should at once apply to the U. S. Civil Service Commission, Washington, D. C.,

for application Form 1312, laboratory assistant in petrography, male, No. 65.

✂

The U. S. Civil Service Commission announces an examination for aid, on Jan. 21 and 22, 1914, to fill vacancies in the Bureau of Standards, at \$600 and \$720 yearly. Competitors will be examined in the following subjects: (1) Elementary algebra, geometry and trigonometry, 30 points; (2) general physics, 30; (3) Elementary mechanical drawing, 20; (4) education, training and experience, 20 points. Graduation from a mechanical training, technical or scientific school or equivalent training in a scientific or technical laboratory is a prerequisite for consideration for this position. Applicants must have reached their nineteenth but not their twenty-fourth birthday. Persons who desire this examination should at once apply to the U. S. Civil Service Commission, Washington, D. C., for application Form 1312, Aid (male), No. 64.

✂

The U. S. Civil Service Commission announces an examination for topographic aid, Feb. 4, 1914, for temporary employment as topographic aid under the Geological Survey during the field season, at from \$40 to \$75 a month. Appointment to permanent positions will be made only of persons who qualify in and are certified from the junior topographer examination. Competitors for the position of topographic (temporary) will be examined in the following subjects: (1) Mathematics (elementary, practical questions), 15 points; (2) surveying (elementary, practical questions), 15; (3) topographic drawing, 20; (4) letter writing, 10; (5) training and experience, 40 points. Applicants must have reached their twentieth but not their fortieth birthday. Persons who desire this examination should at once apply for application Form 1312, Topographic aid, temporary (male), No. 62, to the U. S. Civil Service Commission, Washington, D. C.

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The U. S. Civil Service Commission announces an examination for junior topographer, on Feb. 5 and 6, 1914, to fill vacancies in the Geological Survey, at salaries from \$720 to \$1200 a year. Competitors will be examined in the following subjects: (1) Mathematics (comprising arithmetic, algebra to and including problems involving quadratics, plane and solid geometry, plane trigonometry, logarithms, mensuration and projection), 15 points; (2) surveying, use and care of instruments, and elements of astronomy as applied to surveying (the field questions are all elementary in character and do not involve any mathematical knowledge beyond that under Subject 1), 15; (3) contour construction (consisting of drawing contour lines from given perspective view), 25; (4) topographic drawing and lettering, 15; (5) training and experience, 30 points. Applicants must have reached their twentieth but not their thirtieth birthday, except that in the case of men who have had five field seasons' experience in any government bureau as technical field assistant doing topographic work similar to that executed by the Geological Survey, the maximum age limit is 35 years. Persons who desire this examination should at once apply for application Form 1312, junior topographer, male, No. 63, to the U. S. Civil Service Commission, Washington, D. C.

"The Savagery at Calumet."

Under the above caption the New York *Sun* makes the following remarks in its characteristic style:

The humane and innocent Mr. Moyer, worthy verowance of those tried humanitarians, the Western Federation of Miners, may have failed in his argument that an agent of the brutal capitalists cried "Fire!" so as to burn the children of their serfs, but he has elicited thoughts of great value from the *World*:

The copper industry has been highly protected for many years. It has always been in politics. It has always been in speculation and jobbery. It has always been monopolistic, corrupt and despotic.

Like every other business unduly favored by law, it has maintained the falsehood that the bounty heaped upon it by a discriminating Government has been used to improve the condition of labor. The truth is that this money has gone to the dividend account to maintain excessive capitalization and to establish a power political, financial and industrial that for many years was unchallenged.

The science, the skill and the honesty of Alexander Agassiz, the Shaws and their successors in making profitable to its shareholders and its employees a mine memorably successful among scores that failed, get this much of honor from a critic that is so eager to have corporations remember their duties. These men took a "no good" mine, developed it with every appliance, ran it not for Robber Barons, not for the fluctuations of the stock market, but for the benefit of the owners and the laborers.

There has been no objection among the former, although the death of this, as of any other mine, is an event foreseen and to be allowed for in the benefits. Among the laborers what is the complaint? That the company is just (in the old sense); that it will not consent to discriminate against employees; that it hires men who are incapable of receiving the right hand of fellowship from Brother Bauchop Wilson.

In other words, the sin and shame of the Calumet & Hecla people is that they insist upon "equal rights to all, special privileges to none."

Our esteemed neighbor lays the trouble on the tariff and greed, and an "industrial system that has too often been reckless of public rights and inhuman in its deception and oppression of labor." The tariff makes an immense difference, doesn't it, to men of the intelligence that has always marked the Calumet & Hecla management? The "greed" is presumably the same as that of any citizen for his profits, whether he runs a mine, a junk cart or the *World*. As for the deception and oppression—we might add the murder—of labor, the white-souled Brother Moyer is an admirable example.

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Government to Hunt Radium

WASHINGTON CORRESPONDENCE

As a result of the constant agitation of the subject within the last few days and the introduction of various resolutions, Secretary Lane of the Department of the Interior, has written a letter to Chairman Foster, of the House Mines Committee, in which he expresses a wish that a joint Congressional resolution shall be passed authorizing the President to withdraw lands believed by experts in the employ of the Geological Survey to contain radium. Mr. Lane also wants power to hire explorers to hunt for radium just as a few years ago they were employed to look for potash, although without definite results. Mr. Lane says that:

Radium is found in ores carrying uranium and vanadium, which are used extensively in the arts, and processes by which it is extracted are secret. A process has been invented by the chemists in our Bureau of Mines which promises, from the laboratory experiments thus far made, to be successful. Under the endowment of two Americans, a building is now being erected in Denver (which, with its equipment, will be opened for work in the coming February), in which an effort will be made to prove the commercial possibility of this American process. If successful, this process will be given to the world, and all of the radium secured over and above a small premium, will be the property of the United States, and will be put into the hands of the United States Public Health Service for public use.

Under all these circumstances, it seems to me that the only prudent course that the United States can follow is to withdraw such of its lands as are supposed to contain radium from public entry. This will guard against these lands being taken up by those who would not put them to their highest and most beneficial use. It would be inhuman to deprive other nations of access to our radium deposits if they alone were masters of the secret by which this mineral could be secured, and it is believed that there is a sufficient amount of carnotite and pitchblende already in private ownership in this country to permit European experimentation and production. The people of the United States, however, should be entitled to protection against the exhaustion of this resource and its control by the scientists of other lands.

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Federal Investigation into Michigan Strike

WASHINGTON CORRESPONDENCE

Secretary of Labor, W. B. Wilson, has again endeavored to get a foothold in the Michigan Copper Mining strike situation. This became practically necessary for him in view of a letter written by Senator James E. Martine, on Dec. 28, in which the Senator requested the dispatch of a special agent to the mining region to investigate the conditions there following the expulsion of President Moyer, of the Western Federation of Miners, a few days ago. Secretary Wilson sent John B. Densmore, the solicitor of the Department, with instructions to see what the facts were and ascertain what could be done. It is not believed, however, that Secretary Wilson's efforts will be of much avail because of the fact that he has lately been so thoroughly discredited by reason of the partisan speeches and addresses he has delivered in which he has described himself as a trades unionist, and has apparently taken the view that he was in his present position for the purpose of promoting the interests of organized labor, instead of using his official powers to get at the facts in labor disputes and harmonize such controversies as there might be in the different branches of the industry. Mr. Wilson, with reference to this very strike, took a biased position some time ago in an address made before the American Federation of Labor, at Seattle, denouncing the mine owners and their position. He has lost ground quite rapidly of late as a possible arbitrator because of this extreme position. Government officials and men who have been identified with the Department of Labor and are thoroughly familiar with its operations in the past express the opinion that the administration of President Woodrow Wilson is being rather seriously embarrassed because of the apparent impossibility of getting an understanding with contestants in industrial controversies and that the Department of Labor is failing to fulfill one of its principal functions.

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The Howe Volatilization Process will be abandoned by the Gwalia Consolidated. Fuel required, says the "Argus," was 62.7% of the ore, extraction 36.4%. The company spent between £16,000 and £18,000, and acquired "£39 and a vast quantity of optimism."

PERSONALS

K. G. Link has changed his address to Box 71X, Yerington, Nevada.

Alexander Adiassewicz has returned to New York from his trip through the Western states.

C. B. Whitwell is examining the Red Cross mines at Dobbins, Yuba County, California.

A. E. Drucker is visiting Shanghai and expects to be in London by the middle of January.

Prof. G. A. Roush, of Lehigh University, will edit the next volume of "The Mineral Industry."

B. B. Thayer goes to Butte next week on one of his periodical tours of inspection. He will return to New York in February.

George T. Coffey, superintendent of hydraulic operation with the Yukon Gold Co., has gone to spend the winter in California.

H. Whittingham, recently with Geo. H. Garrey, in Coahuila, Mexico, is now with the Societa di Pertusola at Iglesias, Sardinia, Italy.

G. C. Mackenzie, in charge of the experimental zinc plant in Nelson for the Dominion government, has been visiting a number of mines near Sandon, B. C.

Thomas Wilson, of Manhattan, Nev., who has purchased mining interests in Josephine County, Oregon, is in that section looking after work that is being done there.

F. R. Weekes, of New York, consulting engineer for the British Columbia Copper Co., is visiting its Copper Mountain properties near Princeton in the Similkameen district.

James S. Colbath, recently with the Mines Company of America, has opened an office at Los Angeles for consulting practice, devoting especial attention to cyanide works.

Byron N. White, owning important mining interests in the Slocan and White Horse copper camp, Yukon, has been seriously ill at his home in Spokane, Wash., but is now improving.

John A. Nichols, superintendent of the openhearth plant of the Carnegie Steel Co., at Clairton, Penn., has been appointed superintendent of the steel plant of Corrigan, McKinney & Co., Cleveland, Ohio.

John R. Rutherford has resigned his position on the engineering staff of the Hollinger Gold Mines, Porcupine, Ont., to accept a position as superintendent of the Motherlode Gold Mine, Sheep Creek, British Columbia.

Harry G. Smith, formerly of Concheño and El Tigre, Mexico, has accepted the position of superintendent of La Luz y Los Angeles Mining Co., Prinsapolca, Nicaragua, and sailed from New Orleans on Dec. 14 for that point.

Lucerne Gridlay, who has had charge of the Lansingville plant of the Republic Iron & Steel Co., has been appointed inspection engineer of that company, a position just created, and will have his headquarters at Youngstown, Ohio.

Charles H. Stewart, of the firm of Alex. Hill & Stewart, of London, England, accompanied by Ernest Levy, of Rosslund, the firm's British Columbia representative, has been paying a visit of inspection to the Van Roi mine in the Slocan district.

J. M. Callow, of the General Engineering Co., Salt Lake City, Utah, is at Superior, Ariz., starting work on the construction of the concentrator for the Magma Copper Co., at that point. He expects to return to Salt Lake shortly before Christmas.

Geo. A. Camphius and Gerald Rives have formed a partnership in mining, engineering and mine-management work, having headquarters in the Mills Building, El Paso, Tex. Both engineers are well and favorably known in Mexico and the Southwest.

W. R. Bassick, general manager of the Yuba Construction Co., has returned from a visit East. He arrived at San Francisco a few days before the new all-steel dredge "Yuba No. 14" was ready for initial tryout on Dec. 17, and was at Hammon when the new boat started.

Dr. Richard Moldenke, Watchung, N. J., has returned from a European trip. In company with Walter Wood, of R. D. Wood & Co., who is still in Europe, Doctor Moldenke was in conference with representatives of other countries on the matter of export specifications for cast-iron pipe and pig iron.

