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Gold King Mine at Valdez

BY GEORGE E. WINKLER*

SYNOPSIS—A small gold mine on Columbia glacier is being steadily operated, the most interesting feature of the work perhaps being the methods of transporting supplies to the mine and mill, which include lifting from the beach successively to Shoup glacier and then to Columbia glacier at an elevation of 4500 ft., gasoline and donkey engines being used.

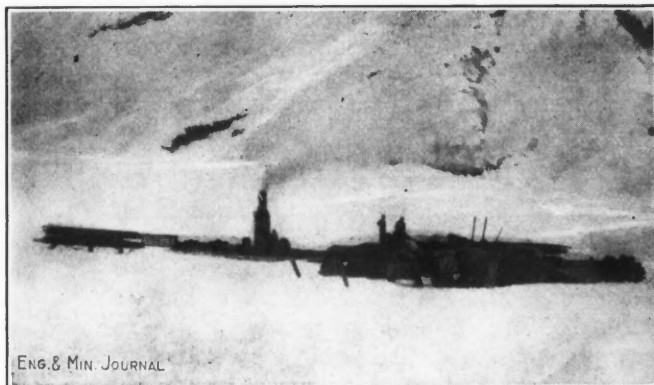
The Gold King Mining Co., of Valdez, Alaska, owns the Gold King group of 10 claims, located by Hans Anderson, Frank Gustafferson and Olaf Oleson, July 4, 1910, and sold to the Gold King company in October, 1912, for \$105,000. The group is on the divide between the Shoup

ton of ore treated, composed largely of pyrite, with a little galena, stibnite and magnetite.

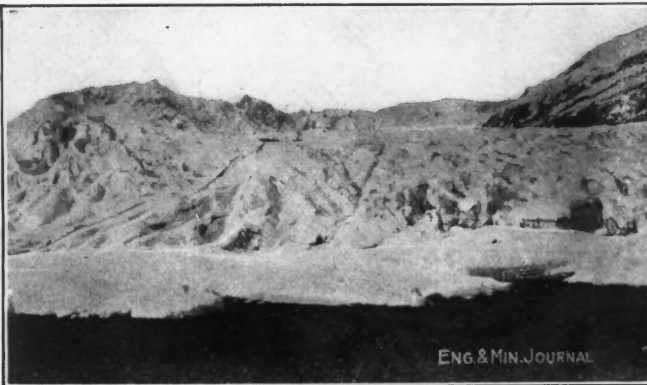
The mill is driven by a 6-hp. Fairbanks-Morse gasoline engine, and another 6-hp. engine is used to operate a Dodge rock crusher, while a 2-hp. engine is used to work a Risdon-Johnson concentrator. The gasoline consumption amounts to 30 gal. per day of 24 hr., the gasoline costing 55c. per gal. delivered at the mill.

ORE OCCURS IN NARROW VEINS BUT IS RICH

There are four veins in the Gold King group, two of which are being worked. No. 1 vein, the richer of the two, has an average width of 8 in., and assays over \$100



TAKING SUPPLIES IN OVER SHOUP'S GLACIER



FOOT OF SHOUP'S GLACIER AT SHOUP BAY

and Columbia glaciers, on a spur on the Columbia glacier side, at an altitude of 3500 to 4500 ft. above sea level.

RESULTS OF MILLING ON A SMALL SCALE

During the winter of 1912-13 machinery and supplies were taken in over the Shoup glacier, a mill building 20x90 ft., erected and a 3½-ft. Huntington mill installed capable of crushing eight to 10 tons of ore per 24 hr. The mill has been run 35 full days since completion in August, 1913, operations commencing on Aug. 12. During that time 250 tons of ore were treated, yielding \$19,000, an average of \$76 per ton being saved on the plates. In addition to this between five and six tons of concentrates were stored for shipment to the smelter. These assay \$150 per ton. The manager states that a saving of 90% is being made in the concentrates and on the plates. The ore yields 60 to 75 lb. of concentrate per

per ton; a 5-ton mill test gave returns of \$130 per ton. Some magnificent specimens occur in pockets in this vein, from one of which the original locators took out \$1300 worth of gold with a hand mortar. No. 2 vein, which is nearer the mill, has been tunneled for 50 ft., the vein being the full width of the tunnel, and yielding on a mill test of 5 tons, \$56 per ton. Both veins are in slates and greywackes of Paleozoic age (probably Carboniferous), known locally as the "Valdez series," and cut the formation, with a northwest strike. No. 1 vein dips 65° south and No. 2 vein about 90° north.

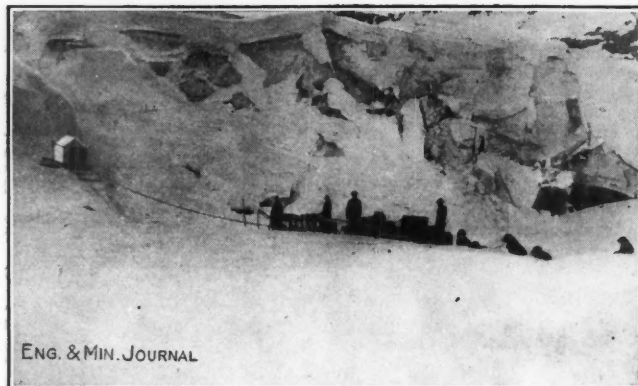
A crosscut tunnel is being driven which is now in 418 ft., that in another 250 ft. is expected to strike the No. 1 vein, giving a depth on it of 500 ft. The same adit will cut the No. 2 vein at a depth of 200 ft. No. 1 vein is cut by a fault that throws it 220 ft. to the southwest. By following the "drag" left by the vein along the line of the fault the vein was picked up again.

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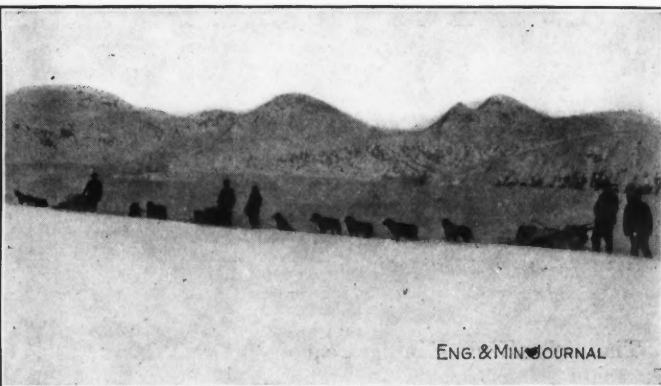
The development work to date consists of 1150 ft. of tunnels, 60 ft. of shaft and 110 ft. of raise. In sinking 50 ft. on the No. 1 vein 700 sacks of ore weighing about 100 lb. each were taken out. On the No. 2 vein 35 tons of ore were taken from an open cut 50 ft. long and 6 ft. deep. Most of the work so far has been the driving of crosscut tunnels, so it is impossible to make any estimate of the tonnage.

At the mine and mill a permanent crew of 25 men is employed when in full operation, but it is only possible, because of weather conditions in the winter season causing shortage of water, to mill ore for about six months of the year; during the rest of the time development work

From that point it is hoisted to an altitude of 4500 ft., the elevation of the summit between the two glaciers. Five relays are necessary in making this lift with a 6-hp. gasoline engine. From the summit a sleigh attached to a cable is used to lower the freight, a distance of 1½ miles to the mill. For transporting small consignments in the summer, dog teams are used between the summit and the mill, a team of eight dogs taking 800 to 900 lb. to the load. In this manner the company took in 175 tons of machinery and mill supplies, and 25 tons of general supplies, between April and June 30, 1913, at a cost of 3½c. per lb. The manager expects to be able to cut this cost to 2c. per lb. by putting in a larger donkey engine and



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HAULING IN SUPPLIES WITH GASOLINE ENGINE
Haul is from Shoup Bay to top of Shoup's Glacier.

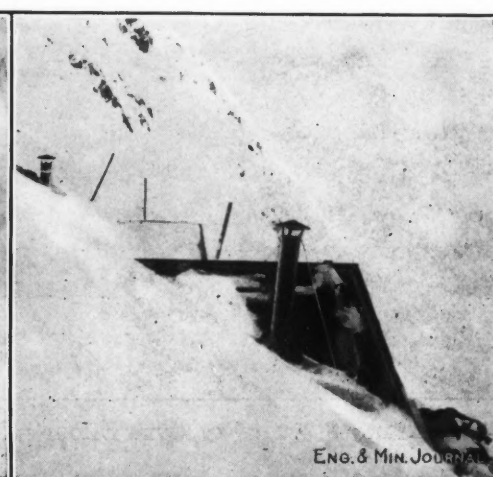
A DOG TEAM HAULING SUPPLIES IN JANUARY
Most of the hauling is done in winter when snow covers ground.



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UPPER VEIN, GOLD KING MINE
Ore is let down from point (X) to mill, over snow in sleighs.

ON SHOUP'S GLACIER
Taking donkey engine around crevasse with blocks and cable.

IN JANUARY, 1913
Roofs of bunk house and kitchen.

and the stoping of ore can go on without intermission. The company has let contracts for 500 ft. of tunneling this winter.

LIFTING AND IMPORTANT STEP IN TRANSPORTATION

The greatest interest that the Gold King Mining Co.'s operations present centers in the transportation problems that its manager has been engaged in solving. Freight is brought from Valdez to Shoup Bay, a distance of 15 miles, on scows. From the beach it is lifted a distance of 2000 ft. and a height of 800 ft. on to the Shoup glacier by a 6-hp. gasoline engine; it is then hauled five miles up the Shoup glacier with horses and sleighs to the foot of the Columbia glacier divide, 1400 ft. above sea level.

a longer cable, so that freight can be lifted to the summit with fewer relays.

All timber for the mine workings has to be taken in over the same route at present, but it is intended later to procure it from a hill on the Columbia glacier side eight miles distant, known as "Black Island." This eminence, which is entirely surrounded by ice, is 1½ miles long by one mile wide, and its lower slopes are well timbered with spruce of a size suitable for mining purposes. The mill will eventually be driven by water power, which can be obtained from a stream three miles from the mine that is capable of furnishing 150 hp. for six months in the year.

The company has installed a telephone line from the beach at Shoup Bay, across the Shoup glacier and over

the summit to the mine, with phones at the beach, one at the Midway Camp, 1400 ft. elevation, one at the mine office, one at the stamp mill, and one at the bottom of the shaft. Small telegraph wire was used, the same as that used by the Government signal service for ground wires. The wires are laid right on the ice, and the line has been working satisfactorily.

The Shoup and Columbia glaciers are both live glaciers. The Shoup glacier is 15 miles long and covers an area of about 40 square miles, while the Columbia glacier is 30 miles long and 15 miles wide at its widest point. The Columbia glacier empties into Columbia Bay, in Prince William Sound. Fresh crevasses appear in these glaciers during the summer season, adding greatly at times to the difficulties of transportation. For this reason freight is nearly all taken in during the winter and spring months before the breakup. Crevasses range from small fissures up to 20 ft. in width and 200 ft. in depth. The glaciers are carrying boulders ranging in size up to 20 ft. square, besides much fine morainal material. The Shoup glacier is estimated to be moving at the rate of 10 to 12 ft. per year; it is undoubtedly dying, as it lies much lower in its bed than it did 12 years ago.

Selective Converting at O. K. Mine

By A. P. SELBY-DAVIDSON*

The blister copper produced at the O. K. mine in northern Queensland during the period from 1906 to September, 1908, averaged 0.22 oz. gold, 6.2 oz. silver per ton, and would produce a good merchantable copper without electrolytic refining as the following analysis shows: As, 0.0016; Sb, nil; Bi, 0.0006; Pb, 0.0016; Ni, 0.095; Se-Te, under 0.0005; Zn, 0.0045; Fe, 0.0023; Cu, 99.14%. As ore from the lower levels was treated, the precious metal content of the blister improved, but was insufficient to pay the increased treatment charge of £2 15s. per long ton.

The ratio of gold-silver to copper varied in different parts of the mine, the blister calculated from assays made on the ores ranged from gold 0.16 oz., silver, 6.42 oz., to gold, 0.79 oz., silver, 12.23 oz. per ton. It was impracticable at the time, October, 1908, to pick the ores to produce copper high enough to sell as auriferous. "Selecting" was the only course.

From experience elsewhere, I was of the opinion that at least 60% of the gold could be recovered with a fall of 10% in bottoms. To prove whether varying percentages of bottoms had any influence on the recovery of gold, a fresh converter was taken and "bottoming" continued until the lining was cut out. The matte (36% Cu) was blown to regule in the usual manner, care being taken to blow as high as possible without foaming. The vessel was turned down, slag skimmed off and blowing continued, the time depending on the amount of regule present and the percentage of bottoms required; when finished, the regule was poured into pots and the bottoms into molds. No account was taken of the metal contents of the slag or byproducts produced; any regule skimmed off with the slag was added to the main portion. Bottoms and regule from each blow were weighed, sampled and assayed separately.

the contents of which have been taken as 100 per cent.

It was apparent if the bottoms could be removed from the vessel without interfering with the continuity of the process that blister as low as 0.15 oz. gold and 4.2 oz. silver, could be "selected" without losing money. About 50% of the gold, 15% of the silver could be recovered in 10% bottoms, at a cost not exceeding £1 per ton of enriched product. The converters used were of the Bisbee type, 72x96 in., with eleven 3/8-in. tuyeres; the lining consisted of barren quartzite and clay. There was ample blast, the compressor delivering up to 3000 cu.ft. per min. at an average pressure of 6 1/2 pounds.

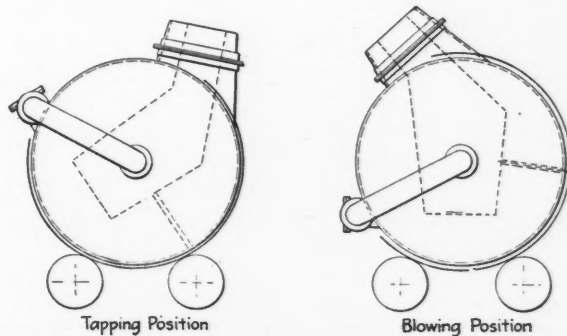
TABLE I. RECOVERIES WITH BOTTOMS OF DIFFERENT PROPORTIONS

No. of Blow	Wgt. of Bot-toms Tons	Assay Gold	Assay Silver	Wgt. of Regule Tons	Assay Au	Assay Ag	Time Blowing for bottoms	Per-centage Bot-toms Pro-duced	Recovery % Gold	Recovery % Silver
1	0.4241	1.07	11.35	1.0179	0.020	4.25	20	34.36	95.70	52.67
2	0.0474	12.03	22.33	1.5750	0.030	8.65	10	3.64	92.34	7.20
3	0.1786	2.60	19.00	1.1500	0.020	7.74	12	16.33	95.28	27.60
4	0.0875	5.86	18.47	1.4147	0.030	8.33	11	7.21	92.36	12.06
5	0.2553	1.76	17.42	0.8446	0.020	6.18	13	27.53	96.37	46.00

Totals or averages 0.9929 2.468 15.436 6.0022 0.025 7.31 13.2 17.21 94.23 25.89

Bottoms assayed 98% Cu; regule, 78%; blown direct to blister (99 Cu), the gold averages 0.455 oz., the silver 10.36 oz.