Louis Koppenhoefer has resigned as secretary and purchasing agent of Wm. Wharton, Jr., & Co. and the Phila-

delphia Roll & Machine Co., Philadelphia, Penn., subsidiaries of the Taylor-Wharton Iron & Steel Co. In addition to his duties as purchasing agent, he was in charge of the work of the traffic department. With the close of 1913 he completed 30 years of continuous service with the Wharton-Samuel interests.

F. W. Bradley has given to the University of California, from which he graduated in 1886, the sum of \$1000 per year for 10 years, for the purpose of aiding students in the College of Mining whose records and ability "seem to promise that they will be of material service in development of the mining resources of the state." Aid is to be given through loans, and repayments and interest, which is to be charged after graduation, are to be added to the original fund.

Stanton S. Freeman, general manager of the Carbon Iron & Steel Co., operating Carbon furnace at Parryville, Penn., has been elected president of the Eastern Pig Iron Association for the ensuing year. He succeeds Robert E. Brooke, of the E. & G. Brooke Iron Co., Birdsboro, Penn. Mr. Freeman is one of the leading furnace operators of the East. His management of the Carbon furnace has been marked with signal success. He is 39 years of age and is a native of Columbus, Ohio. His advanced education was obtained at the Ohio State University of the class of 1898, when he took his degree of mining engineer. W. S. Pilling, of Pilling & Crane, Philadelphia, continues in the post of secretary of the association, which he has occupied for some years past.

OBITUARY

Ira P. Carnes, vice-president Lima Locomotive Corporation, Lima, Ohio, died suddenly Dec. 10 from heart failure caused by acute indigestion, aged 63 years.

Stephen Harris Harrington, president and chief owner of the Harrington & King Perforating Co., Chicago, died at his home at Highland Park, Ill., Dec. 20, aged 68 years.

Dr. Henry Potonié, geologist of the Prussian Geological Survey and professor of paleobotany in the Bergakademie, died on Oct. 28, in his fifty-sixth year. He was widely known for his studies of paleozoic floras and for his recent work on the origin of coal.

John M. Drake, Jr., superintendent of the Bennett mine at Keewatin, Minn., died Nov. 27, from pneumonia. He was buried at Houghton, Mich., Dec. 1. He was 31 years old, and leaves a wife and infant daughter. Mr. Drake graduated from the Michigan College of Mines in 1907 and had since been engaged in mining in the Lake Superior country, with the exception of a short time spent in Mexico.

George Martin Luther, secretary and general manager of the Nichols Chemical Co., died in Brooklyn, N. Y., Dec. 25, aged 64 years. He was born at Greenbreak, N. Y., and was graduated from Cornell in 1870. For a while he was in the coal business with his father, George W. Luther, at Albany, and in 1885 he came to this city, where he became a member of the firm of Thomas C. Hunt & Co., manufacturers of coal-handling machinery. Five years later he became associated with the Nichols Chemical Co. with which he was connected at the time of his death. Mr. Luther was formerly president of the Granby Consolidated Mining Co., and was interested in several mining enterprises. He was a member of the Downtown Association, the Chemists' Club, and Albany Society of New York City. Mr. Luther is survived by his wife and two daughters.

SOCIETIES

Amerlean Institute of Mining Engineers—The Nominating Committee appointed by the president has submitted the following names of officers for 1914: For director and president, Benjamin B. Thayer; for director and vice-president, H. C. Hoover and W. L. Saunders; for directors, R. W. Brock, Canada, District 11; C. W. Merrill, San Francisco, District 6; Albert R. Ledoux, New York, District 0; Henry L. Smyth, Cambridge, District 1; D. C. Jackling, Salt Lake City, District 7.

Old Freibergers in America—The regular annual meeting of the Old Freibergers in America took place at the Hofbrau Haus, New York, Dec. 20. A very pleasant evening was spent around the festive board. All the former officers were reelected: Dr. R. W. Raymond, president; Gardner F. Williams, vice-president; C. L. Bryden, secretary and treasurer.

It was decided to hold a meeting in San Francisco in 1915 during the Panama-Pacific Exposition, and a number of the members are planning to go to Freiberg in 1916, to help celebrate the 150th anniversary of the founding of the old Bergakademie.

American Society of Mechanical Engineers—The subject for the meeting in New York, Jan. 9, is "The Power Problem in the Electrolytic Deposition of Metals." This meeting will be held jointly with the American Institute of Electrical Engineers and the New York Section of the American Electrochemical Society. The meeting will be held in the Engineering Societies Building, Dr. C. O. Mailloux, president of the American Institute of Electrical Engineers, presiding. The following papers will be read: "The Limitations of the Problem," Lawrence Addicks; "The Mechanical Side of the Problem," H. E. Longwell; "The Electrical Side of the Problem," F. D. Newbury. The papers will be illustrated. As the subject is a much broader one than the typical case chosen for the formal papers, an interesting discussion is expected, in which all are invited to take part.

INDUSTRIAL NEWS

The Sullivan Machinery Co. announces the removal of its El Paso office from 506 San Francisco St., to Rooms 511 and 512, Mills Building.

K. Nagai, representing Suzuki & Co., of 29 Mining Lane, London, E. C., and Kobe, Japan, has been visiting in New York. He is anxious to secure the agency for American-built mining machinery.

The McIntosh & Seymour Co., of Auburn, N. Y., has been taken over by a new corporation and will hereafter manufacture a full line of Diesel engines, as well as the present line of steam engines.

The Steel City Electric Co., Pittsburgh, announces the appointment of the Geo. A. Schardt Co., Empire Building, Pittsburgh, Penn., as its sales representative in the territory of Pennsylvania, west of Altoona, and the state of West Virginia.

The Nelson Valve Co., of Chestnut Hill, Philadelphia, Penn., announces that it has taken over the manufacture and sale of the Erwood swing gate valve, formerly made by Messrs. Walch & Wyeth, of Chicago. In the future the valve will be known as the Nelson-Erwood swing gate valve.

C. L. Newcomb, Jr. has been appointed to succeed G. B. Turner as Western representative of the Gouids Mfg. Co., Seneca Falls, N. Y. Mr. Newcomb's headquarters will be at 12 Chamber of Commerce, Denver, Colo., and he will look after the company's interest in the Rocky Mountains and Northwestern territories.

The Eastern Metals Corporation, with offices in New York, has contracted with the Siemens & Halske Co., for one 2-ton Frick induction electric furnace for its plant at Bayonne, N. J. The furnace will be of the new type, which is the double ring and single phase, and will be the first one of this design in this country.

The Cleveland branch of the H. W. Johns-Manville Co. has recently provided larger quarters for several of its subsidiary offices. The Columbus office and contract department are now in the Peters Power Building, 45 West Long St., with large warehouse facilities half a block distant. The Toledo office has moved to 213 Water Street.

General Electric Co., Schenectady, N. Y., reports the following orders: from the Inspiration Consolidated Copper Co., of Miami, Ariz., six motors ranging from 50 hp. to 100 hp. with control panels; the South Eureka Mining Co., of Butter Creek, Calif., a 2.5-ton electric storage battery mining locomotive; the Tonopah Extension Mining Co., of Tonopah, Nev., a 150-hp. induction motor and starting panel.

TRADE CATALOGS

The Morrison Boiler Co., Sharon, Penn., catalog: The Morrison Water Tube Boiler. 12 pp. Illus. 9x6 inches.

The Alexander Milburn Co., Baltimore, Md. Catalog No. 21. Portable acetylene lights. 48 pp. Illus., 6x9 inches.

The Platt Iron Works Co., Dayton, Ohio. Bulletin No. 755. High lift and turbine pumps. 12 pp. Illus., 8½x11 inches.

Metallurgic Engineering Co., 53 W. Jackson Blvd., Chicago, Ill. Bulletin. Electric furnace, Snyder System. 12 pp. Illus., 8x11 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.

AGGLOMERATION—A Process for the Agglomeration of Ore in Rotary Tubular Furnaces. F. L. Smith & Co., Copenhagen, Denmark. (Brit. No. 7707 of 1913.)

CAST IRON—Method for Removing Sulphur from Cast Iron. Walter F. Prince, Elizabeth, N. J. (U. S. No. 1,081,403; Dec. 16, 1913.)

CONCENTRATOR—Centrifugal Concentrator. Christoffer A. Christensen, Portland, Ore., assignor to The International Mining & Milling Co., Portland, Ore. (U. S. No. 1,081,267; Dec. 9, 1913.)

CRUCIBLES—Method of Recovering Graphite from Worn-Out Crucibles. Albert Teichmann, Zeitz, Germany. (U. S. No. 1,080,085; Dec. 2, 1913.)

CRUSHING—Ball Mill. Frank E. Marcy, Salt Lake City, Utah. (U. S. No. 1,080,768; Dec. 9, 1913.)

DRILL—Hammer Drill. Albert H. Taylor, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,081,637; Dec. 16, 1913.)

DRILL—Rock Drill. Edwin M. Mackie and Percival F. Doyle, Franklin, Penn., assignors to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S. Nos. 1,080,706; and 1,080,707; Dec. 9, 1913.)

DRILL—Rock-Drill Chuck. Frank Franz, Walter S. Tower, and Archibald H. Wells, Wallace, Ida. (U. S. No. 1,081,527; Dec. 16, 1913.)

DRILL BIT—Rock-Cutting Drill Bit. Walter E. Carr, Littleton, Colo., assignor to the Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,081,721; Dec. 16, 1913.)

DRILL-ROTATING MECHANISM. Daniel S. Waugh, Denver, Colo., assignor, by mesne assignments, to the Denver Rock Drill Manufacturing Co. (U. S. No. 1,081,351; Dec. 16, 1913.)

ELECTRIC FURNACE. George Massip, Levallois-Perret, France. (U. S. No. 1,080,840; Dec. 9, 1913.)

ELECTRIC SMELTING—Smelting or Refining of Metals and the Like in Crucibles. Henry G. Solomon, London, England. (U. S. No. 1,081,164; Dec. 9, 1913.)

FEEDING APPARATUS—Pulp-Feeder. Thomas F. Harkins, Leadville, Colo., assignor of one-half to Murdock A. Nicholson and one-half to Alexander E. Fowle, Leadville, Colo. (U. S. No. 1,081,737; Dec. 16, 1913.)

FILTERING APPARATUS for Laboratory Use. Percy A. Boeck, Worcester, Mass., assignor to Norton Co., Worcester, Mass. (U. S. No. 1,081,574; Dec. 16, 1913.)

FLUE DUST—Method of Utilizing Iron, Blast-Furnace, Flue-Dust. Ralph Baggaley, Pittsburgh, Penn. (U. S. No. 1,081,921; Dec. 16, 1913.)

INGOTS—Manufacture of Ingots. Samuel T. Wellman, Cleveland, Ohio, assignor to Liquid Forged Steel Co., Cleveland, Ohio. (U. S. No. 1,081,997; Dec. 23, 1913.)

MINE-CAR WHEEL. Walter Morton McCoy, Birmingham, Ala., assignor to Charles Ellis Foust, Birmingham, Ala. (U. S. No. 1,081,318; Dec. 16, 1913.)

ORE-CONCENTRATING MACHINE. George W. Arnold, Denver, Colo., assignor of one-third to Harry Hertzberg, Denver, Colo. (U. S. No. 1,081,421; Dec. 16, 1913.)

ORE SEPARATOR. Charles Henry Brown, Magdalena, N. Mex., assignor to the Sherwin-Williams Co., Cleveland, Ohio. (U. S. No. 1,081,360; Dec. 16, 1913.)

ORE WASHING—Apparatus for Washing Ore. Hermann Alexander Brackelsberg, Hagen, Germany. (U. S. No. 1,080,886; Dec. 9, 1913.)

ROASTING—Furnace for Treating Ores. John A. Frey, Silver Spring, Md. (U. S. No. 1,081,732; Dec. 16, 1913.)

ROASTING FURNACE. Charles W. Renwick, Isabella, Tenn., and Nicholas L. Heinz, La Salle, Ill. (U. S. No. 1,080,586; Dec. 9, 1913.)

SMELTING—Process of Smelting Metals. John D. Hilliard, Albany, N. Y., assignor to New England Metal & Machine Co., Boston, Mass. (U. S. No. 1,080,344; Dec. 2, 1913.)

SMELTING FURNACES—Improvements in Smelting Furnaces. T. H. Holroyd, Southfields, Eng. (Brit. No. 21,560 of 1912.)

SMOKE SEPARATOR. Clayton Floyd Holmes, Beaumont, Tex., assignor of one-half to Joseph Friebis, Beaumont, Tex. (U. S. No. 1,081,116; Dec. 9, 1913.)

STEEL MANUFACTURE—Art of Manufacturing Steel. George Hillard Benjamin, New York, N. Y. (U. S. No. 1,080,807; Dec. 9, 1913.)

SULPHUR—Improvements in Furnaces for Decomposing Pyrites and other Metallic Sulphides. W. A. Hall, New York. (Brit. No. 20,759 of 1912.)

SULPHUR—Process for the Production of Sulphuretted Hydrogen. W. A. Hall, New York. (Brit. No. 20,757 of 1912.)

SULPHUR—Process for the Production of Sulphur. W. A. Hall, New York. (Brit. No. 20,760 of 1912.)

TUNGSTEN—Method of Preparing Tungsten and Alloys Thereof. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Co., New York, N. Y. (U. S. No. 1,081,567; 1,081,568 and 1,081,570; Dec. 16, 1913.)

VANNER CONCENTRATING BELT. Robert De Large, Ray, Ariz. (U. S. No. 1,082,309; Dec. 23, 1913.)

Editorial Correspondence

SAN FRANCISCO—Dec. 23

The Industrial Accident Board, which was charged with enforcement of the Workmen's Compensation Act, passed at the last session of the California legislature, has issued an address to employers. The compensation act goes into effect Jan. 1, 1914. The substance of this act was printed in the "Journal" of June 28, 1913. The appointment of the commission was provided for within 30 days prior to Jan. 1, instead of 30 days from Jan. 1. The state, through the compensation insurance provided for under the act, is preparing to insure employers against loss through injuries sustained by employees. The board states that the rates will average from 20 to 40% lower than compensation rates hitherto prevailing in California. After paying losses, operating expenses and setting aside required resources and a moderate percentage to build up a surplus to meet catastrophe losses, the balance, if any, is to be paid to the policy holders. There is not much likelihood that there will be a balance, nor will this promise of thus providing practically a mutual company induce employers to favor the state fund. The employer is promised that in the event of an accident, no matter what may be the cost, he will be relieved of the entire burden, which will be assumed by the fund. In the event of a catastrophe wiping out the reserve of the state fund, however large or small such reserve may be, the commission promises that the employer is relieved of any liability and adds: "And it is not conceivable that the great state of California would permit the injuries coming under its policy to suffer a loss of compensation. This feeling should afford employers insuring with the state as policy holders as well as their workmen, a peace of mind in itself worthy of every consideration." The compensation act holds the employer liable for any and all accidents to employees whether or not the employee is at fault, except in cases of intoxication or willful misconduct. One serious objection to this law is that it provides that the higher the scale of wages paid, the higher the premium demanded for insurance. The enforcement of the law in its application to the mining industry is quite likely to result in curtailment in the number of men employed and decrease in the wages paid. Many of the larger mines can afford to devote more time to development and exploration and curtail the extraction and treatment of ores, and thus largely diminish the production of metals and minerals. The mining industry is being rather hard ridden in various ways by the performances of the legislature of 1913. Whether any of the laws that were passed in that legislature may or may not be corrected in the next, much evil has been done that can never be undone. Had the legislature of 1913 set out purposely to work hardships upon the mining industry it could not have more successively accomplished the undertaking than has resulted from the passing of the various laws affecting the industry.

DENVER—Dec. 27

Nothing New in the Coal-Strike Zone has occurred in the last week. An investigation of alleged outrages by the state militia was begun at Trinidad, Dec. 23, by a committee of the Colorado Federation of Labor, the chairman of which presented a letter from Governor Ammons to the military authorities, stating the purpose of the investigation. Charges of inhuman treatment have been made by military prisoners at the jail and charges of ransacking the homes of miners, and stealing their money have been made by the miners. Meantime, though the places of the strikers are being rapidly filled and the output of coal is said to be within 25% of normal, thus averting all danger of a coal famine, the situation shows no signs of settlement and it is costing the state \$5000 per day to pay the militia. Most of the big industries are suffering from short fuel supply, as the Minnequa steel plant, at Pueblo, which has only one furnace running, and 3000 of its employees are out of work.

SALT LAKE CITY—Dec. 24

A Publicity Campaign is to be undertaken by the Salt Lake Stock & Mining Exchange, and a committee has been appointed to collect information of general interest regarding mines and other local properties. It is proposed to keep a record of the fluctuation of stocks on the local market and information as to the financial and physical condition of

various properties. These data are to be accessible to anyone interested. Exhibits of Utah ores and minerals are to be placed in Salt Lake railroad stations.

Utah Copper Co.'s November Production was 11,121,078 lb. With the exception of June and September, this is higher than the production of any month preceding. The daily output has been between 22,000 and 24,000 tons of ore, when not interfered with by snow or severe winter weather. About two-thirds of this tonnage is shipped over the Bingham & Garfield R.R., while the rest is handled by the Denver & Rio Grande. During the last quarter of the year thus far, October and November, 21,600,000 lb. of copper have been produced, and it is probable the production will exceed that of the third quarter, which amounted to 32,287,452 lb. During the first eleven months of the year, 109,643,477 lb. of copper have been produced, which is greater than the total production of either of the two years preceding. The production of 1913 will be about 120,000,000 lb. A number of improvements were made during the year, including storage bins equipped to handle moist and frozen ores during the winter months, also some changes at the Arthur and Magna plants. A large cash surplus has been built up to be used in carrying copper in transit, instead of borrowing money against the metal until deliveries to consumers have been made. This copper sometimes amounts to 40,000,000 lb. The regular quarterly dividend of 75c. per share was paid Dec. 31.

HOUGHTON—Dec. 26

Importation of Miners will begin after Jan. 1, the mining companies having given the men remaining on strike until that date to return to work. It was the original intention of the mining companies to commence to bring in the outside labor this week, but the business men at Calumet got together in a hurriedly called meeting and appointed a committee to confer with the managers of the mines at the north end of the district with the request for an extension of the time limit until the first of the year. Businessmen particularly desire to see the old hands return to their work rather than to see them superseded by outsiders. These men held several meetings with the remaining strikers, tried to show them the futility of continuing on strike, offering to extend liberal credit to them if they would return to work and take care of their families and make every possible concession to get them on their financial feet again. The meetings had some good effect, it is believed. These business men are continuing their active campaign among the remaining strikers. The situation is this: If these remaining strikers do not take their old positions back by the first of the new year, thousands of outside workers will be brought in without further delay. The Calumet & Hecla alone has 1500 picked men ready and waiting to come to this district. These men are for the North Kearsarge, Allouez and Ahmeek mines, the old mine itself having a full complement of workmen. The attitude of the local businessmen is that the strikers themselves are not to be blamed. They have believed everything that the agitators have told and have heard little else. At the meeting with the strikers at Mohawk the other evening the men actually believed that the Calumet & Hecla had not produced any copper since the strike started. It was difficult for the businessmen to convince them to the contrary. Another fiction these men have believed is that the Government is going to take over the mines soon. A friend of the writer met a Mohawk miner on the road the other day, "Still on strike, John?" asked my friend. "Sure. Next week the Government is going to take the mines. I am going to be superintendent of the Ahmeek and Dunnigan will boss the Mohawk." Dunnigan is strike agitator at Ahmeek. "What makes you think that?" "That's what Wilson said in his Seattle speech, and he's going to make the President do it." And no amount of argument could convince this simple man that he did not know what he was talking about. This socialistic doctrine of the Secretary of Labor has kept alive the spirit of hope in many of the strikers remaining out. It has been fed to the strikers in their newspapers regularly, in all languages and preached to them in all the strike meetings. In addition to this story the tale is now being told that the congressman from this district is working on a big investigation scheme for the Federal Government. In connection with the lawyers for the strikers and with Mahoney and

other leaders of the Federation and that when that investigation starts all of the mine managers will turn over the properties to the strikers. It seems strange that these tales should continue to influence the strikers and keep alive the hope that they have a chance to win. The situation is that the thousands of men now at work will not permit the return to work of a goodly proportion of the strikers; the men who have been the most persistent in the disorders. President Moyer, of the Federation, made another proposal to arbitrate, but the men who are working claim that they are the largest and most important factor to be considered in any sort of an arbitration scheme. Since the citizens of the county got together, backed up the sheriff and insisted on law and order, conditions have improved wonderfully and steadily. Calumet & Hecla, Superior and Centennial are three mines that are now actually running normal, producing as much copper as they did before the strike was called. Ahmeek, located in the hotbed of the Federation headquarters, is getting out 700 tons of rock daily now. This is about one-third normal. The working force is 250 men compared with 830 before the strike. Allouez is shipping 600 tons daily. The Osceola Consolidated is maintaining shipments at 1200 tons daily and has kept up this pace all this month. Half this comes from the old Osceola mine and the rest from the South Kearsarge. The North Kearsarge now is being unwatered and work will start there in a short time. The greatest difficulty of all has been experienced at the Wolverine and Mohawk. They are now making regular shipments, small in amount but steady none the less, for the first time since the strike started. At the Copper Range Consolidated there is a notable improvement. The Baltic mill now works both shifts and another mill will likely start operations in a few days. Quincy is producing better than 60% of normal. The outside men brought in, Germans, are proving satisfactory laborers and a good class of citizens. General feeling throughout the strike district is improved since the campaign of murder and arson and dynamiting stopped. Business men report good Christmas trade, better than they anticipated. The spirit of good fellowship prevails again. This is evidenced strikingly in Calumet. One prominent mining man, whose name is not revealed, has ordered the Associated Charities to provide the children of every striker in the district with clothing, a Christmas dinner, candy and toys.

CALUMET—Dec. 27

A Christmas Eve Celebration Panic resulted in 72 deaths. A celebration was being given by the Western Federation of Miners for the wives and children of the strikers. Several hundred women and children accompanied by a few men had assembled at Italian Hall and the festivities were in progress when some man gave the cry of "Fire." Immediately there was a stampede which lasted but for a minute or two, when it was realized that there was no fire, but in that time 72, mostly miners' children, the majority of whom were girls, had been trampled to death. The hall is on the second floor of the building and is reached from the street by one stairway, and it was at this point that the greatest loss in life occurred. When the rescue work began, it was necessary for the firemen and others to go in at the second story and work from the top for it was impossible to remove the bodies from the bottom of the stairway, so tightly were they jammed together. The entire community is grief stricken, mass meetings have been held and ample financial aid has been pledged for the relief of the stricken families and everything possible is being done to alleviate the suffering.