Two 1 1/2-in. holes 12 in. apart, were drilled through the shell opposite the tuyeres. Tapholes in the lining were



CONVERTER IN BLOWING AND TAPPING POSITION

formed in a similar manner to tuyere holes by leaving suitable bars in them when relining. Blowing from bottoms was carried on as previously described, varying between 8 and 12 min. When ready to tap, the vessel was partly turned so that when the blast was shut off, the tuyeres would be free and there was no danger of the contents running over while tapping. The bar was drawn and the bottoms run into blister molds. When regule "showed," a hot bar was placed in the taphole and driven home while the vessel was moving to a blowing position, the remaining regule being converted to blister, classed as "ordinary." The "bottoms" as tapped were not fit for shipment, being melted up weekly in a vessel which had done at least two blows; sufficient matte was added to melt them and finish the charge. This copper was classed "auriferous." Fully 33% of this was made from added matte.

The recoveries and distribution of metals under normal running are shown in Table II. The original blister contained gold and silver worth £2 6s. 2d. per ton, for which no allowance was made. By selecting, there were pro-

*Care of Electrolytic Refining & Smelting Co., Ltd., Port Kembla, N. S. W., Australia.

duced 51 tons of auriferous blister worth £481. The extra charge incurred amounted to £191, leaving a clear gain of £290, or 10s. 5d. per ton of original blister.

TABLE II. RESULTS OF "SINGLE BOTTOMING"

Material	Tons	Per Cent. of Blister	Assay		Recovery	
			Gold	Silver	Gold	Silver
Ordinary...	505	90.83	0.18	7.81	47.50	86.47
Auriferous..	51	9.17	1.97	12.10	52.50	13.53
Averages or totals...	556	100.00	0.344	8.20	100.00	100.00

After allowing for added matte, bottoms amounted to 6.3%; gold recovered 51%; silver 10.80%.

It was difficult to control the percentage of bottoms. To increase recoveries "double bottoming" was resorted to, the length of the second blow depending on the amount of bottoms produced from the first tap, and varying from two to five minutes. The results of "double-bottoming" are shown in Table III. The second bottoms recovered 71.94% of the gold and 12.58% of the silver left in the regule, with a fall of 10.88%, equal to a total recovery of gold 86.6%, silver, 23.67% in 18.4% of bottoms.

TABLE III. RESULTS OF "DOUBLE BOTTOMING"

Material	Tons	Per Cent. of Blister	Assay		Recovery	
			Gold	Silver	Gold	Silver
Bottoms 1st tap...	2.15	8.44	1.89	13.50	52.29	12.68
Bottoms 2nd tap...	2.54	9.96	1.05	9.90	34.32	10.99
Ordinary...	20.80	81.60	0.05	8.40	13.39	76.33
Averages or totals...	25.49	100.00	0.304	9.00	100.00	100.00

It will be noticed on referring to Table I, that the percentage of bottoms made had little influence on the gold recovered; but under working conditions, the percentage recovery of gold was largely influenced by the percentage of bottoms produced and due to bottoms being retained in the vessels by irregularities of the lining. Probably there was as much copper left in the vessel when producing 5% as 10% bottoms. That copper was left behind, is obvious on referring to Table III. The first tap recovered 52% of the gold, whereas of the gold remaining, 72% was recovered in the second tap.

Recoveries and distribution of metals under "double-bottoming" conditions are shown in Table IV. Allowing for added matte, bottoms amounted to 12%; gold recovered, 71.64%; silver, 18.08%. The original blister was worth £1137; extra returning charges would have absorbed £1042, leaving a balance of £95, or 5s. per ton. By selecting we produced 64 tons of auriferous copper worth £608; operating and returning charges absorbed £240, leaving a profit of £368, equal to 19s. 5d. per ton, or 14s. 5d. per ton more, as compared with selling the 379 tons as auriferous. The margin between selling the whole output as auriferous and producing 18% auriferous, varied with the gold and silver contents of the ore, which ranged from 1:16 to 1:28. The original blister produced during October, 1909, from average ore as mined assayed 0.73 oz. gold and 14.03 oz. silver; this was so close to the margin that it was doubtful whether selecting was profitable.

TABLE IV

Material	Tons	Per Cent. of Blister	Assay		Recovery	
			Au	Ag	Au	Ag
Ordinary...	315	83.11	0.143	10.05	26.78	77.38
Auriferous..	64	16.89	1.924	14.46	73.22	22.62
Averages or totals...	379	100.00	0.444	10.79	100.00	100.00

Before discontinuing operations, ores from different parts of the mine were treated with the idea of producing two grades of blister, one low enough to "select," the oth-

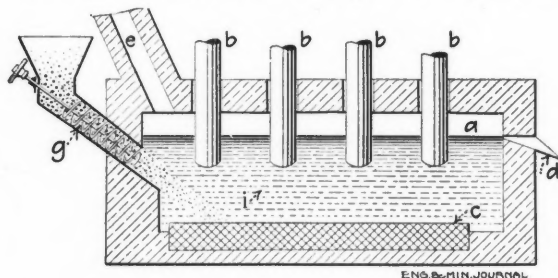
er high enough to sell as "auriferous." From 4550 tons of ore smelted, the average grade of blister produced carried sufficient gold and silver to render selecting unprofitable. The assays ranging from 0.27 oz. gold and 9.6 oz. silver to 1.01 oz. gold, 19.24 oz. silver per ton. It was found practicable to produce two grades; the lower one comprising 28% of the total was to be selected. It was estimated by adopting this compromise method, selecting 28% of the total copper and melting the bottoms with the "auriferous," that 25% would be sold as "ordinary" and 75% as "auriferous," and that the returns from precious metals would be increased by 15% over selling the whole output as auriferous. This scheme was never put into practice as the company suspended smelting operations shortly after completion of this test run.

No actual costs were kept of the extra expense incurred by bottoming. Wear and tear on vessels increased and time was lost handling and melting bottoms. But from information available at the time, it was estimated that it cost £1 per ton of auriferous copper produced.

The converting plant consisted of one stand with four vessels, situated on a lower level than the blast furnace. The plant as originally constructed had a small reverberatory on an intermediate level to act as a matte storage for the converter; after about 12-months' run, this was torn out, and matte was delivered to the converter by means of pots. The converters were tilted by hand and changed by means of a transfer car with four jacks, also worked by hand. A vessel could be changed in one hour. The converting plant was run on two shifts. The blast furnace, 36 x 72 in. at the tuyeres, threated an average of 55 tons of ore per day; the ore averaged 6% copper during the time selecting was carried on. The furnace was run with intermittent tap and inside separation. Any excess matte was tapped, dumped and used as occasion demanded.

Electric Zinc Smelting

F. Tharaldsen, of Trondhjem, Norway, in German patent No. 261,188, reports trouble from the dusting of the charge in electric zinc smelting. When the charge comes in contact with the hot slag, the evolution of the gas and vapor is so rapid and the gas and vapor pressure



SECTION OF THARALDSEN FURNACE

within the charge is so high, that in their escape fine dust is entrained. In order to obviate this he proposes to introduce the charge beneath the slag level.

[The inventor's observation of the entrainment of dust, the reason therefor, and the objection thereto, are interesting and correct. However, his means for circumventing the difficulty do not look practicable.—EDITOR.]

Mineral Exports of Colombia in 1912 were as follows, according to the "Bulletin" of the Pan American Union: Gold in bars and as dust, 19,642 kg.; platinum, 875 kg. In 1911, 10,574 kg. of gold was exported and 2554 kg. of platinum.

Steam Shovel Operation

BY C. M. HAIGHT*

SYNOPSIS—Brief description of equipment used. Digging rate influenced by height of bank, length of cut, character of material, train service, miscellaneous interruptions. Methods of drilling and blasting. Record and average digging rates and ranges of costs.

The large scale on which the openpit mines of the Mesabi range are worked is directly due to the use and development of the steam shovel. Many mines which were begun as underground operations have been changed to openpit mines and the steam-shovel openpit is the feature of the range. A short survey of the work capacity of the shovels in use may be interesting.

EQUIPMENT

Bucyrus, Marion and Atlantic shovels ranging in size from 60 to 90 tons predominate, although shovels as large as 110 tons have been used. For ore the 90-ton size has been found to be the most satisfactory and is generally adopted. The 60-ton size is generally used by stripping contractors and for clean-up and scrambling work, as a shovel of that size can operate over much rougher ground than the larger ones.

The ore cars used are furnished by the railroads. They are built either of steel, or timber, or of both, are hopper-bottomed, and of 100,000 lb. capacity. They range in weight between 28,000 and 33,000 lb. The stripping cars are of the side-dump type and range in capacity from 4 to 20 cu.yd. The heavier cars with air brakes and air dumping device are rapidly becoming standard; they are built of either wood or steel. The track gage is standard in the ore pits and generally so in stripping work, but some stripping contractors use a 36-in. gage and small industrial locomotives called "dinkeys." All the locomotives used in the pits are classed as dinkeys, since they are built without pilots. Some have saddle tanks over the boilers, but most of them have separate tenders. The weights of these locomotives range from 12 to 100 tons without the tender. The rails vary from 60 to 80 lb. per yard.

OUTPUT

A steam shovel should average five dippers per minute in good digging; this is at the rate of 250 cars of ore, or 4000 cu.yd. of stripping per 10-hr. shift, but these figures are ideal and are greatly modified in practice. The maximum output of a shovel will be obtained when it is digging the whole shift. This is a condition, however, which, due to avoidable and unavoidable delays, can never be reached. The more delays are eliminated, the more nearly will the maximum output be approached. The factors controlling the amount of actual working time may be classed under several heads: (1) The height of the bank in which the shovel is digging; (2) the length of the cut that can be taken; (3) the character of the material being dug; (4) the train service or track layout; (5) miscellaneous interruptions, such as bulldozing boulders, taking water, coaling, turning the shovel, moving back, etc.

The height of bank or depth of the cut has a considerable effect on the speed of loading; for the higher the bank, the more the material that can be dug from one position and the less time in moving the shovel ahead. The shovel tracks are laid in sections 6 ft. long; when the shovel has passed over one section, this is brought ahead, and as soon as the ground is cleared it is dropped into place ready for the next move. Ordinarily the pit men have time to get a section in place before the shovel is ready to move, so that no time is lost waiting for the section to be laid. The least time noted for moving ahead was 50 sec., but the average move takes from 2 to 2½ min. With a shallow cut the pit men do not have time to get the section laid before the shovel is dug out, so that a longer time than that mentioned above is necessary for the move. If the shovel can be moved ahead between trains the delay will not matter, for loading cannot go on anyway; but this is not always possible. When digging below the loading track the depth of the cut is limited by the height to which the dipper can be raised, as it has to clear both the car and its load; 7 ft. below the loading track is about the limit for a 90-ton shovel when loading ore cars. With stripping cars it is somewhat more, about 8 feet.

There is a delay when changing from one cut to the next. To move a shovel back requires time and labor, hence the longer the cuts the smaller the number of times the shovel will have to be moved back and the smaller the proportion of time lost. It will take much less time to move a shovel back a half mile once than a quarter mile twice, for the cutting, throwing, and connecting of the tracks are the items that take by far the greater part of the time in moving. The shorter the cuts, therefore, the greater will be the time taken from digging.

The character of the material in the bank will influence the speed of loading. If the ground is hard, or frozen, digging will be slow, though by blasting the bank ahead of the shovel serious delay can generally be avoided. Rock also causes delay; occurring in the ore, it has to be picked out by hand, while in stripping work the large boulders must be set aside for later block-holing, or must be broken in front of the shovel by bulldozing. When working in winter, or the early spring, many large frozen chunks remain unbroken even after blasting, and these have to be set aside for the time being, or broken small enough to handle.

Blasting the ground ahead of the shovel is done by a special crew of men. The holes are usually drilled by hand; in stripping, with hammers and drills, and in ore, with jumper drills if vertical holes can be used. If the bank is high, flat-angle gopher holes are driven from the bottom. If the bank is not too high, vertical top holes are put in, generally 15 ft. apart and the same distance back from the crest, reaching to the bottom of the coming cut. In ore, two or four men with a jumper drill on contract, get from 7c. to 10c. per ft.; an average shift's work is about 60 ft., but some gangs have done as high as 120 ft. in 10 hr. In stripping, where hammer and moil or drill can be used, three or four men work together, one holding

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the drill or moil and the others striking with hammers. In winter the moils are used hot in order to thaw out the ground as they are driven. This work is generally done on company account, and costs between 8c. and 15c. per ft., the work accomplished varying with the character of the ground. Gopher holes are used generally in overburden, and sometimes in ore when the bank is high. They are driven at a flat angle from the bottom of the bank with hammer and moil and enlarged by blasting; two men work together at two holes, one at each. The contract price for this work ranges between 10c. and 15c. per ft. for ore, and between 7c. and 10c. per ft. for stripping. The work accomplished in a shift ranges between 21 and 25 ft. All holes are chambered at the bottom with small charges of dynamite. When finished they are loaded with black powder and fired with either fuse or battery. Sometimes both fuse and electric caps are put in each hole in order to guard against a misfire. While black powder is more dangerous to use than the different varieties of dynamite, it has proved the most satisfactory explosive for the work.

The delays due to train service may be small or considerable, depending on the conditions and general layout. There is always a period of idleness for the shovel between the departure of the loaded train and the arrival of the next empty. The shorter this interval the more loading time there is; therefore, the nearer to the shovel the empty train can wait, the less will this delay amount to. The greater the number of cars that can be used in a train the less frequently will this interruption occur. Track conditions determine the train length in several ways:

(1) At the end of a cut it may not be possible to have enough room ahead of the shovel for the whole train, so that the train will have to be split into sections of one car or more, and the cars, as they are loaded, set off on a switch in order to give the empty cars access to the shovel. The position of this switch will determine the extent of the delay. In some places even it may be impossible to put in a switch and only one or two cars may be used in a train. (2) The grade of the track or the curvature will affect the length of the train. (3) Weather conditions sometimes necessitate cutting down the length of train; on wet days, for example, the rails are slippery. Curves of 38° and even 40° on standard track have been used when necessity demanded, but such sharp curves are exceedingly hard on the rolling stock and on the rails, besides reducing the speed of the trains. Under some conditions a straight haul to the yards or dumps cannot be made, and it becomes necessary to resort to switchbacks. If the loaded train has to pass over the switchbacks before the empty train can come down over them, considerable time may be lost. Having a passing track near the shovel will help matters in a case like this.

Miscellaneous delays crop out at all times and under all circumstances; they may tie up the work for a short time only, or may affect operations for a day or more. The more common are due to wrecks or breakdowns, stopping work for blasting, shortage of railroad cars, shortage of labor, turning the shovel, coaling, taking water, etc. In summer, water is piped to the shovel, but in winter it has to be taken from the locomotive tank through a siphon pipe, an operation that consumes about five minutes.

Thus it is easy to see that the maximum output of a steam shovel cannot be reached except in unusual instances. Some high records made by steam shovels per

10-hr. shift while loading ore are: 110-ton shovel, 175 cars; 90-ton shovel, 180 cars; 60-ton shovel, 100 cars. These figures, however, could not be maintained even under the most favorable conditions, for the strain on the runner and "craner" would be too great. For a 90-ton shovel, 60 cars per shift averaged throughout a season is considered fair work, although it has been exceeded.