Exit C. H. Moyer, president of the Western Federation of Miners; he hurriedly left the copper country the night of Dec. 26. He was escorted from his room at the Scott Hotel, Hancock, to the train, by a body of citizens, who impressed upon him that he was an "undesirable citizen," and that his presence would not be tolerated further. This action was the outcome of an interview between Moyer and a committee that called upon him, to ascertain from him direct what action he intended taking to alleviate the want and suffering of the families that were stricken by the Christmas Eve catastrophe. The committee could get no satisfactory answer to their questions and when the result of the meeting became known, the citizens became indignant, and Moyer "pulled his freight." A fund of over \$25,000 has been raised in the county for relief, but when the committee went to the various families, it found some in most destitute circumstances, yet they refused to accept anything from the committee, for the Federation had called upon them and cautioned them not to accept anything from the citizens, and that they would be taken care of by the Federation. Cases of the most inhuman neglect were found to exist in some of the homes of the strikers. Investigation into the cause of the tragedy at Italian Hall by the civil

authorities has not brought out any new disclosures.—[Washington dispatches state that Secretary of Labor Wilson has sent John B. Densmore, solicitor of the department, to Calumet, to render assistance if possible to settling the strike.—Editor.]

IRON RIVER—Dec. 26

On the Menominee Range the Tully, a property of Corrigan, McKinney & Co., is being prepared for extensive operation. A miners' dry, which will be the largest in district, is nearing completion, as is an office building. The engine house is ready for duty. Lumber for additional dwelling houses has been assembled. A steam shovel is excavating for large stockpile grounds. At the town at the Chicago mine, the Rogers-Brown Ore Co. has installed both a water and a sewer system. All of the buildings accommodating the 200 employees and their families are connected with the mains. Water is obtained from a large spring and is pumped to a reservoir on a hilltop. The pressure is sufficient for fire protection. A 2000-gal. Prescott pump, supplementing previous equipment of the kind, has been installed at the Rogers-Brown company's Rogers mine. The Wickwire Steel Co. is providing its Homer property at Iron River with a steel headframe. A pulmotor has been added to the equipment of Oglebay, Norton & Co.'s Chatham mine. It is the intention of the Chicago & Northwestern R.R. to use big Class J four-drive-wheel locomotives in its ore traffic on the Menominee range next season instead of the Class R three-drive-wheel engines now in the service. As this will necessitate heavier steel, 90-lb. rails are being laid where necessary.

IRONWOOD—Dec. 26

A Record in Sinking was made in completing the "New C" shaft on the U. S. Steel Corporation East Norrie mine at Ironwood. The new shaft is midway between "B" shaft of the Norrie and "D" shaft of the East Norrie and 1225 ft. deep. It is known as "New C" to distinguish it from the older one across the caved surface to the north, and which now is called "Old C." When the new shaft goes into commission, "Old C" will be dismantled and there will disappear the finest wooden headframe ever erected on the Gogebic range. However, the wooden headframe in the Lake Superior iron country has had its day. It has been supplanted by the steel headframe that is better in every way and that, now that it has become standardized, can be erected at a cost little greater than the high-class wooden structures of a decade and more ago. Of the 1225 ft. for which the "New C" has been opened, 850 ft. was gained by sinking from surface and 375 ft. by raising from the 17th level. The shaft is, approximately, 18x11 ft. inside measurements. It is sunk at an inclination of 64°. The shaft was completed in one year, ground having been broken in December, 1912. For the 850 ft. sunk heavy steel sets were used with concrete slab lagging. Five stations, each 22x25x10 ft., were cut, timbered and concreted. The shaft is divided into two skip roads, one cageway, one ladder way and one pipe compartment. Each slab of concrete lagging weighed 130 lb., and the steel sets are made of extra-heavy material. A particularly excellent record was made last spring when during the 26 working days of March the shaft was sunk and lined for a distance of 105 ft., this requiring the breaking and hoisting of 24,600 cu. ft. of rock. The shaft will now be raised from the 19th level and the remainder of its equipment installed. The new shaft then will be ready for use whenever "Old C" is dismantled and mining activity is shifted from the encroaching residential district to the location 1000 ft. farther south.

TORONTO—Dec. 26

The Northern Ontario Exploration Co. has called a shareholders' meeting to consider the absorption of the company by the California Exploration Co. The Northern Ontario Exploration Co. was originally formed by Bewick-Moreing & Co. to operate a number of claims in the Porcupine district. Development was, however, disappointing, and all work in Ontario was stopped. Subsequently, Bewick-Moring & Co. transferred their activities to California, where they took over the old Plymouth mine and commenced development. Results are stated to have been satisfactory and the Northern Ontario Exploration Co. has a considerable interest in the property. It is now proposed to absorb the Northern Ontario Exploration Co., giving the shareholders stock in the California Exploration Co. for their interests. The shares in the California Exploration Co. will be split into shares of a par value of 10s., and the capital will be increased to £120,000, the Northern Ontario Exploration Co. receiving a total of 179,137 shares. Canadian shareholders, who are largely in the majority, will now have a run for their money.

The Mining News

ALABAMA

Jefferson County

ALABAMA POWER CO. (Birmingham)—First unit of 17,000 hp. at Lock 12, Coosa River, will be completed in February. Gadsden plant is now supplying 1000 hp.

GULF STATES STEEL CORPORATION—Good progress is being made in sinking slope on Shannon-McDonough tract. This slope is 17x9 ft., and will have a capacity of 2000 tons per 10-hr. shift.

SLOSS SHEFFIELD STEEL & IRON CO. (Birmingham)—This company will close its coke ovens at First Ave. and 30th St. in accordance with agreement made with the city some time ago. Slag pile there has been removed.

TENNESSEE COAL, IRON & R.R. CO. (Ensley)—Ingersoll-Rand turbo-blower, lately installed, was started second week in December. It replaces five blowing engines, and its capacity is 60,000 cu ft. per min. Company intends to manufacture ferromanganese on larger scale, using Cuban ores to large extent.

ALASKA

CHATHAM MINING CO. (Cleary)—Mine closed for present, except for prospecting work. Ore above adit level has been stoped out. A winze has been started on rich ore shoot penetrated by adit to determine advisability of driving a new adit at a lower level.

FAIRBANKS GOLD MINING CO. (Fairbanks)—Dredge on claim No. 8 Above, Fairbanks Creek, was closed down for winter, Oct. 16. Owing to delayed arrival from London of Mr. Arons, engineer in charge, dredge made a late start, and output was correspondingly curtailed. It is planned to commence operations much earlier next season.

SOO MINING CO. (Oiness, via Fairbanks)—A recent cleanup at larger mill returned about \$1500 from 50 tons of ore. Little "coffee grinder," as small mill at mine is known, capable of crushing three tons of ore per day, will be run until there is a sufficient supply of ore in bins to warrant starting larger mill in creek bottom, 2000 ft. from mine.

NEWSBOY (Cleary)—Cleanup for September was \$8000; for October \$8500. Working profit was \$3000 for each month. Ore is from 1 to 14 ft. wide, and six men working underground are able to keep five-stamp mill supplied and at same time to keep development work well ahead of stoping. Although worked for several years, September was first month in which a profit was made.

CRANE GULCH (Meehan, via Fairbanks)—Fred. Parker is planning to work large scraping outfit next season on block of ground at mouth of Crane Gulch, and including part of claim No. 3 Below, Fairbanks Creek, and part of Nolan & Griffith fraction. On lower 3 Below, creek claim, Haughland, Blaucher, Munson & Sather are also preparing to use scraping plant.

DUNTON (Hollis)—Gold-silver mine is equipped with five-stamp mill, one Wilfley, two 6-ft. vanners, one one-drill compressor, one two-drill compressor, one piston and three stoping drills, and three turbines. Ore assaying \$4 is pay. Mine has been operated since last June, and with eight men \$10,000 worth of gold has been produced. With present plant the 8 to 12 ft. of \$3 ore cannot be profitably worked.

McCONNELL (Fairbanks)—Edward McConnell and associates, who have bonded Murphy-Perrault property, of two claims at head of Pearl Creek, a tributary of Fish, have commenced active development work. A 60-ft. shaft sunk two years ago disclosed a vein 24 in. wide. A sample of several tons of ore from shaft was taken to Fairbanks, where Garden Island test mill recovered \$24 per ton in free gold. A five-stamp Allis-Chalmers mill for property has been landed at Fairbanks, and if developments justify, it will be erected soon.

CRITES & FELDMAN (Meehan, via Fairbanks)—A shipment of 60 tons of ore taken from an open cut 200 ft. long on the Hi Yu claim was recently crushed at Willis mill on Chatham Creek. Return was \$40 per ton. Upon completion of mess house and bunk house now under construction, force of men will be increased and development work will be hastened. Helen S. tunnel will be continued into hill and two shafts will be sunk on claims lying farther up ridge between Moose Creek and Too Much Gold Creek. A mill has been ordered, but it will not be erected until next summer.

JAMES CLAIMS (Chisana, via McCarthy)—The claims from which first gold in district was taken last summer and brought hundreds of gold seekers into country, have changed hands for a consideration of between \$400,000 and \$500,000. E. J. Ives, Frank Manley and J. J. Price obtained option on group of 13 of rich pay claims, and will leave Seattle first of year to develop their property. It is understood that Manley, Price and Ives agreed to pay \$40,000 cash and obtained an option on property, and if Fletcher T. Hamshaw does not make good by January a promise to raise funds to obtain three claims on Bonanza Creek, where original discovery was made, May 3. Manley-Ives-Price combination will obtain an option on these as well, making a total of 16 claims in all. Claims which have changed hands include Nos. 4, 5, 6, 8 and 9, on Bonanza Creek. No. 1, on Little Eldorado, No. 3 Above, on Little Eldorado, bench on left limit of No. 1, on Little Eldorado, Coarse Money gulch discovery, a fraction between 9 and 10 on Bonanza, No. 21 Glacier claim, Gold Run discovery and Gold Run discovery annex. There are six suits in local courts against James and his associates, Nels Nelson, Mrs. James and W.

A. Johnson, over claims located in Chisana. Fletcher T. Hamshaw originally had an option on entire group of James claims, but it is understood was unable to raise money, and Price, Manley and Ives made deal. All three new owners have made small fortunes in Fairbanks district and were recently associated in Iditarod.

ARIZONA

Maricopa County

MAX DELTA (Phoenix)—It has been decided to sink 285-ft. shaft to depth of 500 ft. and drifts will be driven at several levels. Two other shafts will be sunk to depth of 100 ft. and drifts driven.

Mohave County

LARGE IRON-ORE DEPOSITS on Bill Williams Fork were examined. There is apparently an immense tonnage of ore easily available, one estimate being 2,500,000 tons practically on surface. Railroad facilities, however, are lacking and immediate purpose of inspections was to ascertain feasibility of building a railroad into that country.

GOLCONDA (Golconda)—Shaft sinking is in progress, it being understood that shaft is to be sunk from 500- to 700-ft. level. At present, there is a large tonnage of zinc ore in sight. An auto truck is being used to haul ore and concentrates from mine to railroad, a distance of four miles.

ARABIAN MINING CO.—Property, comprising Independence and other claims at Myers Well, in Union Pass district, has been taken under bond and lease by A. B. Richmond, acting for Mines Co. of America. Robert Brannock has done considerable development work on property in last few years.