Good figures on stripping per 10-hr. shift are: 90-ton shovel, 3800 cu.yd.; 60-ton shovel, 3000 cu.yd. Several shovels in the Hibbing district have loaded over 100,000 cu.yd. each in a month, working two shifts but not Sundays. This, of course, was with high banks and under favorable conditions, and is cited only to show what has been done. An average for stripping work is hard to arrive at because conditions vary so greatly, but the following figures indicate the ordinary range. A 60-ton shovel would range between 1800 and 2200 cu.yd. per shift; a 90-ton shovel between 2000 and 2500 cu.yd. Shovels larger than 90 tons are rarely employed in stripping work, as they are not easily handled on the grades that are usually inevitable.

COSTS

The cost of steam-shovel work varies greatly, as would naturally be expected. The shovel engineers or runners formerly were paid \$5.77 per shift, and usually got a bonus for steady work; cranemen got \$4.04 and firemen, \$2.50. Locomotive engineers were paid \$3.75; firemen, \$2.50, and brakemen, between \$2 and \$2.75. The four to six pit men, and carmen with a shovel got \$2.35, while trackmen and laborers got \$2.10. These wages were raised, however, in 1913.

In estimating, 15c. per ton is generally taken as the average cost of steam-shovel mining. Under the general conditions prevailing this figure is not often exceeded. In fact, in several pits ore has been loaded for 8c., which includes bringing cars into the pits, loading them, and returning them to the yards. This work was done where the conditions were not the most favorable, and under more favorable conditions this figure may be reduced, if it has not already been lowered. In the smaller pits and in those where the work is in the nature of a scam, the cost naturally is high, but these cases are the exception, not the rule.

For stripping the costs vary greatly, many contracts have been let at figures ranging from 27c. to 30c. per cubic yard, though, of course, the actual cost of the work is not that. Figures for this actual cost range from 17c. to 22c. The discrepancy, however, is not any too much to take care of the extraordinary risks which the contractor assumes.

Natomas Consolidated

Owing to an illegible word in the manuscript, Mr. Rolker's letter on p. 192 of the *JOURNAL* of Jan. 17, 1914, read, "at the recent annual meeting," of the Natomas Consolidated, when it should have said "at the recent special meeting."

Coal has been Discovered in the Lukuga Basin, Katanga. says the "Journal du Congo." The coalbeds crop out in several places, and the numerous cuttings made have shown the existence of seven seams, varying in thickness from 1 ft. to 6½ ft. The persistence of the seams has been established by several boreholes. The type of coal is semi-bituminous, hard and light. Analyses give 28 to 45% volatile, ash 18 to 20%, and 6500 to 7000 calories. The coal is adaptable to domestic and industrial purposes.

Safety Rules--Electrical Installation*

(1) Boxes, lined with approved noncombustible insulating material, should be provided for all switches, fuses, current breakers or other bare parts exposed to the weather, dampness or contact with inflammable material, or where employees are liable to make accidental contact with live parts.

(2) Conduits shall be considered as a mechanical and fire protection only and not as an insulating medium. Provision should be made to prevent water getting in conduits. Only circuits carrying the same kind of current, at the same voltage shall be run in one conduit.

(3) Conductors should be of rail, bar or structural shape wherever practicable, so located, protected or guarded as to minimize the danger to men working near them. Wherever practicable they should be painted yellow to distinguish them from ordinary structural work.

(4) Circuit breakers of the contactor type or electrically operated should be used. Latches, blocks, etc., should not be used to prevent the circuit breaker from opening. Means should be provided to prevent unauthorized persons from changing the setting of the relays.

(5) Disconnecting devices or switches should be provided for entirely disconnecting switchboards, oil switches, generators, etc., from all possible sources of power, including outgoing feeders, while men are working on them.

(6) Fuses should be of the inclosed type.

(7) Ground wires should be provided for frames and bedplates of generating machines, all electrically driven machinery, motors, switchboard frames and railings, etc.

(8) Lighting arresters should be located in easily accessible positions at a sufficient distance from wires and other inflammable material to prevent danger of fire, and should be protected by noncombustible barriers, and should be guarded so that employees cannot come into accidental contact with them.

(9) Lamps of the arc type should be constructed as nearly as practicable of noncombustible material, and should be kept supplied with globes. No portion of the lamp outside of the globe and casing, except the binding posts, shall be live.

(10) Series arc lamps, and lamps hung on structural supports, should have insulating supports and be not less than 20 ft. above the ground.

(11) Tungsten lights should be used when possible.

(12) Incandescent lamps or clusters of 150 watts capacity and over, with reflectors or shades shall be suspended by a conduit, rod or other substantial support and should not depend upon electrical feed wires for support.

(13) Incandescent lights on 125- to 275-volt two-wire circuits should be carefully installed. Sockets of 500 volts should be used, of the porcelain, composition, or weatherproof type, with glass or mica insulation. Brewery cord and Duplex cable should be used for drop and portable lights and it is advised that wires be taped a distance of five inches above sockets. Switches should be double-pole, preferably of the knife type.

(14) Portable lamps should be installed only where absolutely necessary, and then wire guards should be pro-

vided over the lamps where there is gas or other combustible material, or where the lamp is liable to be broken and explode.

(15) Motors should be railed off or otherwise guarded, wherever practicable, and armature shaft ends should be encased.

(16) Rubber or wood-slat mats should be placed at the front of and in the back of switchboards.

(17) Safety switches should be provided on all cranes, wherever the main switch and control is not within plain sight of the motor, and at all places where it is necessary for men to work out of sight.

(18) Switches should be installed so that gravity will tend to open them rather than close them. Where practicable, switches should be mounted so that the blades are dead when the switch is open.

(19) Automatic oil switches should be used in preference to air-break circuit switches on circuits of from 275 to 1000 volts. In stations of 500 kw. capacity and over there shall be remote control, either hand or electrically operated.

(20) All panel switchboards should be of noncombustible material, such as marble or slate, mounted on metal framework, which shall be self supporting or rigidly braced. There should be not less than 4 ft. actual clearance between the equipment on the back of the board and the wall or other structures, and the ends of this space shall be guarded by railings or screens which will permit a clear view of the space back of the board. There shall be no doors, cupboards, stored material or obstruction of any kind behind the boards, and this space shall not be used as a thoroughfare. No live parts carrying a potential of over 275 volts shall be mounted on the face of the panels.

(21) All exposed parts carrying a potential of from 275 to 1000 volts shall be painted blue and those carrying over 1000 volts shall be painted red, so as to make them easily distinguishable.

(22) Warning signs shall be placed on all poles carrying a current of 275 volts or over. Where a lower current is carried on the same pole a high-tension danger sign shall be mounted on or immediately below the lowest crossarms carrying the high voltage.

(23) Start-and-stop buttons or safety switches should be located at each machine so far as practicable.

(24) On overhead transmission lines or open main wiring inside buildings, different types of insulators should be used for each separate class of service, so as to make circuits easily distinguishable for reasons of safety as well as for operation.

(25) No live wire of any voltage shall be exposed in manholes.

(26) Higher-voltage lines should always be located above those of lower voltage.

(27) Lines should be installed so as to maintain a clearance of 22 ft. above standard-gage tracks and yard level when supported on poles; when carried on viaducts, bridges or other structures they should preferably be installed in conduits. When not installed in conduits on such structures and when located above the structures they should be constructed to maintain a clearance of at least 8 ft. above the floor or walkway level. They shall in all cases be so constructed as not to project below the lowest part of such a rigid structure.

(28) Wires carrying over 275 volts and less than 3000

*From Inland Steel Co.'s book of rules.

volts shall not be run on crossarms with lines carrying a greater or smaller potential. They should be kept as far as practicable away from windows, platforms and other places where unauthorized persons can come in contact with them.

(29) Feed wires above 275 volts shall not be carried through buildings, except where power is supplied to machinery therein, and in all cases should be of either conduit or underground construction.

(30) Open or exposed mains shall be located so as to prevent injury to men having occasion to work in their vicinity.

(31) No wiring shall be laid on top of floors, as it is liable to trip someone, and in connection with extension lights, the latter are liable to be pulled from their positions and explode.

(32) All wires used during construction work and for all temporary purposes shall be removed as soon as the work is completed. If this cannot be done at once, the ends of the wires should be taped, to prevent possible short circuiting, and a danger sign should be attached thereto.

(33) Flexible cord for lamps should not be tied on iron rods or allowed to come in contact with water or oil.

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The Scoria Process for the Manufacture of Briquettes

The problem of increasing blast-furnace efficiency through diminution of flue dust while operating with burdens consisting largely of fine ores has of recent years attracted the attention of metallurgists. The chief advantage offered by the use of briquettes lies in the fact that disturbances in the furnace, caused mostly by the presence of fine ores in the burden, are avoided, and that blast pressure can be considerably reduced.

For more than two years the scoria process has been in active operation on a scale of 200 tons daily at the Rheinhausen works of Friedrich Krupp A. G., which, on the strength of the results obtained, has now doubled its installation. I propose, therefore, to give a short account of this simple method, which, as its name implies, uses slag—scoria—in preparing the valuable materials for smelting in the blast furnace. In other words, it uses a binder, but with the distinction that, between manufacturer and use, the material so employed undergoes an essential transformation, being hydraulic until it passes into the furnace and being there turned automatically into a fusion binder. The metallic oxides will, therefore, be free to react during their passage through the region of the top gases, while the binder gives the briquettes the necessary consistency to support the weight of the stock pile.

Granulated slag and lime are mixed with the valuable materials, whether flue dust or fine ore, and are made hydraulic in rotating steam drums, where they are exposed to moderate-pressure steam. When thoroughly mixed, sifted and ground, the powdery mass is conveyed to presses to be formed into bricks, which are carried in trainloads of trolleys to cylindrical kilns, in which they are hardened by being exposed to the action of high-

pressure steam for from 8 to 10 hr. The trainload of hardened bricks goes straight from the kiln to the blast furnace and is there dumped, unless required for immediate use.

It will be noticed that the manufacture is almost automatic. If the necessary amount of steam is provided, there is nothing in the process itself that requires supervision. The transportation is practically all mechanical, the actual handling of the briquettes being necessary only once; namely, in transferring them from the press to the trolleys before they are hardened. The labor required for an installation of two presses consists of a foreman and 14 men, including labor for steam drums, grinding and conveying machinery, presses, hardening kilns, and trolley transportation.

The fact that no air drying is necessary in the scoria process deserves particular attention, as it is thereby distinguished from all other briquetting processes; and the saving in space and handling is a considerable factor among its economical advantages. The running of the plant requires no special experience or skill, and the work is such that the labor regularly available at a plant can readily undertake it without special supervision. Raw materials are always at hand at the plant and have not to be supplied from outside, and the success of briquetting does not depend on special conditions of the flue dust.

Both low cost and ease of administration, however, would hardly give the scoria a marked advantage over other processes, if the result of scoria briquettes on blast-furnace operation as a whole had not been signally salutary. For instance, in a trial run of several days' duration, a proportion of 43% of the charge (burden plus limestone) was added in the shape of scoria briquettes without in any way interfering with the regular running of the furnace.

The fact is, the hydraulic binder gives the body the necessary consistency at a minimum consumption of binding material, and, being in the nature of a hydrosilicate, leaves the oxides freely accessible to the top gases. Great pressure on one side of the briquettes is not necessary to produce an actual flow of gas through the structure; the force of the human lung is sufficient for that purpose. On the other hand, the temperature necessary for the destruction of the hydrosilicates is above that at which sintering commences, so that there is no chance for the briquettes to crumble away prematurely.

Actually a very important coke economy results from the use of scoria briquettes. Working with a homogeneous and naturally piled stock column, the gases circulate and pass up under equal pressure, combustion is more complete than is otherwise possible, and the production of carbon monoxide is lessened; it has been proved by actual operation in Germany that a saving of from 15 to 20% of coke can be effected. This could be still further increased if the burden were to consist of only lump ore, over 1.25 in. in size, and briquettes. Under such conditions, blast-furnace operation would be so accelerated that the output of the furnace could be enormously increased. The inventor of the process feels confident that it is well within the means of possibility so to perfect operating conditions as to produce one ton of iron in a day for every cubic meter (35 cu.ft.) of blast-furnace volume.

In April, 1913, a plant having a capacity of 400 tons per 20-hour day was completed for the Aktien Gesellschaft für Hüttenbetrieb, Duisburg-Meiderich.

Note—From a paper by Ernest Stütz, read at the October meeting of the A. I. M. E.

Molybdenum in Cyanide Solutions

BY J. E. CLENNELL*

SYNOPSIS—Tellurium was found in an ore brought from Central America. Tests on a caustic-soda extract showed the tellurium; but also some other element which was for a time supposed to be something new, but which eventually proved to be molybdenum. Its action and effect in cyanide solution are described.

In making investigations for Charles Butters at his laboratory in Oakland, I had occasion to examine some samples of ore and solution from the San Sebastian mine, Salvador, Central America. The presence of tellurium was suspected in it, and extraction tests with caustic soda were made with a view to removing this element and rendering the ore more amenable to cyanide treatment.

REMOVING TELLURIUM FROM ORE

The presence of tellurium in the caustic-soda extract was confirmed by acidifying with HCl, saturating with sulphurous-acid gas, heating to boiling and allowing to settle. The insoluble residue, which was small, was then filtered off, washed with hot water and dissolved in boiling 50% nitric acid. This solution was then evaporated to fumes in a casserole with a little concentrated sulphuric acid, allowed to cool till fuming ceased, and a fragment of metallic tin added, which gave the characteristic pink or purple color, resembling the color given by phenolphthalein with alkali.

The filtrate from the tellurium was boiled to expel excess of SO₂ and then saturated with hydrogen sulphide. This produced a fairly copious dark-brown precipitate, often appearing reddish at first, but becoming darker and denser on boiling. As this precipitate was found to be readily soluble in alkaline sulphides, it was at first supposed that for some reason the sulphurous acid had failed to give a complete precipitation of the tellurium. In treatment with nitric and sulphuric acid, however, no color was obtained, and the addition of tin only gave a yellowish-green or brownish tinge.

RESULT OF CYANIDING THE ORE

Extracts obtained by cyanide treatment of the ore settled solutions decanted from some residue samples sent from the mine, and zinc box head and tail solutions all showed the presence of copper and ferrocyanide. Tellurium could not be detected with certainty in any of the solutions or extracts containing cyanide which were examined. There was evidence, however, that some substance was present, forming a brown sulphide soluble in alkaline sulphides.

The following was found to be the most convenient method of separating the substance. The solution, made alkaline if necessary with caustic soda, was heated to boiling with zinc dust and filtered. The insoluble portion consisted chiefly of metallic copper with small quantities of lead and carbon from the zinc dust and probably any gold and silver originally in the solution. The filtrate was acidulated with hydrochloric acid, heated to boiling and allowed to settle, thus precipitating the ferrocyanide as a zinc compound. The filtrate from the zinc

ferrocyanide, containing an excess of zinc chloride, hydrochloric and hydrocyanic acids, was precipitated by passing a current of hydrogen sulphide through the hot liquor. This generally gave at first a reddish color and finally a dark-brown precipitate, becoming denser on boiling and entirely similar to that obtained from the caustic-soda extract of the ore. A little copper was sometimes thrown down together with the brown precipitate, so it was generally necessary to redissolve in sodium sulphide, boil and filter and reprecipitate the filtrate with hydrochloric acid.

PRESENCE OF A NEW ELEMENT SUSPECTED

The reactions pointed clearly to the presence of some metal of the group containing arsenic, antimony and tin, i.e., precipitable by H₂S in acid solution, as a sulphide soluble in alkaline sulphides. Careful tests for antimony, tin and tellurium failed to confirm the presence of any of these elements, and reactions were obtained which apparently excluded all others of the group, and it was thought for some time that an entirely new element had been discovered. Evaporation of the sulphide with nitric and sulphuric acids generally failed to give any color. In a few tests where a bluish tinge was observed, it was probably ascribed to a little ferrocyanide which had escaped precipitation at an earlier stage, forming Prussian blue with the traces of iron derived from the reagents or filter-papers. The solution of the sulphide in nitric acid failed to give any yellow precipitate with a soluble phosphate, with or without previous addition of ammonia.

Some of the reactions obtained suggested an element analogous to selenium or tellurium; heating the sulphide either in an open or partially closed vessel appeared to volatilize it. As the black, non-volatile residue was small, it was taken for carbon produced by decomposition of some organic impurity.

Extraction with carbon bisulphide showed that the sulphide as generally obtained was mixed with a large proportion of free sulphur, to which were probably due the various shades of red and brown noted according to the conditions of precipitation. The residue, after extraction with carbon bisulphide, was dark brown and much reduced in bulk. On evaporating the extract, nothing but pure sulphur was obtained.

The sulphide was apparently quite insoluble in hydrochloric acid (thus excluding tin and antimony) but dissolved readily in *aqua regia* or in a mixture of hydrochloric acid and potassium chlorate. This solution was tested, without effect, with a number of reducing agents, including sulphurous acid, alkaline sulphites, oxalic acid, stannous chloride and ferrous sulphate (thus excluding tellurium, gold, platinum and iridium). Sodium hypsulphite threw down the sulphide mixed with sulphur.

TESTS FOR MOLYBDENUM

Finally it was discovered that when the pure sulphide was evaporated to dryness with *aqua regia*, adding a little hydrochloric acid near the finish, a fine blue color was produced. An exactly similar color was obtained from sulphide of molybdenum prepared from molybdic acid or

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from ammonium molybdate and treated with *aqua regia* in the same way.

Traces of organic matter appear to interfere with the formation of this color. It is noted in the JOURNAL of Nov. 1, 1913, p. 836, that the sulphuric-acid test for molybdenum sometimes fails. An attempt to obtain the reaction by using the solution of the sulphide in sodium sulphide and evaporating this direct with nitric and hydrochloric acids also failed to give any distinct indication.

The identity of the supposed new element with molybdenum was, however, confirmed as follows: After evaporating the sulphide with *aqua regia* as described, ammonia was added and the mixture again evaporated to dryness, nitric acid then added and again evaporated, and the residue taken up with dilute nitric acid. A few drops of a concentrated solution of sodium phosphate were then added, then ammonia in slight excess, the liquid boiled and finally made very slightly acid with nitric acid. The yellow phosphomolybdate precipitate formed gradually on continued heating. This test, while delicate as a reaction for phosphates, appears to be less sensitive as an indication for molybdenum, as it requires a relatively large proportion of molybdate for a given quantity of phosphate. It may also fail in presence of certain foreign substances.

ACTION IN CYANIDE SOLUTION

The sulphide was found to be extremely soluble in cyanide, forming a yellow solution, which gives a reddish turbidity on acidulating with hydrochloric acid, and a dark-red precipitate on continued boiling. The form in which the molybdenum occurs in the original cyanide solution has not yet been definitely ascertained. This ready solubility, however, indicated that it may act powerfully as a cyanide and the diminished cyanide consumption noted after preliminary extraction with caustic soda may be largely due to the elimination of molybdenum by the latter.

In order to observe the effect of pure molybdenum compounds on cyanide, the following experiments were made: A solution of sodium cyanide was prepared, which, tested in the ordinary way, showed 1.242% KCN and 0.028% CaO. (1) 25 c.c. of the NaCN solution, with addition of KI required 56.05 c.c. standard $\text{AgNO}_3 = 2.242\%$ KCN.

(2) 25 c.c. NaCN solution + 0.1 gram molybdic acid, + KI required 48.55 c.c. $\text{AgNO}_3 = 1.492\%$ KCN, indicating a consumption of 0.75 gram KCN for every gram of molybdic acid added. The solution smelled strongly of HCN and after addition of AgNO_3 , as above, was no longer alkaline to phenolphthalein.

(3) 25 cc. NaCN solution + 0.5 gram ammonium molybdate + KI required 36.45 c.c. $\text{AgNO}_3 = 1.458\%$ KCN indicating a consumption of 0.392 gram KCN for every gram of ammonium molybdate added. This salt also acts as an acid toward cyanide as the solution smelled strongly of HCN and after addition of AgNO_3 was not alkaline to phenolphthalein.

(4) 25 c.c. NaCN solution + 0.1 gram molybdic acid, + a few cc. of strong NaOH solution, and KI required 55.95 c.c. $\text{AgNO}_3 = 2.238\%$ KCN.

(5) 25 c.c. NaCN solution + 0.5 gram ammonium molybdate + a few c.c. strong NaOH and KI required 55.95 cc. $\text{AgNO}_3 = 2.238\%$ KCN.

These tests show that the compounds tried act as acids

toward cyanide, but have no decomposing effect in presence of sufficient protective alkali. It may therefore be supposed that the molybdenum in the solutions is present, not as a cyanide, but as a sodium salt in which molybdenum forms part of the acid radical.

The thanks of the writer are due to Charles Butters for the use of his laboratory and the opportunity of carrying out these researches, and for permission to publish the results. They have been given in considerable detail as the occurrence of molybdenum in cyanide solutions has not, so far as the writer is aware, been previously noted. It is hoped that the description of the various pitfalls encountered in the course of the investigation may be of assistance to others in dealing with similar problems.

Ontario Workmen's Compensation Act

SPECIAL CORRESPONDENCE

After three years of investigation, Sir William Meredith, Special Commissioner for the Ontario Government on workmen's compensation, has concluded his final report which is now in the hands of the Lieutenant Governor and the Cabinet, and which will probably be presented to the Legislature next February. The principal provisions of the new compensation law as drafted by Sir William, are as follows:

Employers, but not the employees, contribute to the fund. The Provincial Government will also contribute to the fund.

The insurance fund for the industries will be handled by a commission appointed by the Government.

Compensation for injuries lasts as long as the disability.

Railway companies will administer their own funds.

Industrial diseases are put on the same footing as accidents.

Employers must contribute toward the expense of the administration.

Contributory negligence is no bar to compensation, but shall be taken into account in the settlement.

The Crown is not included in the bill, but will call on the board in case of accident to Government employees.

Willful or serious misconduct will mean that no compensation be paid unless death or serious disability results.

Compensation for managers is limited to \$2000 a year.

No hard and fast rule is laid down regarding the reserve fund for compensation, this being left to the board to determine.

Telephone and navigation companies must commute weekly or periodical payments to their employees and keep their workmen insured against accidents.

Farming, wholesale and retail establishments and domestic servants are not included in the bill, but provision is made to bring them in when the board sees fit.

The new law guards workmen against unscrupulous employers. No litigation will be necessary in order that an injured man receive compensation.

The decision of the board will be final, but the Crown may state a case for an opinion from the Appellate Court.

Sir William Meredith was appointed Royal Commissioner in 1910 to draft a workmen's compensation law for Ontario and his report is the result of three year's work, during which time he has studied the systems in the United States, England, Belgium, France and Germany, and has held numerous conferences with representatives of employers and employees.

Many objections have been raised on both sides, principally by the manufacturers, but Sir William believes that the bill as now drafted is equal if not superior to the most advanced legislation on this question, in existence. The proposed bill includes the best points of the British, German and American systems of compensation

and its basic principle is that the industries should bear the cost of compensation and that the employees should not contribute.

The workman of Ontario will be insured against accidents from minor hurts that keep him from work more than seven days, to total disability or death, and also against diseases arising from the industry in which he is engaged. This insurance will give to him or his dependents, compensation equal to 55% of his earning power and will be turned over to him by a Government board. This board will be vested with sufficient authority to see that by no industrial failure and by no mischance will his compensation be forfeited.

If he is an employee of a railway, navigation or telephone company, his employer must, upon the direction of the Board, compensate him for any injury out of the individual resources of the corporation. If engaged in any of the numerous industries which are not covered by the schedule, his compensation will come from a fund raised by assessments upon the employers according to their hazard grouping. The Commissioner has decided that only through a collective system by which all industries of a certain class are jointly liable for injuries to their workmen, will the injured men be protected, but that with large corporations, such as railways, telephone companies and similar public utilities that do not suffer from the same risk of collapse as small industrial companies, compensation may be borne by the employer individually, subject to such safe-guards as the board may at any time consider necessary.

The scale of compensation is as follows:

Funeral expenses not exceeding \$75.

Where widow is the sole dependent, a monthly payment of \$20.

Where dependents are widows and one or more children, a monthly payment of \$20, with an additional monthly payment of \$5 for each child under 16 years of age, not exceeding in the whole \$40.

Where dependents are children, a monthly payment of \$10 for each child under 16 years, not exceeding in the whole, \$40.

Where permanent and total disability results from the injury the amount of compensation shall be weekly payments during the life of the workman, equal to 55% of his average weekly earnings during the previous twelve months.

Where disability is partial or temporary, the compensation shall be weekly payments of a sum proportionate to the earning capacity of the workman, not exceeding in any case, 55% of his average weekly earnings.

The Commissioner states that while there is no logical reason that farm hands, domestic servants and employees of wholesale and retail establishments should not be included, the present state of public opinion will not justify such a comprehensive scheme. However, for such employees as do not come within the many classes specified in the new Act and who are not in a position to collect insurance under either the individual or collective systems, the new law will do away with those points in common law, which in the past have stood between the injured person and justice, such as "assumption of risk," "contributory negligence" and "common employment." The doctrine of contributory negligence shall not be a bar to compensation by the workmen, but shall be taken into account in the assessment of damages.

A difficult point to be decided is the basis on which the assessment, to provide the funds for compensation, shall be raised. The German law provides for assessing only the amounts necessary to meet the payments for compensation which fall due during the year next preceding that in which the assessments are made, with an added percentage to provide a reserve to meet deficiencies in the

accident fund in the event of any unusual catastrophe or depression in trade. No assessment is made beyond that necessary to meet the demand for payments which are to become due in future years. Representatives of the manufacturers argued against this system as they considered it unfair to the manufacturer who might start an industry in the future, because it shifted upon his shoulders, part of the burden of compensating for accidents which happened before he became an employer.

To meet this danger, the draft bill does not lay down any hard or fast rule as to the amount which shall be raised to provide a reserve fund. This latter has been left to the board, whose duty it shall be at all times to maintain the accident fund so that with the reserve, it shall be sufficient to meet all the payments for compensation, as they become payable, and so as not to unduly or unfairly burden the employers with payments which are to be made in respect of accidents which have happened previously. A further safeguard in this respect is the power given to the Lieutenant-Governor-in-Council to make a supplementary assessment to be added to the fund.

Sir William Meredith is convinced that there should be no appeal from the decision of the board, so that it would be impossible for a wealthy employer to harass an employee by compelling him to litigate his claim. In his judgment, the farthest the Legislature should go in allowing the intervention of the courts should be to provide for a stated case by the Lieutenant-Governor-in-Council to the Divisional Court. At the same time, Sir William opposes such a provision, as in any form of appeal to the Appellate Court, the way would be open for the defeated litigant to go to the judicial committee of the Privy Council.

With regard to industrial diseases, Sir William states that the risk is inherent in certain industries and the workman is powerless to guard against them.

The draft of the Act differs materially from the views of the manufacturers as to the amount of compensation to be paid. The Act provides that the compensation shall continue as long as the disability caused by the accident shall last and the amount of compensation shall have relation to the earning power of the injured workman.

Workmen will suffer under the new law to the following extent:

Loss of wages for seven days, if disability does not last longer.

Pain and suffering for injury.

Outlay for medical treatment.

Loss of 45% of wages while disability lasts.

All that the employer is called upon to bear is 55% of the injured employee's wages while off duty. The burden which the workman is required to bear cannot be shifted upon the shoulders of anyone else but the employer may and no doubt will, shift his burden upon the shoulders of the community. A warning against half measures of justice to the workmen of the Province, closes the report.

That the present law inflicts injustice on the workman is admitted by all. From that injustice he has long suffered and it would, in my judgment, be the gravest mistake, if questions as to the scope and character of the proposed remedial legislation were to be determined, not by a consideration of what is just to the working man, but of what is the least he can be put off with, and if the legislature were to be deterred from passing a law destined to do full justice owing to the groundless fears that disaster to the industries of the Province would follow from the enactment of it.

The proposed Act will be presented to the Ontario

Legislature and it is expected that the employers, particularly the Manufacturers' Association, will offer strenuous objections. Their principal contention will no doubt be that the employee should contribute to the compensation fund and that the amount of compensation should be limited.



Moisture in Compressed Air*

Every user of compressed air knows that moisture is to be avoided, if possible, when the air is used in pneumatic tools, drills or, in fact, in any reciprocating mechanism. It is also generally known how the trouble due to moisture occurs; namely, by the vapor condensing while expanding in the air-operated tool. The drop in temperature which takes place during expansion causes the water formed to freeze, clogging up the air passages, or if actual freezing does not take place, at least the water formed washes out the lubricant, causing the tool to wear rapidly. The usual method of eliminating moisture is by cooling the air after it leaves the compressor, thus depositing a portion of the moisture before it enters the

to any steam table 0.050 lb. per sq.in. abs. Therefore, if the total pressure of the atmosphere is 14.7, the pressure exerted by the air must be 14.7 less 0.505, which equals 14.195 lb. per sq.in. If, now, instead of being saturated the air contains only 70% of the maximum, that is to say, the relative humidity of the air is 70%; then the pressure exerted by the vapor would have been only

$$0.7 \times 0.505 = 0.3535$$

and the pressure exerted by the air would be

$$14.7 - 0.3535 = 14.3465$$

When the mixture of air and vapor enters a compressor the vapor again behaves like any gas, that is, it is compressed adiabatically with the air. The vapor then becomes in every sense steam, and at the end of compression it is highly superheated, and only by reducing its temperature can the vapor be deposited as water. *Vice versa*, when compressed air containing this vapor is used in any mechanism where it is expanded, the vapor is expanded adiabatically, and a temperature reduction takes place and a portion of the steam is condensed. It is this condensation which causes so much annoyance in air-operated tools.

The volume of vapor which any volume of air contains can be calculated from the following simple formula:

$$V_s = \frac{V p_s}{p}$$

where

V_s = Volume of vapor in cubic feet at pressure p ,
 V = Volume of air and vapor in cubic feet at pressure p ;

p = Absolute pressure of air and vapor per square inch; thus at sea level and atmospheric conditions $p = 14.7$;

p_s = Absolute pressure per square inch exerted by the vapor.