BOUNDARY CONE (Oatman)—Drift which is being driven west from shaft on 550-ft. level is in ore for over 110 ft.; shot extends east of shaft 60 ft. Average width is said to be 5 ft., assaying \$30 in gold. Mine was extensively developed last year and is in excellent shape for producing a large tonnage. Erection of a mill is contemplated.

CALIFORNIA

Amador County

KENNEDY (Jackson)—Construction of tailing wheels is completed, and driving motors are expected to be installed within a month and plant ready for operation about middle of January.

ORIGINAL AMADOR MINES CO. (Amador City)—Suit has been brought by stockholder demanding reissue of 1000 shares of stock, omitting provision that no interest shall accrue on stock until holders of treasury stock have been satisfied. Stock was purchased of a director who it is claimed did not sign agreement withholding dividends. Plaintiff asks that agreement withholding dividends. Plaintiff asks that agreement be rendered void.

Butte County

MAMMOTH CHANNEL (Magalia)—Report of engineers on proposed drainage tunnel has been received. This tunnel will cost \$100,000. It is reported that money is available.

Calaveras County

PLYMOUTH ROCK (Jenny Lind)—It is reported that mine is under examination for Bewick, Moreing & Co. Mine was operated about 10 years ago with good results.

MT. TIMOLOUS—Recent development has encouraged deepening of new shaft from 100-ft. level to 300 ft. Mine was operated 20 years ago and was equipped with a 10-stamp mill, which is said to be in fair repair.

Nevada County

GOLDEN GATE (Grass Valley)—Operations have been temporarily suspended and electric system will be remodeled.

GOLDEN CENTER (Grass Valley)—New 10-stamp mill, it is reported, will begin operating Jan. 1. Shaft has been deepened from 300 to 500 ft. and drifts driven on vein.

GARAGE MINE (Grass Valley)—Ore taken from 100-ft. shaft sunk under an automobile garage, has returned \$8 per ton. It is claimed this is not profitable ore. A. B. Snyder, owner, will sink another 100-ft. shaft in belief that better ore will be found. He is restricted to depth of 100 ft., as mineral rights below that depth are owned by another operator.

San Benito County

WONDER (Hollister)—Manuel Gonzales shipped his first flask of quicksilver recently, after about 14 years of prospecting and development.

Shasta County

BALAKLALA (Coram)—New gas plant is completed and tests of Hall desulphurizing process will begin in near future. Shipments of ore to Mammoth smelter at Kennett continue. Strengthening of aerial tramway towers has been completed. Mine is in good shape for resumption of smelting at Balaklala plant if Hall process proves successful.

Tuolumne County

DREISAM (Arastreville)—High-grade ore is reported at 500-ft. level.

SANTA YSABEL (Sonora)—Mine has been reopened after long idleness.

CLIO (Jacksonville)—Robert Graeur and other Los Angeles men have taken a purchase option. Price is said to be \$150,000. Mine is an old producer, idle for several years and a year or so ago reopened by Buick interests.

Yuba County

YUBA No. 14 DREDGE (Hammonton)—Fourth all-steel gold dredge in California and largest gold dredge in world was completed Dec. 16 and ready for digging. It is equipped with 16-cu-ft. buckets. Actual hull construction was begun Aug. 13. This is first dredge to be provided with a steel deck. It was built by Yuba Construction Co. for the Yuba Consolidated Goldfields.

COLORADO
Lake County

ARKANSAS VALLEY REDUCTION WORKS, although Leadville is said to be extremely dull just now, is running five furnaces steadily and has been for several months, most of the ore coming from the district.

San Juan Region

AMES POWER GENERATING PLANT in San Miguel district has been enlarged from 2500 to 5000 hp. by completion of flume by Western Colorado Power Co., from Trout Lake to plant, a length of 13,000 ft.

LUCKY (Breckenridge)—Two carloads of heavy galena ore were shipped last week from mine on Mineral Hill to Leadville.

NORTH STAR (Breckenridge)—A strike of high-grade gold ore has been made in middle tunnel of Archie mine and a carload was shipped to Chamberlain sampler.

STANDARD CHEMICAL CO.—During November company produced 306 tons of carnotite ore, which is being shipped to Placerville en route to company's plant at Pittsburgh. Company employs 75 miners, has 93 burros packing ore to where it can be loaded on wagons and 125 horses and 20 men hauling it to the loading station on railroad.

Summit County

TONOPAH MINING CO. has acquired 3000 acres of placer ground at Breckenridge, equipped with three dredges, machine shop and power plant ready for operations in spring. Water rights have also been acquired.

Teller County

NORMAL ACTIVITIES HAVE NOT YET BEEN RESUMED in Cripple Creek district since storm. Men are shoveling out narrow-gage tracks, which serve a number of Bull Hill properties.

POINTER (Cripple Creek)—Shaft house was destroyed by fire Dec. 23.

GOLDEN CYCLE (Goldfield)—Electric pumps have been recovered by bailing, and are being dried out ready for service. Mine resumed operations Christmas week.

IDAHO**Coeur d'Alene District**

EMPRESS (Nine Mile)—Tunnel is in 400 ft. and will be driven 150 ft. more to crosscut vein at vertical depth of 400 ft. Outcrop on property is 18 in. wide and carries 5% lead. Considerable surface work has been done. Work will be carried on all winter.

CONSTITUTION (Pine Creek)—Protest filed by company at Coeur d'Alene land office in July, 1911, has been decided in favor of mining company. Ground in dispute has been declared to be most valuable as mineral land and homestead entry will be canceled. There are several other suits of a similar nature pending at present over land in same district.

EAGLE MOUNTAIN (Burke)—Galena ore of good grade has been encountered on foot wall of vein. A 1000-ft. crosscut has been driven to vein and drifts have been driven both ways. Low-grade ore shows in right drift, while a streak of pay has been cut in left. Latter is in a dike 250 ft. wide in which ore was found.

PARAGON (Murray)—Arrangements have been completed to begin work on property at once. Shaft that was started before mine was shut down will be sunk to depth of 200 ft. From shaft a crosscut will be driven to vein which will be directly under ore which has been stoped above. If ore is encountered, Black Horse mill will be put in operation.

MINNESOTA**Cuyuna Range**

CURTAILMENT DURING THE HOLIDAYS was rule of Cuyuna operators as on other ranges. Kennedy and Armour No. 2 mines closed down for 10 days, and others for more or less lengthy periods, which actions are taken locally to be result of pessimistic outlook in iron circles.

DULUTH-BRAINERD (Crosby)—New shaft is now 6 ft. in ore. Flow of water so far has been but 80 to 90 gal. per min., not sufficient to supply needs of surface plant.

CUYUNA-DULUTH (Ironton)—Shaft is now down 252 ft. on its way to 300 level. Village of Ironton, near-by, has recently entered into a contract to take its water supply from mining company.

ARMOUR NO. 2 (Crosby)—New style tram car has just been put into use, being of company's own design and construction. A double truck with Hyatt roller bearings is used, and lines of construction follow those of railroad ore cars; capacity 100 cu.ft., while old cars were but 45 cu.ft. Cars are now being used for surface haulage, but others will be built for underground work.

CUYUNA-MILLE LACS (Crosby)—Both levels of mine were recently flooded, due to breakage of a pump. Mine has been having water troubles for some time, but is now unwatered and in operation again. A depth of 126 ft. has been attained by new timber shaft. Northern Pacific Ry. is constructing 1600 ft. of additional tail track and sidings at mine. Company is considering increasing its pumping facilities, as water has reached capacity of its present equipment.

Mesabi Range

MILD WEATHER IS CONDUCTIVE TO STRIPPING. Oliver Iron Mining Co. is carrying on extensive stripping operations at Mahoning pit, and Arthur Iron Mining Co., operating name of Great Northern Ore Securities Co., is stripping near Calumet, Minn.

GRAHAM NO. 2 (Mesabi)—Dry house was destroyed by fire on Dec. 19.

KNOX (Aurora)—Operations have been resumed on a small scale. Property closed down some time ago, when New York State Steel Co. failed.

Vermillion Range

MCCOMBER (Tower)—Shaft is now down over 80 ft., showing red hematite.

CHANDLER (Ely)—South forty of Chandler property is being got ready for operation. Work has been progressing for four months, during which time surface plant has been overhauled, a shaft house erected and old shaft cleared of debris. A few hundred tons of ore are already on stockpile, and preparations are being made for a considerable tonnage next year.

MISSOURI-KANSAS-OKLAHOMA**Joplin District**

NEW ENGLAND ZINC CO. (Klondike, Kan.)—Lead and zinc found at 160-ft. level. Blend assays high.

HUBBARD LAND (Galena, Kan.)—Kramer Mining Co. has taken lease on 200 acres for drilling campaign. Former prospectors successful several months but believed they had exhausted orebody.

CRAGG MINING CO. (Joplin, Mo.)—Concentrator to be closed down for repairs. New machinery will be installed, increasing capacity. Mineralized ground blocked out sufficient to operate mill for long period.

MONTANA**Beaverhead County**

RABBIT FOOT—Edward W. Benner, of Butte, has taken a lease on this gold property in Bloody Dick district.

Granite County

MONTANA—On these claims owned by Boulder Mining & Development Co., in Boulder district, a crosscut is being driven to cut three veins of copper ore upon which some work has been done near surface.

Jefferson County

KING SOLOMON (Clancy)—Shaft has been sunk to 600-ft. level and a station is being cut preparatory to drifting on vein. Some good ore was encountered during sinking operations.

Madison County

DREDGING FOR GOLD NEAR TWIN BRIDGES has been proposed, and it is rumored that a company has been formed to exploit a large tract of placer ground. Options on several thousand acres have been secured with sufficient time to permit thorough prospecting by drilling. It is said that area covered by these options overlaid with rich placer gravel. Should drilling operations prove this assumption to be correct, it is proposed to operate several dredges. New district is about 20 miles north of placers near Virginia City, which are now dredged by Conrey Placer Mining Co.

Silver Bow County

INCREASE IN COPPER PRODUCTION seems to be indicated for 1914. This will be largely brought about through leaching process developed by Captain Wolvin at Butte-Duluth property and by Bullwhacker company. At Butte-Duluth it is stated that when enlarged plant is in full operation copper will be produced direct from the ore at 8c. per lb., while Bullwhacker company claims that even a lower price will be attained. But it is at Anaconda where some remarkable results have been attained. For many months Anaconda company has been experimenting with different methods for treating millions of tons of slimes from concentrator. First a small experimental plant was erected and it is now announced that results attained are even more successful than anticipated and a larger plant is being erected. It is estimated that company will save in form of concentrates not less than 50% of copper in slimes. Enlarged plant being constructed will have capacity for treating all slimes from 12,500 tons of ore daily, amounting to more than 2000 tons of slime daily. A small leaching plant after months of experiments, turned out to be a success and it is said to be only a question of a short time when directors of Anaconda company will authorize commencement of construction of a leaching plant calling for an expenditure of some \$3,000,000. With those new plants in operation, copper output would be considerably increased. Another improvement is being made in reverberatory building where arrangements are being made to feed furnaces with pulverized coal just as soon as crushing machinery is installed. This will do away with stokers and bring about quite a saving.

NORTH BUTTE (Butte)—Night of Dec. 14 three-story dry house at Speculator mine burned to ground and for a while threatened other buildings. Loss is between \$5000 and \$6000. A new dry house is being built near Granite Mountain shaft to accommodate more than 1000 men. It will be fireproof building, built of the steel frames of old transformer building of Missouri River Power Co., which for many years formed a conspicuous landmark in East Butte. Lockers, wash and toilet rooms will be modern.