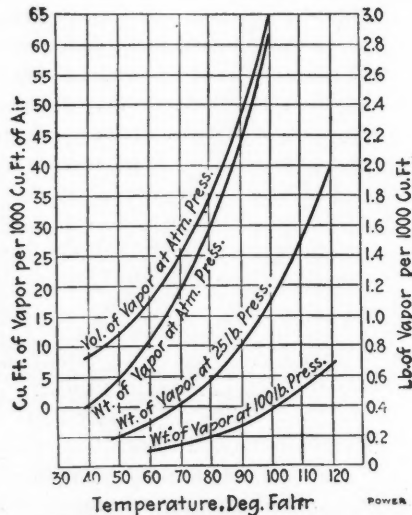
Thus, if the mixture is saturated, p_s equals the pressure of saturated steam obtained from a steam table at the temperature under consideration. The weight of vapor present will be $V \times D$, where D is the weight of vapor per cubic foot and if the air is saturated D equals the weight per cubic foot of saturated steam taken from a steam table at the temperature in question.

In the accompanying diagram is shown the volume of vapor in cubic feet which 1000 cu.ft. of air contains at atmospheric pressure when saturated and at different temperatures. Thus, if the temperature of air is 80° F., the pressure exerted by the vapor is 0.505. The volume V_s of the vapor is according to the above formula:

$$\frac{1000 \times 0.505}{14.7} = 34.3 \text{ cu.ft.}$$

And this is the quantity also shown by the diagram.

Curves are also given, showing the weight of vapor which 1000 cu.ft. of air at atmospheric pressure, 14.7 lb. per sq.in., can hold at different temperatures as well as the vapor which 1000 cu.ft. of free air can contain at 25 lb. gage pressure and 100 lb. gage pressure per square inch. Thus at 60° F. the weight of vapor is 0.8 lb. at atmospheric pressure and at 80° F. it is nearly 1.6 lb., or twice that at 60°. From these diagrams it can be determined exactly how much vapor remains in the air after being compressed and then cooled in an aftercooler. For instance, if air is taken into a compressor at 80° F. and if it is saturated with vapor, 1000 cu.ft. of air will



VAPOR IN AIR AT DIFFERENT PRESSURES AND TEMPERATURES

pipe lines, and one of the objects of this article is to show just how effective an aftercooler is in removing this moisture at different degrees of cooling.

MOISTURE REMOVED BY AFTERCOOLER

Atmospheric air always contains a certain amount of moisture and this exists as a vapor, and when present in the air it behaves like steam; it exerts pressure, the amount of which depends upon the temperature and the quantity of moisture present. At a given temperature air can hold a fixed maximum of moisture and when it contains this maximum, the air is said to be saturated. Air containing moisture behaves in accordance with Dalton's law on mixture of gases, that is, each gas or vapor in a mixture exerts its own pressure and the total pressure of the mixture is the sum of the pressures exerted by the gases independently. Thus, take atmospheric air at 80° F., if the air is saturated with moisture the pressure exerted by the vapor will be the pressure of saturated steam at a temperature of 80° F., which is according

*An article by A. Hofmann in "Power," Jan. 13, 1914.

contain 1.6 lb. of vapor, and if the humidity is 70%, the amount of vapor will be

$$0.7 \times 1.6 = 1.12 \text{ lb.}$$

If, now, this air is compressed in a two-stage compressor to 100 lb. discharge pressure, the intercooler pressure will be about 25 lb. If water is supplied the intercooler at 60° F., the air will leave the intercooler at about 80°, and the amount of vapor 1000 cu.ft. of air at 25 lb. pressure can contain is found from the diagram to be nearly 0.6 lb. In other words, 1.12 lb. less 0.6, equal to 0.5 lb. of vapor, has been removed by the intercooler, or 45% of the moisture originally in the air. If, now, the air leaves the compressor at 100 lb. pressure and is cooled in an aftercooler to 80° F., the diagram shows the moisture still in the air to be 0.2 lb., or 18% of what air was there originally, that is, the intercooler has removed 45% and the aftercooler 36% of the vapor.

If instead of cooling the air in the aftercooler down to 80° it had been cooled down to 60°, the vapor remaining would only have been 0.1 lb., or 9%, of what it originally contained, and this shows the great importance of cooling the air to the lowest possible point. In the case just cited, by cooling 20° lower, that is, from 80° to 60°, half of the moisture in the air was eliminated. Take another example. If the air enters the compressor at 60° F. and 70% humidity, it will contain about 0.56 lb. of moisture, and if, on account of insufficient cooling surface the air can be cooled down to only 110° in the aftercooler, practically all of the moisture originally in the air will remain after it has been compressed to 100 lb.

In order then to get all but a small percentage of the vapor out of the air it must be cooled to a low temperature. It is impossible to remove all of the moisture, and if the air is used at the same temperature as it leaves the cooler, it will be saturated with moisture and water will deposit when expansion takes place in the tools. To entirely prevent the deposit of moisture, the air must be cooled to a much lower temperature than that at which it enters the tools, or what amounts to the same thing, the air must first be cooled and then reheated before it is used.

MOISTURE CAUSES LOSS OF WORK

Another phase of this question is, how does the moisture in the air affect the work done by the compressor? It has already been stated that the vapor must be compressed the same as the air; therefore the work required to compress the vapor must be considered as lost work, since the vapor is eventually practically all deposited as water in the intercooler, aftercooler or pipe lines, and does no work in the tools. For instance, with 1000 cu.ft. of air entering the compressor at 80° F. and 70% humidity, as before, the vapor will occupy a volume of 34.3 cu.ft. at saturation or

$$0.7 \times 34.3 = 24 \text{ cu.ft.}$$

at 70% humidity. This is equal to 2.4% of the total volume of 1000 cu.ft. In other words, the volumetric loss due to vapor is 2.4%. If compression takes place in one stage to 100 lb., the work required to compress 24 cu.ft. of vapor will also be 2.4% of the total work, or 2.4% represents the work lost in compressing the vapor. If compression takes place in two stages, the loss is a little less because the vapor that is removed by the intercooler does not have to be compressed in the high-

pressure cylinder. Calculation shows in the above case for two-stage compression that the lost work will be about 2%. If the air enters the compressor at 100° F. and 80% humidity, the same reasoning shows that with single-stage compression the lost work is about 5% and with two-stage compression about 4 per cent.

This is a loss in compression of air ordinarily not considered. It is true that most users of air compressors know the importance of taking air into the compressor at as low a temperature as possible, and the reasons, of course, are that by so doing a greater weight of air is compressed with a given amount of power expended. In addition to this the air should be taken into the compressor as cold as possible so as to reduce the lost work due to compressing the vapor. For instance, if air is taken from a warm engine room close to 100° temperature and laden with moisture, the figures show that the loss due to compressing moisture may be as high as 5 or 6% of the total work done.

COOLING WATER REQUIRED BY WATER VAPOR

Finally, there is one other question to be considered in connection with moisture in the air; that is, what percentage of the total water supplied to the intercooler or aftercooler is used to cool and extract the vapor in the air. Suppose, as before, the air enters the compressor at 80° F. and 70% humidity, then if the temperature of the air leaving the low-pressure cylinder in a two-stage compressor is 250°, and the air is cooled down to 80° F. in the intercooler, the volume of air and vapor being 1000 cu.ft., the volume of vapor alone is 24 and the volume of air is 976 cu.ft. The weight of this air will be 71.8 lb. and the heat extracted from the air will be the weight multiplied by its specific heat and by the reduction of temperature; that is,

$$71.8 \times 0.237 (250 - 80) = 2893 \text{ B.t.u.}$$

The weight of the vapor contained in the air as before is 1.12 lb. This must be cooled from 250° to 80°, and as the specific heat of the vapor is about 0.46, the heat extracted will be

$$1.12 (250 - 80) 0.46 = 87 \text{ B.t.u.}$$

To this must be added the latent heat of the 0.5 lb. of vapor which is actually deposited in the cooler. The latent heat of steam at 0.5 lb. abs. pressure is 1046, which, multiplied by 0.5 gives 523 B.t.u. The total heat, therefore, given up by the vapor will be

$$87 + 523 = 610 \text{ B.t.u.}$$

and the entire heat removed by the water in the cooler contained both in the air and the vapor will be

$$2893 + 610 = 3503 \text{ B.t.u.}$$

In other words, of the total heat extracted 610 B.t.u., or 17.4%, is taken from the vapor in the air; namely, 17.4% of the water used is required by the vapor, a most surprising result.

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Legal Title to Minerals

Principles relating to the nature of title to minerals where their ownership has been severed from the ownership of the surface were decided recently by the North Carolina Supreme Court, in the case of Hoilman vs. Johnson, 80 *Southwestern Reporter* 249, as follows: Ownership of minerals in place may be severed from title to the surface by a conveyance of them by an ordinary deed, or by a conveyance of the surface with express reservation

of the minerals to the grantor. And when two distinct estates have been thus created, ownership of the minerals is not lost by failure to develop them, no matter how long such failure may continue. The rule of law that title to land may be acquired without deed by long-continued possession under claim adverse to the holder of the legal title cannot be extended so as to give the owner of the surface title to the underlying minerals by the mere fact that he has long remained in exclusive possession of the surface. One who owns all the "mineral interests" in a tract of land need not mine for every known mineral in order to claim all the different kinds which the land may contain.

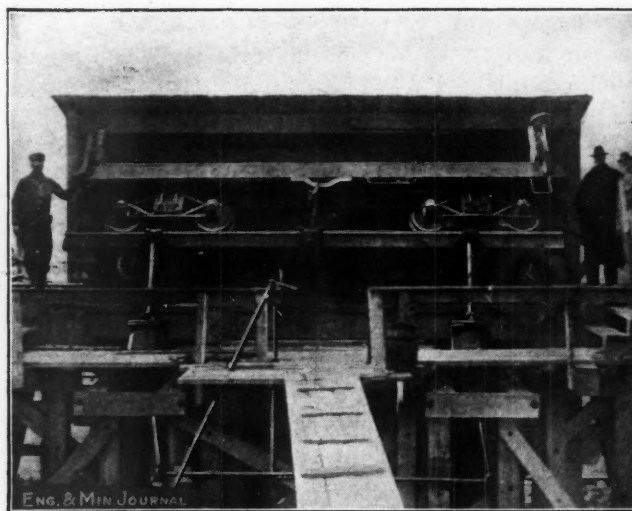
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Dumping Quarry Cars

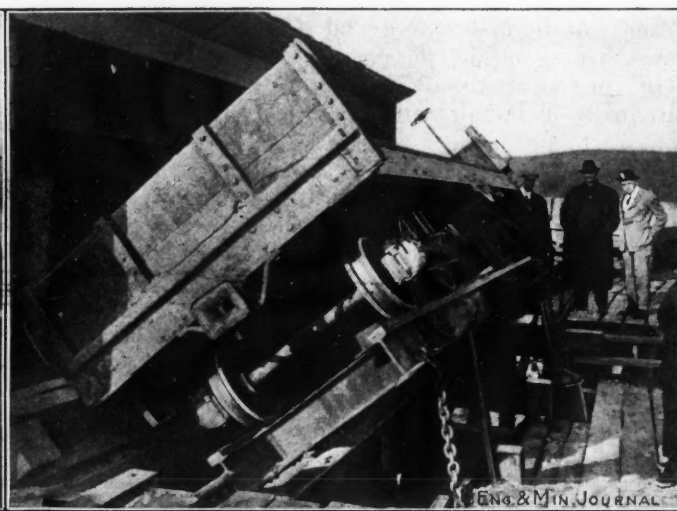
Cars which are to be used in quarry service for carrying stone from the quarry to the crusher should meet the following requirements: The height from ground to top of bed should be as low as possible, particularly if cars are to be loaded by hand, and the cars should be able to be dumped instantaneously and automatically when they arrive at crusher, both to save time in unloading and to save the cost of unloading by hand.

ber of cars are used the cost of the equipment is increased excessively.

When the Warren Silica Co. was installing its new quarry equipment this point was taken up, and in connection with the engineers of the Orenstein-Arthur Koppel Co., of Pittsburgh, Penn., a system was devised which would lessen the cost of the equipment and make unloading cheaper than it would be with any of the other types of equipment mentioned. The accompanying cuts show the equipment which was installed and it will be noted that the type of car installed consists of a very low type of double-truck flat car, which has a platform 20 ft. long by 6 ft. 6 in. wide by 2 ft. 9 in. high to top of floor, thus making it possible for men to load the car without any extra exertion. At the crusher is installed a platform hinged at one side and supported by the other on two air cylinders. When the car arrives at the crusher it runs on this platform, a catch engages the side of the car automatically and by admitting air into air cylinders, the tippie with the car is lifted up so that the car floor assumes a slope of 45°, the load then slides off the car into the crusher and upon releasing the air from the cylinders the tippie assumes an upright position and the train moves on, bringing another loaded car on the plat-



DUMPING ARRANGEMENT FOR FLAT CARS



END VIEW OF CAR BEING DUMPED

A large number of different designs have been made up for such service, but it is not possible to make a car, the body of which will dump without also making it so high that it cannot be loaded by hand, if the capacity of the car is to be large enough to make it economical. This, of course, does not apply to cars which are loaded by a steam shovel, as the height of these cars can be several times as high as the car which is to be loaded by hand, but a low car is also an advantage for steam-shovel service, as it makes it possible for the steam shovel to load the cars for a longer time without shifting the tracks. There have been several designs of cars made which had a separate body hinged on one side to the underframe in connection with which an air or electric hoist located at the crusher was used. A hook from this hoist engaged a side of the car opposite crusher, lifting the body up so that the load would slide into the crusher. A car constructed in this manner, however, is very expensive, as it requires practically two underframes and if a large num-

form. This plan of operation has proved very satisfactory and economical. The time and labor taken in dumping the car being less than with any of the types of equipment mentioned.

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Water Rights of Mining Claim Locators

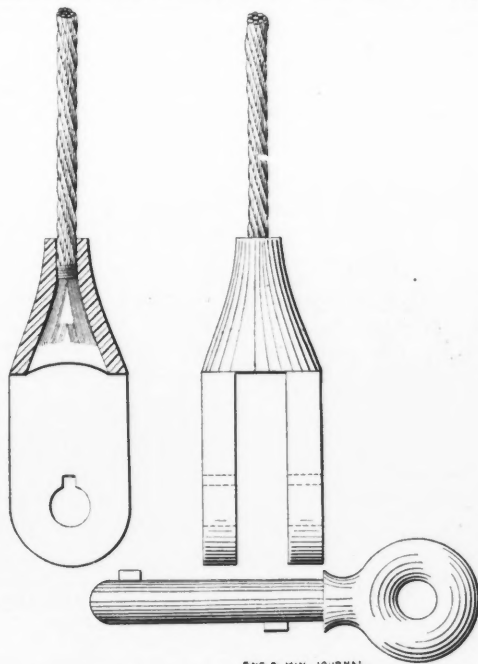
Ownership of a mining claim, the exterior boundaries of which embrace a spring, gives the locator no right to water flowing from the spring in a natural channel, as against persons who may have previously appropriated the water for mining, domestic or irrigation purposes. In reaching this decision in the case of *Campbell vs. Goldfield Consolidated Water Co.*, 136 *Pacific Reporter* 976, the Nevada Supreme Court holds that where the waters of a stream flow in a natural course, they are the subject of a beneficial appropriation.