TUOLUMNE (Butte)—At recent meeting of directors, Superintendent Neenan reported that so far during December 2300 tons of ore have been hoisted from 800 and 1800 levels. Sinking of shaft to 2400 level has been completed; a station is being cut at this level for crosscutting to vein which is about 150 ft. distant. Stopping on this level will materially increase output. It is expected that proceeds from output on 800 and 1800 levels will provide funds for development work on 2400 level.

PILOT-BUTTE (Butte)—Although injunction suit brought against this company by Anaconda company is still pending, a large amount of development work and construction work is to be carried on at mines, so as to equip them for operation as soon as litigation is settled. At a meeting of directors held a few days ago, a fund of \$50,000 was provided to meet cost of this work. It will consist of sinking shaft from 2000- to the 2400-ft. level and driving crosscuts from 2200 level,

building ore-bins and a spur to connect with Butte, Anaconda & Pacific R.R. It is estimated that with these facilities general operating costs will be reduced. Until this work is completed no ore is to be hoisted from middle lode on 1800 level.

BUTTE & DULUTH (Butte)—Reports that have gained wide circulation are to effect that big mining interests in and out of Butte are at work to secure control of Butte & Duluth properties and leaching plant. It has been stated that engineers of Butte & Superior company have made an examination of Butte & Duluth holdings, apparently with object of acquiring property. Radical changes in management, by which C. F. Sherwood, until recently with Butte & Superior, became assistant manager, were largely responsible for report that Butte & Superior had taken hold of Butte & Duluth. Captain Wolvin, of Butte & Duluth, while admitting that outside interests were contemplating securing control of his company's properties, stated that as yet no direct offer had come to him from Butte & Superior men.

NEVADA

Clark County

SINGER (Goodsprings)—Dry concentrating plant recently erected has been operating at full capacity, and about 400 tons of lead concentrate per month is being shipped to Salt Lake smelters.

ANCHOR (Goodsprings)—Final payment to Yount & Fayle for this property has been made by Frank A. Keith and associates, of Los Angeles, and property passes into their hands. The 1800-ft. aerial tramway from property is practically completed, and it is expected that ore shipments will commence about Jan. 1. Ore is a mixed lead and zinc-carbonate, averaging about 35% zinc and 12% lead, and will probably be shipped to zinc oxide plants in Illinois.

Churchill County

GOLDEN CROWN (Bernice)—Oreshoot has been cut in tunnel 1200 ft. from Portal and at depth of 600 ft.

NEVADA WONDER (Wonder)—Sinking to 1300-ft. level has been commenced. Ore is showing in face of drift on 1000-ft. level, which is being driven to cut oreshoot opened on levels above. South drift on 1000-ft. level will be driven to prospect continuation of Nevada Wonder vein.

Elko County

ALTITUDE (Jarbridge)—Property located in second crater has installed a small grinder and gasoline engine for working high-grade ore.

LITTLE DEVIL (Jarbridge)—Lessees have taken out five tons of shipping ore. Ore is amenable to chlorination, but no amount of low-grade ore has been developed.

LYNN-BIG SIX—This company, 22 miles north of Carlin, has installed a gasoline hoist, shaft has been straightened and sinking resumed. Shaft is now nearing 200-ft. level, where station will be cut and east and west drifts driven on vein. Shaft will eventually be sunk to 400-ft. level.

ELKO MINING CO. (Jarbridge)—Mine is being developed by a shaft sunk in ore all way from surface, and by drifts therefrom. Shaft is now down 375 ft., at which depth a station is being cut and drifting will be started. About 700 ft. of drifts have been driven besides several winzes have been sunk and a small amount of stoping has been done. An adit intersects shaft at a depth of 175 ft., at which depth a gasoline hoist is operated. A 5-stamp mill has been installed. It started running in November. It is now treating 25 tons daily, principally from development work. Ore is delivered from mine to mill by a Leschen two-bucket tramway 1600 ft. long. John A. Jess is superintendent and H. L. Hollis consulting engineer.

Humboldt County

ANTELOPE SPRINGS—Strike of high-grade zinc ore has been made in this property 20 miles north of Humboldt.

RYE PATCH MILL (Rye Patch)—Operations have temporarily ceased on account of mill freezing up during intensely cold weather.

Lyon County

OIL DRILLING IN SPRING GULCH will be done, it is reported. Oil shales and sand have been discovered near Buckskin.

Douglas County

LONGFELLOW (Gardnerville)—A shoot of ore containing gold, silver and lead, it is reported, has been struck in shaft sinking.

BLACK COPPER (Yerington)—A company has been organized and work will begin early in 1914.

MONTANA-YERINGTON (Yerington)—Development will be done on this property by Mason Valley Mines Co.

BOVARD & KNIGHT (Pumpkin Hollow)—Silver-lead ore of good grade has been discovered. Shipments will be made.

STUART (Yerington)—This group, adjoining Montana-Yerington on north, has been bonded by Mason Valley Mines Co. Shaft is being sunk.

SMITH VALLEY MINES CO. (Smith Valley)—Shaft has been retimbered and hoist installed; engine and compressor are en route. Recent shipments have given satisfactory returns.

WABUSKA COPPER (Yerington)—A new two-compartment shaft is being sunk on north end of property. Station at 150-ft. level in old shaft has been cut and drift started to southeast.

NEVADA-DOUGLAS (Ludwig)—Development on 800-ft. level of Ludwig has proved oreshoot to be larger and of higher grade than on 600- and 700-ft. levels. In this shoot, which is 30 ft. wide, large masses of native copper have been found. In Casting Copper section oreshoot has been developed for 240 ft. in length and 30 to 50 ft. in width. Daily shipments of 100 to 150 tons are made from this shoot.

Mineral County

SIRI BROS. (North Cañon)—Large tonnage of ore has been developed. Test shipment has been made to Thompson smelting plant.

BRODIGAN (Pamlico)—Oreshoot 18 in. wide, showing free gold, has been discovered. Sinking is now being done. Ore will probably be treated in Pamlico mill.

MANHATTAN BIG FOUR (Manhattan)—It is planned to remodel mill, double its capacity and resume operations on company account. Results of negotiations for consolidation of this and other properties in district will be known in near future.

MARIS CHALCEDONY MINE—Shipment of pebbles was made recently to West End mine, where, it is reported, these local pebbles will be used for half requirements of mill. Recent 30-days' test at Belmont mill showed rate of consumption about 3.9 lb. per ton of ore ground. Efficiency in fine grinding not so high as with imported pebbles, due to flatter shape. This may be rectified by careful selection.

ROUND MOUNTAIN MINING & MILLING CO. (Round Mountain)—This is only property in camp that is working on a steady basis. Receipts run between \$25,000 and \$30,000 monthly. Round Mountain Daisy Mining Co. working placer on Round Mountain M. & M. Co. ground by lease, has had a good season's run, from Mar. 1 until Aug. 15, when water ran short. Cleanup was \$80,000 for season. Area of ground worked over 1 acre, bank running to 20 ft. depth. There is quite an area of such ground, which will eventually be worked. The Round Mountain M. & M. Co. is finding new veins in foot wall in development work, which are encouraging and are adding to reserves. Company anticipates enlarging.

Storey County

COMSTOCK PHOENIX (Six-Mile Cañon)—New compressor has been installed for operation of drills and sinking pump. Station will be cut on 550-ft. level and winze sunk to 750-ft. level. Stopping is being done on 550-ft. level.

C. & C. (Virginia City)—More trouble with Starrett sinking pumps in Consolidated Virginia winze at 2500-ft. level of C. & C. shaft was experienced due to hot water. In south compartment, No. 2 pump, which has been working satisfactorily since attaching mechanical shifting device, held water at 43-ft. point, while further adjustments were made on No. 1 pump.

PANDORA (Jumbo)—This group, formerly owned by Pandora Comstock Mining Co., has been sold to New York men who have organized Monarch Gold Mines Co., a Nevada corporation. Property is equipped with both electric and steam power and two-compartment shaft has been sunk to 200-ft. level. Shaft sinking will be continued; mill will be built next spring. Plant for recovery of placer gold and gold-bearing black sand on surface will also be built. Process will consist in plowing and scraping, screening in trommels, and concentration on tables.

NEW MEXICO

Grant County

PHELPS, DODGE (Tyrone)—A case involving title to seven mining claims in the Burro Mountain district and a portion of property sold by T. S. Parker to this company was heard in land office at Las Cruces for last two weeks. It is claimed that land involved is not mineral land and not subject to a mineral patent.

Socorro County

PACIFIC MINES CO. (Mogollon)—Electrical equipment has been completed and placed in commission and development and stoping are now done with air drills. About 15 tons of ore are sent to custom works daily.

B. O. B. MINING CO. (Mogollon)—Sale, at public auction has been announced of mill and mine of Deep Down property owned by this company or as much of property as will satisfy indebtedness of approximately \$70,000.

PENNSYLVANIA

Allegheny County

BETHLEHEM STEEL CO. (Pittsburgh)—Company has bought steel works of Milliken Bros., Inc., on Staten Island, N. Y., with exception of structural fabricating plant. Equipment will be moved to South Bethlehem. Plant includes five 50-ton openhearth furnaces, two continuous furnaces and three trains of rolls.

SOUTH DAKOTA

Lawrence County

RATTLESNAKE JACK (Galena)—Ten-stamp mill is being erected at a good rate. Building is large enough, and arrangements are being made that will permit doubling number of stamps at any time. Hardinge mill will be used for fine grinding, and zinc dust precipitation. At present rate of progress construction work should be finished by early in spring.

UTAH

Beaver County

SHEEP ROCK (Beaver)—Cyanide plant of 15 tons capacity is being installed to treat tailings from small stamp mill. These carry from \$4 to \$6 per ton in gold. It is expected to have plant ready for operation early in year.

MOSCOW (Moscow)—Three-compartment shaft is down 265 ft. Sinking is being done at rate of 26 ft. per week, or about 100 ft. monthly. The shaft is in limestone showing iron-manganese staining. A station is to be cut at 300 level, and sinking continued to 700. Ore is being mined at present from 500, 550, and 600-ft. levels. During November 16 cars were shipped.

Box Elder County

BRITISH AMERICAN PETROLEUM (Brigham City)—This company in sinking a well encountered gas.

HARD ROCK—Gold-bearing quartz has been found on

these claims in Pine Cañon in western part of county, eight miles from old Century mine. Development has been done through a tunnel, and three veins have been cut. An option has been taken on property.

Juab County

VICTORIA CONSOLIDATED (Robinson)—At a special meeting Nov. 15, it was decided to move company's offices from Provo to Salt Lake City. Old board of directors was re-elected.

SELMA MINES (Knightville)—Company owning claims in North Tintic, between North Colorado and Lehi Tintic has raised funds for further development, and an outfit has left Salt Lake for property. Sinking in 210-ft. shaft will probably be done.

TINTIC ZINC (Eureka)—Property is in North Tintic near Scranton. Main tunnel is in 210 ft., and is being driven to reach zinc-lead ore indicated by prominent iron outcrops above, mineralized with these metals. Drifting will be done on vein, when it is reached. Country is limestone.

SCRANTON (Eureka)—Regular shipments of lead and zinc ore amounting to 250 tons monthly are being made. Development is being done on 400 level, where there is a large body of low-grade zinc ore. Object of work is to find the limits of this body, and pockets of high-grade material are expected in lower-grade ore. Drifting is being done to get under old lead stopes on 200 level, worked some time ago, and a continuation of orebodies to greater depth is looked for. Present shipments are large enough to meet all operating expenses.