Details of Practical Mining

Rapid and Safe Bucket Connection

BY JOSEPH GOLDSWORTHY*

The accompanying illustration shows a connecting pin for sinking buckets, which, although not new, has proved safe, quick and simple in practice, and which obtains the confidence of the miners. No dimensions are given, as



LUG PIN FOR CLEVIS CONNECTION OF BUCKET

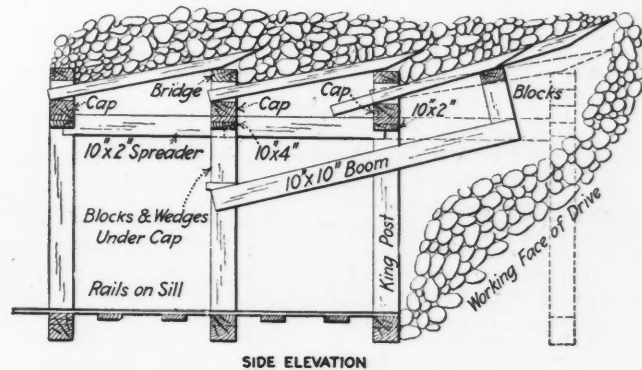
these will vary in almost every case. For a 3/4-in. rope, I use a 1 1/8-in. pin with two lugs, which are 3/8 x 3/8 in. by 1/2 in. long. A slot is cut in the top of the pin hole through the jaws of the clevis socket, as shown. The slots are just large enough to take the lugs with sufficient clearance, so that the pin can be quickly placed in position. The distance from inside to inside of the lugs should be slightly greater than the distance from outside to outside of the jaws of the socket. It will be seen that the front lug is on top of the pin, and the back lug on the bottom. The pin is inserted by pushing the top lug through both slots, giving the pin a half turn so as to bring the last lug on top, pushing this lug through one slot and giving the pin another half turn, bringing it to the proper position, as shown.

It will be readily seen that the chances of the pin's working out are remote; it would have to make a half turn to get the back lug into line with its slot, then travel endwise to get this lug to the outside of the jaw; at this point the front lug would be on the bottom of the pin, and would be holding, so that the operation would have to be repeated before the pin could fall entirely out. The

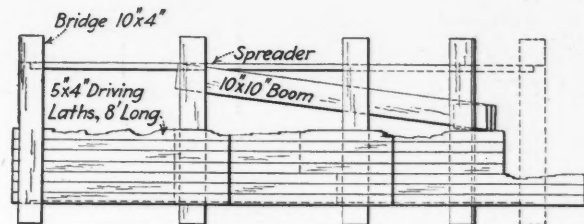
pin is simple, without working parts to get out of order, or to clog with dirt, and in changing buckets, connections are made as quickly with this device as with any other.

Renewing Crosscuts in Sinking Ground

A peculiar feature of mining in the Central Mine at Broken Hill is the continued shrinkage or subsidence going on in the upper levels, following an extensive creep-movement some years ago. The pillar and stope system of mining had been adopted to overcome the unfavorable conditions existing. Unfortunately, before the last of the ore from the stope blocks was won, the combined effect of the unfavorable conditions became too powerful, the pillars crushed and the backs of the stopes burst through;



SIDE ELEVATION



ENG. & MIN. JOURNAL

PLAN

BOOM METHOD OF SPILING

the whole workings sliding down on the footwall. This system of mining, however, has been unjustly blamed for the creep-movements, which were inevitable with any economical method. The effect of the creep-movements is that the whole orebody, filled stopes and standing ore, the outcrop, and a large portion of the hanging wall are all completely shattered, and move gradually downward as extraction progresses. The movement is gradual and regular, and no harm results. The progress of the subsidence is carefully watched by periodical levelings on fixed marks.

The main drift is in undisturbed foot-wall country, with numerous crosscuts tapping the lode. Outside the ore-

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Note.—An excerpt from an article by R. J. Donaldson ("Proc." Aust. I. M. E., No. 10, 1913).

body these crosscuts are quite undisturbed, but west of the foot wall they share in the general subsidence. Many of the crosscuts subside 3 or 4 in., or even more per month, and this subsidence is generally a more serious difficulty than the local pressure on the timbers, as the whole crosscut west of the foot wall gradually drops so much below the level of the main drive as to render tramming impossible. The crosscut must then be redriven over the top of the last one. It sometimes happens that it is necessary to finish some particular section of stoping, depending on the crosscut before the renewal work can be started, and after hand or even horse tramming up the grade to the foot wall has become impossible. In such a case a Holman hoist is rigged just east of the foot wall and the cars pulled up by its aid.

The general method of renewing a crosscut is to drive above the back of the old one, through filling or crushed ore as the case may be, using spiling in the back and sometimes the sides. Ordinary sets are used, consisting of a 10x6-in. sill with a 10x4-in. spreader, 10x10-in. posts, and a 10x10-in. cap, 7 ft. long, with a 10x4-in. spreader.

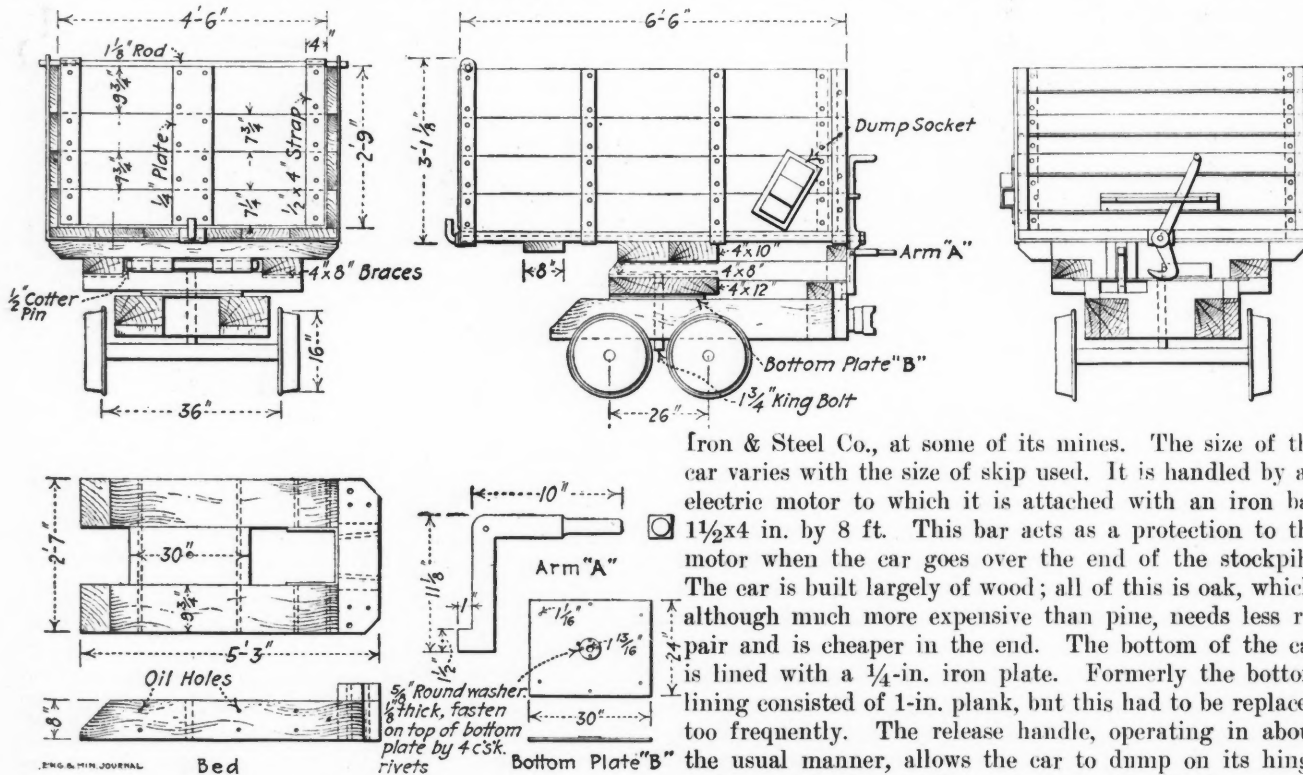
blocks. The pieces are inserted between the bridge and the cap and driven forward one by one, the ground in the top of the face being gradually removed to ease their progress. Then to support them while the rest of the ground in the set is being removed, the boom and king post shown in the drawing are erected. This boom method has the advantage over the use of a false set in that it allows the spiling to be driven home and efficiently supported before any of the ground in the lower portion of the face needs to be removed. The removal of the bulk of the ground from the set is then effected in perfect safety, and the danger of falls out of the face is minimized.

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End-Dumping Stockpile Car of Wood

By E. W. R. BUTCHER*

The accompanying drawing shows a stockpile car of the front-dump, turntable type used by the Republic



OAK STOCKPILE CAR FOR MOTOR TRAIN

The sills are placed between the sets of the old crosscut, which is filled with waste to the new sill level as the work advances. In order to secure as long a life as possible for the new work, the longest posts practicable are used, 10 ft. high, and to prevent side pressure breaking these legs, temporary spreaders are inserted about 6 ft. 6 in. above the rail. Then, as the crosscut subsides the spreader is knocked out to give head room and the rails raised.

The method of spiling presents some points of interest. The pieces are 5x4-in. by 8-ft. Oregon pine, with a bevel end, as shown, to insure the point keeping up during driving. When a set is being stood in the face, the points of the spiling are not supported by the cap directly, but by a "bridge" blocked up some 6 in. above the cap by small

Iron & Steel Co., at some of its mines. The size of the car varies with the size of skip used. It is handled by an electric motor to which it is attached with an iron bar 1 1/2x4 in. by 8 ft. This bar acts as a protection to the motor when the car goes over the end of the stockpile. The car is built largely of wood; all of this is oak, which, although much more expensive than pine, needs less repair and is cheaper in the end. The bottom of the car is lined with a 1/4-in. iron plate. Formerly the bottom lining consisted of 1-in. plank, but this had to be replaced too frequently. The release handle, operating in about the usual manner, allows the car to dump on its hinge and opens the door at the same time. Should the car not dump of itself, a wooden lever arm is placed in the dump socket on the side and the car raised until it does dump. The 4x8-in. timbers on either side of the hinge act simply to steady the car. The king bolt for the turntable is not fastened to the truck; this allows it to pull out and release the body of the car from the truck when it goes over the edge of the stockpile. It has been found less trouble to get back the body of the car after it has gone entirely over the pile, than to get the truck and car back when they are hanging on the edge.

To release the car for swinging, arm A is raised; until it is thus raised, a 1x1 1/2-in. extension at its bottom, fitting under a block, prevents the car from rising, while this same extension, together with the vertical portion of

*Engineer, Republic Iron & Steel Co., Gilbert, Minn.

the arm, is held so as to prevent any side motion. When the car is swung back again to normal position, the arm falls by itself into its place.

The four corner bolts which hold the bottom plate *B* to the bed, also hold the journal boxes, thus eliminating four bolts. The 5-in. iron washer on this plate gives a smaller friction resistance to turning and can be easily replaced when worn.

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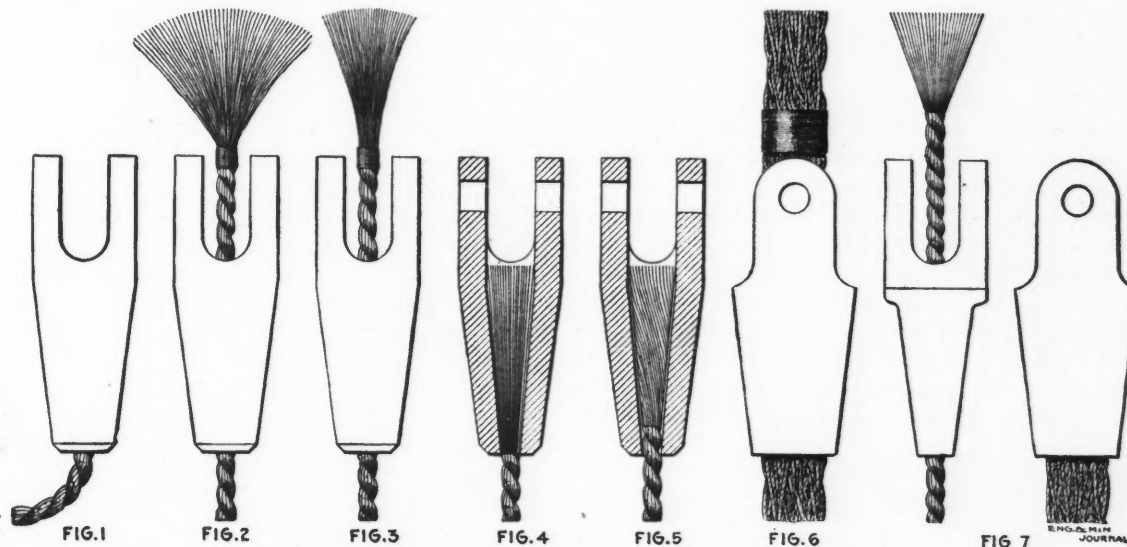
White-Metal Wire-Rope Sockets Used in Mining

There have been many failures, states *Science & Art of Mining*, with white-metal sockets on round winding ropes and many reasons given to account for them, including the following: The socket has to be held in a vertical position to run the white-metal mixture in, and it is suggested that in some cases the socket was not put on straight, owing to the rope being bent to a small radius, as shown in Fig. 1, when running the mixture in, and so when the weight was hung on the rope some of the wires received a larger strain than the others, as the wires do

bent too much. The wires have to be bent back to some extent to thoroughly clean them all. Figs. 2 and 3 show the difference. With upward of 100 wires in a winding rope it is necessary to open them out considerably in order to thoroughly clean them. This bending is scarcely worth consideration when one considers the bending a wire ought to undergo under test.

The wires are said to have been opened out and the core, hemp, taken out for too long a distance. For instance, say the length of the socket is 10 in., the wires may be opened out and cleaned for 10 in. as shown in Fig. 4, and the hemp core is cut out for the same distance. This does certainly make a weak spot at the top of the socket and is objectionable. A better method is to open the wires for a distance of, say, 8½ in., so that there will be 1½ in., Fig. 5, inside the socket which has not been untwisted but around which the white metal runs.

The bending of the rope, say in the case of a balance table, being used at the bottom of a shaft for decking purposes is said to have an effect in causing the wires to break close to the socket.



DETAILS OF WHITE-METAL ROPE SOCKETS

not go back to their natural position after being bent. It is suggested that the wires which receive undue strain are those that break. This may be avoided by giving as large a radius as possible while the socket is in a vertical position.

Copper wire is often used to lap round the rope, and in some cases is left inside the socket. This is said to have set up a galvanic action and caused failure. This is avoided by using iron wire or seeing that no copper wire is left in.

The white-metal mixture may not be heated to the right temperature, usually determined by a piece of wood, hence it does not run uniformly among the wires nor does it run to the bottom of the socket. Some of the wires being held better than others take undue strain. If the socket is not heated it will cool the metal and prevent it running to the bottom.

The wires may not be thoroughly cleaned and fluxed. This can be easily attended to, and should not be a source of failure.

It is said that the wires should not be opened out and

Some say the wires ought not to be straightened when opening out; they should be allowed to lie in their natural twist as they lie when opened in the rope, and no attempt should be made to straighten them. There is really no necessity to straighten the wires, but as all wires should be covered and gripped with the metal there is really little in this suggestion.

The mixture may not be correct. Care should be taken with this, and there is no difficulty if the instructions are followed.

Asbestos yarn is suggested instead of clay for making up the bottom of the socket when running the hot mixture in.

It is said that water runs down the rope and rests on the top of the socket, causing corrosion to begin. This may be so if the mixture does not run through and leaves a hollow place. Care should be taken that the mixture runs through properly so as to leave no lodging place for water.