UTAH APEX (Bingham)—An electrically driven air compressor with a capacity of 1300 cuft. has been installed. Operations have been hampered by sheriff's forces, who have bulkheaded parts of mine in an effort to capture Mexican murderer, Rafael Lopez, who is supposed to have taken refuge in workings.

UTAH COPPER (Bingham)—An increased tonnage is being mined, and production for November promises to equal or exceed that of September, which amounted to 11,817,438 lb. copper. For several months, more shovels than usual have been worked on stripping, and it is expected to have some of these moved back into ore before first of year. Both Magna and Arthur mills have exceeded estimates of their capacity.

ALTA CONSOLIDATED (Alta)—A stock dividend from new issue of 200,000 shares has been declared. Shareholders will receive 700 shares of new stock on each 1000 shares of old issue. An assessment of 5c. per share has been levied on entire stock, from which there will be realized enough to pay off indebtedness of \$15,000, and to leave a surplus of \$10,000 for working capital.

MONTANA-BINGHAM (Bingham)—Arrangements have been made with Bingham-Congor Copper Mining Co. for right to transport its ores through Montana-Bingham tunnel. A cash payment has been made, which with bond issue should enable company to complete tunnel. It is planned to give six Bingham properties drainage and transportation facilities. Electric haulage may be installed.

Summit County

DALY (Park City)—A considerable tonnage of second-class ore has been developed, and there is talk of building a mill. A meeting will be held in Salt Lake Jan. 10, for purpose of reducing capital stock to 200,000 shares, par value \$1.50.

AMERICAN FLAG (Park City)—Mine is being wired for electric lights, and as soon as this work is completed, an extra shift will be added. Stopping has been started on 1000 level, and shipments are being made. December production is expected to be double that of any of the four months immediately preceding. Ore carries principally gold and silver.

Tooele County

GETHIN LE ROY (Wendover)—This company has paid its first dividend of 1c. per share, amounting to \$7500. Mine is 15 miles from Wendover on the Western Pacific.

Washington County

BULL VALLEY GOLD MINES—A lower tunnel is being driven on this property 45 miles south of Modena. Tunnel, which is in 650 ft., is being driven on vein to reach an ore-shoot opened in tunnel above. Specimen ore, rich in free gold, has been opened in a number of places. Much interest is being taken in this camp, and several new companies have been organized.

VIRGINIA

Campbell County

PIEDMONT MANGANESE CORPORATION (Lynchburg)—Creditors have filed an involuntary petition in bankruptcy against corporation, which was thrown into a federal receivership in Richmond recently. Corporation's bonded debt is shown to be about \$665,000, in addition to a floating debt.

CANADA

British Columbia

WONDERFUL (Sandon)—First car of ore mined in many years was shipped recently to Trull smelter.

PAYNE (Slocan)—Crosscut tunnel being driven to get under old workings is now in between 2500 and 3000 feet.

SILVERTON MINES, LTD. (Silverton)—Hardinge conical mills for fine grinding are expected shortly for concentrating plant on Four-Mile Creek.

SURPRISE (Sandon)—Development has shown three veins of galena ore below 800-ft. level, largest of which is 4 to 6 ft. wide. Silver contents of ore averages about 130 oz. per ton.

AUFÉAS (Hope)—A raise is being made in No. 1 drift, 50 ft. from main adit. Oreshoot is widening as work progresses and arsenopyrite carrying gold is replacing the quartz gangue in drift level. A considerable tonnage of ore is now in the dump awaiting shipment to smelter.

RICHMOND CONSOLIDATED MINING CO. (Rossland)—An important strike of ore has been made while working on Lilly May claim adjoining Richmond, and which is now part of Richmond company's holdings, ore 35 ft. wide was

encountered which is rich in copper. Company has been doing nothing but development work and is down 200 ft. Drifting is now in progress toward Richmond property and encouraging showings are being found of same kind as strike made.

GRANBY CONSOLIDATED (Anyox)—A dispatch, Dec. 18, to "Phoenix Pioneer" states number of men now employed about 1000. An addition to present wharf will be started almost immediately in direction of smelter. Pile-driving float has been brought down from Swamp Point, test piles are being driven, and work will be carried on as rapidly as possible. A well attended meeting of Granby Bay Conservative Association was held in Recreation Hall Dec. 12, at which W. X. Macdonald, president, occupied chair. Immediate necessity for thorough local organization, and ways and means were discussed. A smoker will be given by this association in near future. Granby Bay Hotel has been fully occupied ever since it opened, and all finished dwelling houses are occupied. Five or six more residences were to be completed and ready for occupation by Jan. 1. Roman Catholic Church is completed. Contractor who has had contract for steel work in connection with smelter expected to be through in three weeks' time, as also did the machinery men who are installing Pelton waterwheels and Nordberg blowing engines at power house.

Ontario

TOWNSITE (Cobalt)—An interim dividend of 1s. 6d. per share has been declared.

PORCUPINE CROWN (South Porcupine)—It is understood that this company will be put on a 3% quarterly dividend basis early this year.

VIPOND (Schumacher)—Hamilton-Erich interests, of London, have dropped their option on this property on account of an inability to agree to terms with owners.

TOUGH-OAKES (Swastika)—A crosscut on 200-ft. level has penetrated what appears to be a new vein, carrying 18 in. of ore, which assays up to \$1300 per ton. These high assays are sometimes erratic.

BEAVER (Cobalt)—Quarterly report states that Beaver Auxiliary property at Elk Lake has been fully paid for. Development has resulted in discovery of some high-grade ore which, while rich, has not been persistent.

SWASTIKA (Swastika)—Directors propose to issue \$50,000 of 7% bonds, and with proceeds, pay off an indebtedness of \$10,000 and finance additional development. A meeting of shareholders will be held Dec. 30 to ratify proposal.

COBALT LAKE (Cobalt)—Mining commissioner, T. E. Godson has handed down his decision regarding drainage of Cobalt Lake, giving full consent to scheme. This decision was held up until consent of Fire Underwriters' Association had been received as town of Cobalt gets part of water for fire-fighting purposes from lake.

McINTYRE (Schumacher)—Report for November shows total production of \$30,278 from 3965 tons of ore, which averaged \$7.64 per ton. Total operating costs were \$6.24 a ton, while expenditures for plant and equipment were \$6161, showing a small loss for month. Operating costs and grade of ore were lower than for previous month.

PEARL LAKE (Schumacher)—It is understood that a special shareholders' meeting will be called shortly in order that report of General Manager Fisher may be presented and plans for reorganization of company submitted. It is understood that Fisher's report, while pessimistic regarding ore shown in present workings, indicates that situation is not hopeless, and that there are indications of a large body of ore at 600-ft. level. More money must, however, be raised to continue development.

CONIAGAS (Cobalt)—Annual report shows that total silver production for year amounted to 3,572,399 oz., while ore reserves are estimated at 13,329,000 oz. Present year's production has been attained at expense of a decrease of only 600,000 oz. in ore reserves. Dividends paid to Oct. 31 make a total since incorporation of \$5,360,000. Ore was mined and concentrated at a net cost of 8.776c. per oz. as compared with 8.515c. per oz. for previous year. This includes head office expenses, royalties and all expenses exclusive of shipping, smelting and marketing charges which amounted to 4.321c. per oz. Average price received per ounce for silver was 60.55c. as compared with 59.39c. for the previous year.

MEXICO

Sonora

COBRE VERDE (Cabullona)—Sited about three miles north of Santa Rosa this new property is now shipping one car per month of rich copper ore to Douglas.

SANTA ROSA (Cabullona)—A sublease has been granted by present lessees, H. F. Brown and J. E. Englent, to Herman Ernett, who has opened up 18 in. of rich copper ore and work is being pushed rapidly to try and make a shipment of two cars per week.

MINA MEXICO (Moctezuma)—Having been closed down several months on account of local conditions, work is being resumed and as soon as railroad traffic is resumed from Tonichi whole property will again be in full operation, employing about 800 men in mines and smelter. Low-grade ore is smelted and high-grade ore is shipped.

MINNEAPOLIS COPPER CO. (Cumpas)—J. W. Christy, one of principal owners of property, has made an inspection of all holdings at Cumpas, which are now closed down, former manager having left country without paying bills. Holdings were attached by a bank of Douglas. Mr. Christy expects to pay all old bills and commence work again with competent men in charge. There is ore enough in sight in mine to keep smelter running for a year. Smelter will reduce about 30 tons per day.

TRANSVAAL

MESSINA—The Government State Ry. was completed to mine Dec. 4. This will enable company to ship on a large scale, hitherto impracticable, and will also reduce working expenses.

The Market Report

METAL MARKETS

NEW YORK—Dec. 31

The metal markets have been rather more active and stronger, with some indications of a speculative element in purchases.

Copper, Tin, Lead and Zinc

Copper—A large business was done during the last week, chiefly with domestic consumers. The heaviest sales were made on Friday and Saturday at 14½c., delivered in Connecticut, usual terms. On Monday sales were made at 14¼c., del. 30, and on Tuesday at 14½c., del. 30. On Wednesday there were still sellers at the latter price. The aggregate of sales during the week was probably in excess of 50,000,000 lb., mostly done between Dec. 26 and Dec. 29. Since Tuesday the business has been lighter.

Some sales of Lake copper were made during the week at relatively less advance than in electrolytic, but that market had previously been out of proportion.

What with the foreign orders which the producers booked a short time ago and the domestic orders that they have now taken, their books are well filled for January and February. During the last quarter of 1913, the consumers in Europe as well as this country have greatly reduced if not entirely wiped out the stocks which they held (the so called invisible supply), and they have not replenished these stocks. Purchases that have been made of late have been in fact barely sufficient to carry them along for the next 30 days. At the close, the demand continues good, and the market outlook is favorable.

At the close we quote Lake copper at 15@15½c., and electrolytic at 14.70@14.75c. The average of quotations for electrolytic during the last week is 14.55 cents.

The London market was closed Dec. 25, 26 and 27, and opened on Monday, Dec. 29, at almost £1 10s. over the close of Wednesday, Dec. 24, spot being quoted £66 6s. 3d. and three months £66 16s. 3d.. Some realization sent the market off on Dec. 30 to £66 for spot and £66 10s. for three months, and it closes today at £65 2s. 6d. for spot and £65 17s. 6d. for three months.

The quotation for casting copper, Dec. 17, should be 13¾@14 cents.

Exports of copper from New York for the week are reported at 4920 long tons. Our special correspondent gives the exports from Baltimore for the week at 1283 tons.

Base price of copper sheets was advanced ¼c. per lb. on Dec. 26, and is now 20c. for hot rolled and 21c. for cold rolled. The usual extras and discounts are charged and higher prices for small quantities.

Tin—While the London Metal Exchange was closed during the second half of last week, considerable business developed in this market. The general improvement in sentiment brought about a buying movement, in which consumers participated to a considerable extent. London, at the opening of this week, showed the effect of the large orders placed from this side by an advance of almost £4. Profit taking, which was indulged in by London operators brought about a decline, and the market closes easy at £169 5s. for spot and £171 2s. 6d. for three months, and about 37c. here for January tin.

Messrs. Robertson & Bause report receipts of tin ore and concentrates at Hamburg, Germany, in November at 1160 tons from Bolivia, 60 tons from South Africa and 36 tons from Southwest Africa; 1256 tons in all.

Arrivals of Bolivian tin in Liverpool in November were 2158 tons concentrates and 38 tons bars; the whole equivalent to 1295 tons fine tin.

Lead—A good business has been done at the prices named by the A. S. & R. Co., which has made the market. There having been a good demand for both early and distant shipment and producers having made liberal sales, the A. S. & R. Co. on Dec. 29, raised its prices to 4.15c., New York, and 4.07½c., St. Louis. Outside producers have been holding back, letting the principal producer take the business.

The London market is firmer, Spanish being quoted £18 2s. 6d. and English 7s. 6d. higher.

Spelter—The market has been quiet, but firmer. There is a good inquiry for future delivery, but it does not result in business owing to inability to agree upon terms. There have been moderate sales of early shipments, 5.10c. being realized on some tonnage in the latter part of the week, and there seems to be a firmer tone at the close.

The London market is also higher, good ordinaries being quoted £21 12s. 6d. and specials 7s. 6d. higher.

The base price of sheet zinc in carload lots is now \$7.25 per 100 lb. basis, less 8% discount, f.o.b. cars, Peru, Ill.

The Tulsa Spelter Co. broke ground Dec. 10 for a five-block smeltery at Tulsa, Okla. It is expected that the first block will be in operation about May 1, next.

The new smeltery of the Granby company at East St. Louis is about completed, but probably it will not be put in operation until there is improvement in the spelter market.

DAILY PRICES OF METALS

NEW YORK

Dec.	Sterling Exchange	Silver	Copper		Tin Cts. per lb.	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.		New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
25	.....	...	14 3/4	14.30	...	...	...	5.15	5.00
26	4.8510	57 1/2	@15 1/4	@14.40	37 1/2	4.10	4.02 1/2	@5.20	@5.05
27	4.8520	57 1/2	@15 1/4	@14.40	37 1/2	4.10	4.02 1/2	@5.20	@5.05
29	4.8520	57 1/2	@15 1/4	@14.55	37 1/2	4.15	4.07 1/2	@5.20	@5.05
30	4.8510	57 1/2	@15 1/4	@14.65	37 1/2	4.15	4.07 1/2	@5.30	@5.15
31	4.8520	57 1/2	@15 1/4	@14.70	37	4.15	4.07 1/2	@5.25	@5.10

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

Some current freight rates on metals, per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triesta, 22c.

LONDON

Dec.	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
		£ per Ton	Cts. per Lb.								
25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	26 1/2	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	26 1/2	66 5/8	14.41	66 1/2	70	171 1/2	173 1/2	17 1/2	3.86	21 1/2	4.70
30	26 1/2	66	14.34	66 1/2	70 1/2	170 1/2	172	17 1/2	3.88	21 1/2	4.70
31	26 1/2	65 1/2	14.15	65 1/2	70 1/2	169 1/2	171 1/2	18 1/2	3.94	21 1/2	4.70

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.

Exports and Imports of Metals, other than iron and steel, in the United States, nine months ended Sept. 30, are reported as follows:

	Exports		Imports	
	1912	1913	1912	1913
Metals:				
Copper, long tons.....	277,094	321,284	134,231	141,297
Tin, long tons.....	432	1,001	39,090	36,915
Lead, short tons.....	51,321	38,476	67,264	48,475
Zinc, short tons.....	6,520	8,136	5,215	5,856
Zinc in ore, lb.....	13,480,634	10,264,121	24,563,311	20,880,622
Nickel, lb.....	19,359,938	21,862,707	29,501,631	35,601,333
Antimony, lb.....	50,684	63,620	13,067,813	12,810,829
Aluminum, lb.....	211,036	44,535	13,158,531	19,655,571
Quicksilver, lb.....	17,381	54,022		
Platinum, oz.....		1,191	76,600	91,517
Ores, etc.:				
Zinc oxide, lb.....	26,684,187	23,302,226		
Zinc dross, lb.....	403,978	56,696		
Zinc dust, lb.....	27,398	156,656	1,160,033	3,438,751
Zinc ores, tons.....	17,815	12,973	33,001	20,747

Copper, lead, nickel and antimony include the quantities of metal in ores, matte, bullion, etc. Quantity of antimony ore is not given. Zinc dust was not given separately prior to July 1, 1912. The exports include reexports of foreign material.

Other Metals

Aluminum—The market continues quiet and sales have been small. Prices show no change. Quotations are 18½¢ @ 19c. per lb. for No. 1 ingots, New York.

Antimony—The market is still quiet, but a little better tone is apparent, and more business is expected. Quotations are unchanged. Cookson's is 7.40 @ 7.60c. per lb.; Hallett's, 7½ @ 7¾c.; while 6 @ 6¼c. per lb. is paid for Chinese, Hungarian and other outside brands.

Quicksilver—Business has been rather quiet over the holidays, but the market is firm, with no change in prices. New York quotation is \$39 @ 40 per flask of 75 lb. for large lots. The jobbing price for small lots is 54 @ 56c. per lb. San Francisco, \$39 per flask for domestic orders, with special price for export. London price is £7 10s., with £7 2s. 6d. quoted from second hands.

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

Magnesium—Current price of pure metal is \$1.50 per lb. for 100-lb. lots, New York.

Gold, Silver and Platinum

Gold—Gold on the open market in London remained at the Bank price, 77s. 9d. per oz. for bars. There was no special demand apparent, though Paris is reported to be looking for more gold.

Iridium—The market is rather weak, and some small sales are said to have been made as low as \$75 per oz., New York.

Platinum—The market is very quiet just at present, and there is little doing. Prices are easy, and metal can be had at \$42.75 @ 43.75 per oz., New York. Hard metal is quoted \$46 @ 49 per oz., according to grade.

Silver—The market continues steady with slightly downward tendency. While supplies from Mexico have been curtailed, it is equally true that the demand in London and the Far East has been satisfied so far with the supplies in sight.

Shipments of silver from London to the East, Jan. 1 to Dec. 18, as reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India.....	£11,924,500	£9,727,000	D. £2,197,500
China.....	1,796,000	755,000	D. 1,041,000
Total.....	£13,720,500	£10,482,000	D. £3,238,500

Exports of silver from San Francisco, 11 months ended Nov. 30 were: Coin, \$48,200; bullion, \$11,952,344; total, \$12,000,544, being an increase of \$2,282,207 over 1912. The greater part of these exports went to China.

Gold and Silver movement in the United States, 11 months ended Nov. 30:

	Gold		Silver	
	1912	1913	1912	1913
Exports.....	\$46,768,138	\$81,226,017	\$64,353,611	\$58,319,092
Imports.....	55,151,765	58,631,475	44,402,933	33,057,451
Excess.....	I. \$3,383,627	E. \$22,594,542	E. \$19,950,678	F. \$25,261,641

Merchandise exports for the 11 months were valued at \$2,250,929,517; imports, \$1,608,829,114; excess of exports, \$642,100,403. Adding the excesses of gold and silver, we have \$689,956,586 as the total export balance for the 11 months.

Zinc and Lead Ore Markets

JOPLIN, MO.—Dec. 27

The highest price paid for zinc blende was \$43 per ton, the assay base ranging from \$38.50 to \$40.50 per ton of 60% zinc. Calamine, with no output this week, has strengthened and quoted at \$20 @ 22. The average price of all zinc ore is \$37.56 per ton for the week, and the average price for the year is \$45.68 per ton. The lead ore market is an exciting one for the buyers, each trying to increase his purchases with out raising the base price above \$48 per ton of 80% metal content. The average price of all lead ores for the week is \$48.26 per ton, and for the year, \$52.52 per ton. This has been a doubly hard week on outputting. Shallow operations were restricted from the first with a heavy snow falling Monday, Tuesday and Wednesday. Nearly every mine ceased operation on Christmas Eve, a few resuming on Friday, others on Saturday, while many will be idle until Monday.

SHIPMENTS WEEK ENDED DEC. 27

	Blende	Calamine	Lead	Value
Total this week...	9,796,400	481,220	1,947,790	\$241,895
Total 1913	54,172,610	43,383,770	95,779,640	\$15,272,819
Blende value, the week, \$189,385; the year, \$13,093,560.				
Calamine value, the week, \$5500; the year, \$553,724.				
Lead value, the week, \$47,010; the year, \$2,515,544.				

SHIPMENTS WEEK ENDED DEC. 27

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	4,772,250		533,000
Year to date.....	152,035,080	5,546,500	55,983,260
Shipped during week to separating plants, 1,677,100 lb. zinc ore.			

IRON TRADE REVIEW

NEW YORK—Dec. 31

The closing week of the year is a dead one so far as the iron and steel trade is concerned. Nothing has happened to change the course of the market.

No material change in prices is reported. Indeed none was expected in a stagnant market like the present. There is some expectation of lower quotations, however, when the new year opens.

Pig iron is dull and production is being further curtailed, both by steel works and merchant furnaces.

The United States Steel Corporation has entered the domestic market as a permanent seller of ferromanganese in competition with German and English makers who have supplied most of the requirements to steel makers of this country in recent years. In announcing its new policy the Steel Corporation through high officials states that it intends to do merchant business in this product. It hopes to be able to supply the bulk of the material purchased by other steel makers of this country. While no official statement is made of the price at which the Corporation is selling, it is understood to have offered ferromanganese on a basis equivalent to about \$45, seaboard, or \$2 below the latest quotation for imported ferro.

PLATTEVILLE, WIS.—Dec. 27

The base price paid this week for 60% zinc ore was \$40 per ton. The base price paid for 80% lead ore was \$48 per ton.

PITTSBURGH—Dec. 30

There are no definite developments in the steel market which would give a clue to the future, as buyers and sellers alike are busy with year-end adjustments. Mill operations are not an index to market conditions, as a majority of the mills closed for last week, and many remain closed for this week also. The tone of the market, however, is distinctly better, except in pig iron, where lower prices and the blowing out of blast furnaces prevent a favorable view from being taken of the immediate future at least. In the steel trade proper there are well formed hopes that business will brighten up very materially early in January. There have been no important price changes in the past week and unfinished and finished steel products seem to be fairly well held at the level of two or three weeks ago.

Ferromanganese—The Carnegie Steel Co. suddenly appeared as a seller of ferromanganese, and has sold two lots, approximately 1500 and 2000 tons, respectively, at about \$47,

Assessments

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

Monthly Average Prices of Metals

SILVER

Table showing monthly average prices for Silver in New York and London from 1911 to 1913.

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

COPPER

Table showing monthly average prices for Copper in New York and London from 1911 to 1913.

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

TIN

Table showing monthly average prices for Tin in New York and London from 1911 to 1913.

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

LEAD

Table showing monthly average prices for Lead in New York, St. Louis, and London from 1912 to 1913.

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

SPELTER

Table showing monthly average prices for Spelter in New York, St. Louis, and London from 1912 to 1913.

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

PIG IRON IN PITTSBURGH

Table showing monthly average prices for Pig Iron in Pittsburgh in Bessemer, Basic, and No. 2 Foundry from 1912 to 1913.

STOCK QUOTATIONS

Table of stock quotations for Colorado Springs and Salt Lake, listing company names and bid prices.

TORONTO

Table of stock quotations for Toronto, listing company names and bid prices.

SAN FRANCISCO

Dec. 29

Table of stock quotations for San Francisco, listing company names and bid prices.

N. Y. EXCH. Dec. 29

Table of stock quotations for New York Exchange, listing company names and bid prices.

N. Y. CURB Dec. 29

Table of stock quotations for New York Curb, listing company names and bid prices.

BOSTON CURB Dec. 29

Table of stock quotations for Boston Curb, listing company names and bid prices.

LONDON Dec. 17

Table of stock quotations for London, listing company names and bid prices.

Last Quotation.