One of the most important suggestions is that the running in of hot metal alters the temper of the wires and

weakens them. Winding ropes are highly tempered, and to alter it at one place may have a tendency to weaken the wires. It may be said that this difference does not show when testing, but the effects of "fatigue" are so different, and such a wire may give way much earlier.

The most widely accepted suggestion as to the failure of these sockets is that at the top of the socket there is a point which is quite rigid and vibration is arrested suddenly, and the suggestion in the foregoing paragraph should be borne in mind here, that at this point the wires are weakened through being heated. This vibration occurs each winding, and causes fatigue in the steel wire, causing the wires to break at the top of the capel.

There is with Lang's lay ropes a certain amount of "spin" which is arrested at this point, and it is this spin or twist that is said to cause the "fatigue" which causes the wires to break. The socket may be compared to a rope that will bear tensile stress well when gradually applied, but will not stand severe alterations of stress such as occur in a winding rope. A surprising feature of these sockets is that in cases where the conditions are known to be most severe, and where failure would seem most likely to occur, the sockets have stood remarkably well, but in other and much more favorable conditions the sockets have failed soon. The suggestion in the fourth paragraph is no doubt the best method of preventing wires breaking at the top of the socket. Many features have to be considered if fatigue is the chief point of failure, and it may depend on the quality of the steel, as different results would be obtained with different qualities of steel. The handling of the engines needs to be considered, also whether sockets fail sooner with simultaneous decking or decking several decks separately. The height of the headgear, or rather the distance of the socket from the headgear pulley when the cage is at the surface, must affect this question, as the shorter this distance is the greater will be the effect of vibration on the socket.

One argument in favor of the effect of the arrest of vibration on the socket is that these sockets never fail on lock-coil or non-spinning ropes, and there are also no failures with these sockets on flat ropes as shown in Fig. 7. These sockets are put on in the same way as with round ropes. The rope is lapped with wire as shown in Fig. 6, and the strands are then opened out and cleaned. The socket is then put in a vertical position to run the hot metal in, care being taken to see that the socket is straight with the rope. This socket has given every satisfaction, and appears to be the best form of attachment for flat-winding ropes.

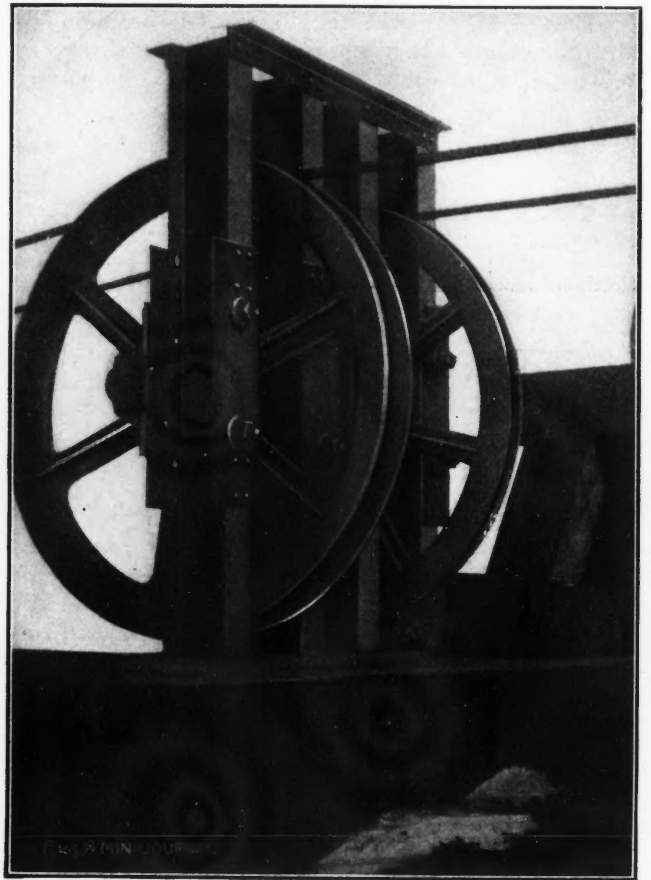
Methods of Checking the Aneroid

An aneroid barometer is the fastest and most easily portable device for determining elevations. But even during constant weather conditions, it is subjected to changes in pressure equivalent to 50 or 100 ft. of elevation, the pressure becoming lowest in the afternoon. It is subject also to the more irregular changes caused by the passage of the cyclonic and anticyclonic pressure areas. (*Econ. Geol.*, October, 1913.) These discrepancies are partly overcome by checking at intervals over points of known elevation, by having a second observer record the read-

ings of another instrument kept fixed, and by keeping the instrument fixed occasionally for short periods of time and noting the rate of change of the readings. A much neater and more satisfactory method of correcting is to use the barograph or recording barometer. This is made in easily portable form and gives an accurate paper record of pressure changes. The instrument can be left at headquarters when a day's work is begun. By noting the times of all readings taken with the field barometer and comparing them with the barograph record for the time in question, the proper correction due to atmospheric changes can be obtained.

Angle Sheave in Steel Stand

In conducting the hoisting ropes from one of the shafts to the hoist at the Republic mine, Republic, Mich., the topography makes necessary several bends or vertical



VERTICAL ANGLE SHEAVES FOR HOISTING ROPES

angles in the lines of the ropes. At the points where these occur, the necessary turn sheaves are constructed as shown in the illustration. The ropes are 1 in. in diameter, the sheaves are 54 in. over all. The supporting structure consists of four 4x8-in. I-beams bedded in concrete and bound together at the top with 3x3-in. angles. The height over all is 5 ft. 4 in., the width 3 ft. 7 in.; the sheaves clear the concrete base 2 in. The sheaves have 6x6-in. hubs with 3-in. shafts. The boxes are 6 in. long; the bolts pass through the I-beam flanges, as shown. The plates riveted to the flanges give additional bearing for the bottoms of the boxes. The structure is strong, neat, compact and exceedingly durable.

Details of Metallurgical Practice

Equipment of an Ore-Testing Plant

BY LEWIS H. EDDY*

The accompanying diagrammatic flow sheet illustrates the equipment of the ore-testing and laboratories plant of the California Ore Testing Co., 591 Bay St., San Francisco. In the selection and installation of equipment the engineers in charge, Abbot A. Hanks, president, and Arthur W. Geiger, manager, desired to meet every exigency that might arise in the treatment of gold, silver and other ores, and have recently overhauled and improved the plant, which was established about five years ago, at a cost of \$25,000. The building has 45x100 ft. main floor space.

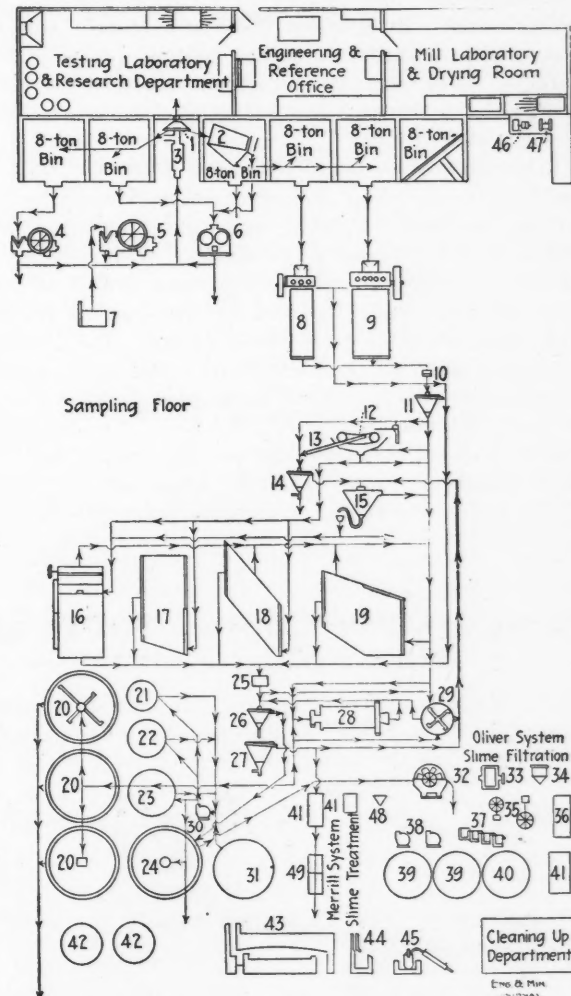
All the ore is weighed. Large lots, over three tons, are fed to an 8x10-in. Blake crusher and elevated in bucket elevator to a Snyder automatic sampler, which cuts out any amount between 20% and 6%, as desired. The sample drops to a sampling sheet for further crushing, mixing and quartering, and the reject is stored in one of six 15-ton bins. Small lots of ore are crushed in Dodge breakers or rolls, as desired, and may be sampled on special floors for this purpose.

There are two batteries of stamps, one a five-stamp battery of 1050-lb. stamps, the other a three-stamp battery of 350-lb. stamps, both equipped with movable amalgamation-plate tables and automatic feeders. The tailings from the batteries run to traps and are then elevated to sizing and classification equipment. This consists of a Callow traveling-belt screen using a 40-, 60-, or 80-mesh screen. The oversize may go direct to a sand table, or to a 36-in. regrinding pan. The undersize is classified in a 2-ft. cone, using hydraulic water, into fine sands and slimes; the sands may be sent to a concentrator and the slimes to a thickening cone and thence to a Deister concentrator or a vanner.

The concentrating equipment consists of four standardized machines, including a 6-ft. Frue vanner, Card slime table, No. 4 Deister sand table and a No. 3 Deister slime table. All the launders are inclined steeply and the equipment arranged for easily and thoroughly cleaning up each lot treated. The arrangement of this equipment is suitable for trying all recent methods of concentration.

The equipment for treating pulp by cyanide includes nearly all the variations of latest practice. There are three leaching tanks of eight tons capacity each, with annular overflow launders, cocoa-matting filters and bottom-discharge gates. These may be filled by a rotary distributor, or sand and slime separation may be made in small cone and Callow cone classifiers arranged above these tanks. An Abbé pebble mill is used for fine grinding sands and has a capacity of about 300 lb. per hr. to pass 200-mesh screen.

The slime treatment is effected in Pachuca tanks, the equipment including four, of capacities from 500 lb. to



FLOW SHEET OF TESTING PLANT

- | | |
|--------------------------------|-------------------------------|
| 1. Sampler | 25. Sump. |
| 2. Screen. | 26. Equalizing cone |
| 3. Elevator | 27. Classifier cone |
| 4. Dodge crusher, 7x9 | 28. Tube mill |
| 5. Blake crusher, 8x10 | 29. Regrinding and amalg. pan |
| 6. Crushing rolls | 30. Centrifugal pump, 2" |
| 7. Weighing scale | 31. Overflow settler |
| 8. 3-stamp battery | 32. Oliver filter |
| 9. 5-stamp battery | 33. Oliver filter |
| 10. Amalgamation trap | 34. Leaf filter |
| 11. Cone classifier | 35. Compressors |
| 12. Callow screen. | 36. Air receiver |
| 13. Launder | 37. Zinc precipitation |
| 14. Cone classifier | 38. Centrifugal pumps, 2" |
| 15. Cone thickener | 39. Gold tanks |
| 16. Frue vanner | 40. Sump tank |
| 17. Card concn. table | 41. Montejus |
| 18. Deister sand table | 42. Cyanide stock tanks |
| 19. Deister slimer | 43. Roasting furnace |
| 20. Leaking tanks | 44. Melting furnace |
| 21. Pachuca agitator, 300 lb. | 45. Retort |
| 22. Pachuca agitator, 600 lb. | 46. Laboratory pulverizer |
| 23. Pachuca agitator, 2000 lb. | 47. Laboratory crusher |
| 24. Pachuca agitator, 6000 lb. | 48. Merrill pre'pt. press |
| | 49. Merrill slime press |

6 tons of dry slime. A boiler equipment with steam coil is used when hot solutions are desired. A 6x8-in. compressor furnishes air for this and other needs of the plant. A 10x12-ft. overflow tank is used for dilution, dewatering or thickening of the pulp.

*Of editorial staff. "Engineering and Mining Journal," 3430 Peralta St., Oakland, Calif.

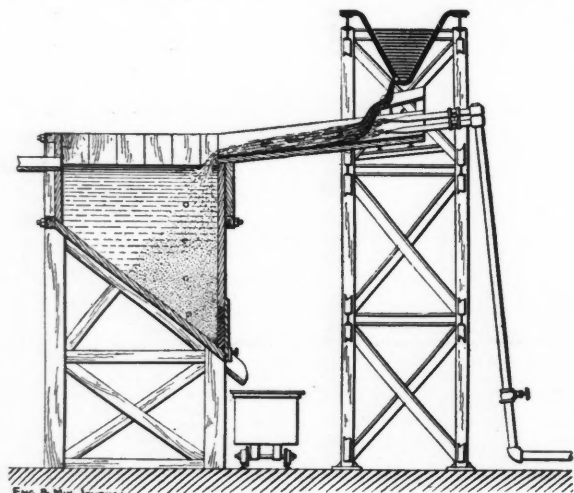
An Oliver filter with 4-ft. drum and capacity of one ton per 24 hr. is extensively used for filtration tests. A 1x4-ft. Merrill filter press is used for the filtration and direct treatment of slime. The filter has several frames of various sizes and a complete necessary equipment for thorough testing. There is a leaf filter and several small filter boxes and frames for filter work on a small scale.

Solutions are precipitated in eight cylindrical zinc-shaving boxes. In addition there is a Merrill zinc-dust press, which permits of actual bullion recovery when desirable. The cleanup equipment includes a 4x6-ft. hearth roasting furnace, a pot melting furnace and material for acid treatment.

Laboratory tests usually precede work in the main plant, such tests being important in indicating methods that may be made available, and which guide the treatment tests. This laboratory is equipped with small pebble mill for grinding; a crusher, pulverizer and small rolls. There are nine small Pachuca agitators, small leaching tanks; each vat holds 10 to 20 lb. of ore. The Pachucas are supplied with air by a rotary air compressor, operated by automatic switch, so that agitation is continuous day and night for the duration of the test. The laboratory includes a chemical equipment for the testing and control of solutions. The pannings, weighings and screen analyses are conducted in a separate room arranged for this purpose.

Granulating Copper Matte at Humboldt, Ariz.

R. L. Hallett, in describing the granulation of copper matte at the Consolidated Arizona Smelting Co.'s plant at Humboldt, gives the water consumption as 900 gal. per



MATTE GRANULATING APPARATUS

ton of matte, the water being supplied at 60-lb. pressure per square inch from two flattened nozzles connecting with 3-in. pipes (*Colorado School of Mines Mag.*, January, 1914). The 3-in. pipes are branches from a 4-in. main that is supplied from a high-pressure pump, automatically regulated to deliver constant pressure by means of a Fisher governor.

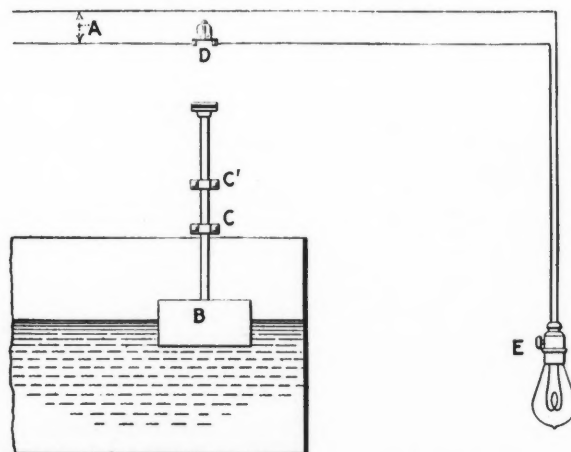
Molten low-grade matte from the blast-furnace settler is granulated and then roasted in Edwards roasters and charged hot into the reverberatory furnace, thus making a high-grade matte for converting. To the older metal-

lurgists, matte granulation is a familiar story, but with the increased scale of operations and other modern improvements, this operation is seldom seen outside of the silver-lead smelting plants. In consequence, the illustration of the granulating equipment at Humboldt will be of interest to many of the younger metallurgists; data regarding water consumption in this operation are seldom given.

The blast-furnace matte at Humboldt is brought to the granulating apparatus by an electric crane and poured into an old cast-iron slag pot supported on a steel framework and having a hole $1\frac{1}{8}$ in. in diameter through which the matte flows into the settling box. The box does not differ essentially from that found in the older smelting plants. It is arranged, however, for discharging the matte particles directly into tram cars, after unwatering by removing plugs from a vertical row of screen-covered holes on one side of the tank. The swinging discharge door is made tight by means of a heavy rubber gasket.

An Electric Water-Level Indicator

The indicator herewith illustrated is described by James E. Noble in *Power*, Dec. 23, 1913. Branch wires A from an ordinary lighting circuit are run to the tank and con-



WATER-LEVEL INDICATOR

tinued to the point or points where observation is to be made. A copper float *B* is attached to a rod, the top of which has a brass plate. The rod should be insulated from the plate and guided by clamps *C* and *C'*. When the tank fills, the rod will close the lighting circuit by bridging the space at *D* and the lamp *E* will light. By attaching an arm to the float rod it can be arranged also to show when the tank is empty by taking a couple of drop wires from the line *A* on the lamp side and arranging a break like *D* near the upper strap or guide.

Fumes from Electrolysis with Insoluble Anodes

Unpleasant fumes from electrolysis with insoluble anodes can be greatly diminished by a little heavy oil on top of the electrolyte. The outlet for the electrolyte circulation should then be trapped to hold back the oil, which will slowly disappear anyway, apparently from slow oxidation at the anode.

Company Reports

Coniagas Mines

According to the annual report of the Coniagas Mines, Cobalt, Canada, for year ended Oct. 31, 1913, dividends amounting to \$1,640,000 were declared. A total of \$5,360,000 has been paid in dividends since incorporation to Oct. 31, 1913. This has been accomplished through mining 275,900 tons of ore and waste and shipping products containing 17,662,904.06 oz. of silver, not including 10,500 tons of mill ore on dumps. The total development work to date amounts to 21,708 ft. Ore reserves were estimated to contain 199,025 tons of ore containing 16,660,700 oz. of silver; included in this estimate is 10,500 tons of ore in dumps.

During the last year there were 61,739 tons of rock removed from the mine, consisting of 6113 tons of barren rock and 55,618 tons of pay rock. The mill treated 54,890 tons, making a total of 227,605 tons milled to date. Development work consisted of 2160 ft. of drifting, 1655 ft. of crosscutting, 77 ft. of winzes, 104 ft. of raises; total, 2966 ft. All development work to date is made up of: Shafts, 610 ft.; drifts, 14,939 ft.; crosscuts, 5899 ft.; winzes, 441 ft., and raises, 819 ft. Employees averaged 152, as follows:

Mines office and supervision	9
Camps	4
Drills, tools and hardware	2
Mining	98
Mining maintenance	8
Mining contract	3
Milling	17
Milling maintenance	6
Lands and roads	1
Loading ore	1
Sampling and assaying	2
Buildings	2
Total	152

The mine was worked continuously except Sundays and shutdowns aggregating 78 hr. The concentrating mill operated 98% of possible time. An average of 2.95 tons per stamp per 24 hr. was obtained. Sand tailings from the mill averaged 3.52 oz. silver and slime tailings, 6.13 oz. silver. The cost of producing silver is given as follows: Mining, concentrating, head-office expenses, royalties, 8.776c. per oz.; shipping, smelting, refining, and marketing charges, 4.321c. per oz.; total, 13.079c. per oz. of silver.

The camp and dining room accommodated an average of 60 men at a charge of 60c. per day. The average disability from sickness for the year was 47 hr. per man. The cost of repairing rock drills ranged as follows per drill per month: 2¾-in. drills, \$11.62; 3½-in. drills, \$18.88; 2¼-in. drills, \$1.06 per month. The mine report shows the average footage drilled per hour of actual drilling time was 3.15 per machine drill, compared with 3.13 ft. for the previous year.

A summary of the results at the Coniagas shows that approximately 405 tons of ore and waste rock were handled per year per man employed. To date waste has only amounted to about 10% of all the rock removed from the mine. Dividends have amounted to about \$19.50 per ton of ore and waste removed from the mine, not includ-

ing 10,500 tons of mill ore in dumps; or that \$1 in dividends has been paid for every 3.24 oz. of silver contained in shipments.

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Utah Apex

The annual report of the Utah Apex Mining Co., Bingham, Utah, for year ended Aug. 31, 1913, shows a gain of \$130,190 for the year, after charging off \$94,585 for depreciation. The receipts were as follows: Gross value of ore sold, \$803,928; royalties, \$9372; miscellaneous, \$3173; discount on bonds purchased, \$6350; abatement of accounts payable, \$3; total, \$822,826. Expenses amounted to \$598,051, made up of: Running expenses at the mine, \$233,248; milling, \$37,171; smelting and freight, \$272,200; umpire fees and ore purchased, \$323; bond interest, \$12,165; taxes, insurance and general expenses, \$42,943. Owing to labor troubles started in 1912, the mine was not operated under normal conditions until March and even then under armed detectives. At the annual meeting, Sept. 9, it was voted to change the date of shareholders' meetings from the second Tuesday in September to the second Thursday in November of each year. At Oct. 5, 1913, the bonded indebtedness had been decreased to \$137,000.

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The North West Corporation, Yukon Territory

The North West Corporation, which, with the Canadian Klondyke Mining Co., constitutes the principal assets of the Granville Mining Co., owns about 75 miles of valleys in the Indian River watershed in Yukon Territory. It was shown at a recent meeting in London, says the *Financial Times*, that the Granville Mining Co.'s holdings consists of 1,015,000 one-pound shares of the total authorized capital of £1,500,000. A. N. C. Treadgold, the chairman and managing director, considers the property of the North West Corporation to contain 600,000,000 cu.yd. of gravel, of which he estimates 100,000,000 to contain gold of an average value of 30c. per cu.yd., and another 200,000,000 cu.yd. containing 20c. per cu.yd.; not to mention other large areas on which there is insufficient information to form an estimate. Mr. Treadgold is of the opinion that in the season of 1915, the company will be able to treat 7,000,000 cu.yd. at a cost of 10c. per cubic yard.

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Superior @ Boston

The annual report of the Superior & Boston Copper Co., Globe, Ariz., for year ended Sept. 30, 1913, shows a balance of \$75,268 on hand. The company began the year Oct. 1, 1912, with a balance of \$81,382, and received \$265,212 from assessments, \$3292 from interest, and \$153,436 from ore sales, making a total of \$503,321, including balance at the beginning of year. Expenditures

amounted to \$428,053, consisting of \$319,093 for development expense, \$8960 for construction and equipment and \$100,000 for note paid off. Development work consisted of 5265 ft. of drifts and crosscuts and 577 ft. of raises. Ore mined amounted to 15,485 dry tons. It is stated that a new orebody, first encountered about a year ago on the 8th level, has been developed by raises between the 8th and 6th levels and laterally on the levels and in stopes. This has made it possible to resume ore shipments. Further extension of this orebody has been proven by diamond drilling.

Colorado Fuel & Iron Company

This company owns coal and iron-ore mines in Colorado, New Mexico and Utah; also blast furnaces and a steel plant at Pueblo, in Colorado. The twenty-first annual report covers the year ended June 30, 1913. The balance sheet shows capital liabilities of \$34,235,500 common stock, \$2,000,000 preferred stock and \$45,266,000 bonds. The bonded debt was reduced during the year by the retirement of \$5000 Grand River bonds and \$14,067,000 convertible debentures; and increased by the inclusion in the account of \$38,525,000 Colorado Industrial Co. bonds. This made \$24,453,000 net increase in debt.

The production statement for the various properties is as follows, in short tons:

	1911-12	1912-13	Changes
Coal mined.....	4,038,852	4,091,667	I. 52,815
Coke made.....	777,993	784,627	I. 6,634
Iron ore mined.....	813,728	853,878	I. 40,150
Limestone quarried.....	459,913	485,756	I. 25,843
Pig iron made.....	426,659	416,467	D. 10,192
Finished iron and steel.....	485,743	458,521	D. 27,222

Of the coal mined, 1,369,422 tons, or 33.5%, were used in making coke; 697,214 tons, or 17.0%, used at company plants; 2,025,031 tons, or 49.5%, sold commercially. The quantity of coal used in making coke was 1.75 tons to the ton of coke.

The earnings and expenses for the year are reported as follows:

	Gross Earnings	Working Expenses	Net Earnings
Iron department.....	\$14,982,804	\$12,125,685	\$2,857,119
Fuel department.....	9,333,083	8,569,936	763,147
Total.....	\$24,315,887	\$20,695,621	\$3,620,266
Total, 1911-12.....	24,268,452	20,496,170	3,772,282

No figures as to costs are given. Taking general averages the coal department shows gross earnings \$2.28, expense, \$2.09, and net earnings \$0.19 per ton of coal mined. The Iron Department gives gross earnings \$32.69; expenses \$26.46; net earnings \$6.23 per ton of finished iron and steel made.

To the net earnings above are to be added \$755,629 interest and dividends received, making a total of \$4,375,895. Payments deducted were \$243,722 for taxes; \$2,169,311 interest and sinking fund; \$235,670 miscellaneous charges; \$80,000 dividend on preferred stock; total \$2,728,703, leaving a balance of \$1,647,192 to profit and loss. Miscellaneous charges included \$50,081 for personal injury and the sociological department.

Financial transactions of the year included the payment of 35%, or \$700,000, as accrued dividends on the preferred stock. In accordance with a vote of the stockholders, \$14,067,000 debenture bonds were retired, and the properties held under the name of the Colorado Industrial Co. were transferred to the Colorado Fuel & Iron Co.

To meet the increased demand for openhearth steel, the executive committee, on Apr. 21, 1913, authorized the construction of three openhearth furnaces (at a cost of approximately \$500,000) as an addition to the plant of 12 openhearth furnaces now in operation.

On Apr. 1, 1912, an increase was made in the wages of coal-mine and coke-oven operatives, which added approximately \$25,000 per month to the payroll, and on Mar. 1, 1913, steel works employees were advanced an amount which represented an increase of approximately \$20,000 per month in that payroll, the total of these two advances equaling at least \$500,000 per annum. These increases represented a charge to the fiscal year under review of approximately \$300,000 more than was borne by the previous fiscal year.

Consolidated Mining & Smelting Co.

The annual report of the Consolidated Mining & Smelting Co., of Canada, for 15 months ended Sept. 30, 1913, shows a net profit of \$998,367 after writing off \$193,256 for depreciation of plants and equipment and \$146,019 for development. Development charged to profit and loss amounted to \$598,240, which represents the actual amount expended during the period for development. After writing off depreciation, plant account shows an increase of \$103,071; and property account, after writing off development, shows an increase of \$232,114 for the period. The company owes \$197,970 to banks for borrowed money. Dividends aggregating \$464,352 were declared. Balance of quick assets over current liabilities amount to \$999,728, and consist principally of ores and metals in course of treatment.

The smelting works at Trail, B. C., treated 407,124 tons of ore and concentrates, producing 186,017 oz. of gold, 3,244,408 oz. of silver, 48,325,252 lb. of lead and 3,454,814 lb. of copper. The production of this plant since 1894 to Sept. 30, 1913, amounts to 1,332,929 oz. of gold; 23,449,031 oz. of silver; 299,295,896 lb. of lead, and 54,244,797 lb. of copper from 3,551,051 tons of ore. During the 15-month period, 38,741 ft. of development and 35,288 ft. of diamond-drilling work were performed.

Davis-Daly

The annual report of the Davis-Daly Copper Co., Butte, Mont., for year ended June 30, 1913, shows a deficit of \$97,343 on operations for the year. Receipts were as follows: Ore returns, \$191,943; rentals, \$1071; royalties, \$2317; miscellaneous, \$478; interest and discounts, \$4272; total, \$200,081. Operating charges amounted to \$294,424 and consisted principally of development work. The report states that the Colorado is the principal mine of the Davis-Daly group. This mine has a vertical shaft 2030 ft. deep. The bottom level is 2000 ft. below the collar of the shaft. At the 1400-ft. level the mine is connected with the Moonlight mine of the Anaconda company. During the year 6187 ft. of drifts and crosscuts and raises were run and 46,923 cars of waste hoisted. There were also produced 33,153 dry tons of ore, averaging 64.94 lb. of copper and 5.96 oz. of silver per ton. The average cost of mining, including development, was \$8.67, and receipts from the sale of ore averaged \$5.73 per ton of ore. It is claimed that the mine was on a paying basis during May, June, July and August, 1913.

Copper Wire Drawing

By DONALD M. LIDDELL*

SYNOPSIS—Electrolytic bars heated and drawn through three sets of rolls, reduced to various final diameters, with $\frac{1}{4}$ -in. as a minimum. Increased length taken care of on floors sloping from the rolls. After rolling, rods are coiled and pickled and then drawn. Lubrication provided. Dies in this plant are rotated. Steel, cast-iron and diamond dies used. Annealing is final process. Finished wire may be tinned, stranded or insulated, or a combination of these processes used.

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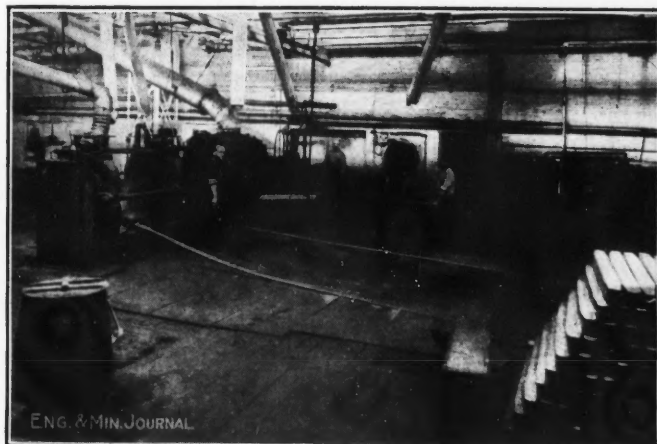
In the following description of wire-drawing operations, the work of one plant is described, although, because of the closely competitive conditions in this industry no names will be given. There is no claim made that the process in this plant is ideal, and incapable of improvement. The magnitude of the industry in general, and its interest to metallurgists may be deduced from the fact that the wire drawers account for about 50% of the total copper consumption of the United States.

The bars most used in the works in question are 225-

The roughing rolls (breaking-down rolls) are eight-pass in this particular mill. Grooved rolls are used, and the bar, with dimensions as given above, comes down to 1-in. square. This 1-in. bar then goes to a second set of rolls, which brings it to $\frac{5}{8}$ -in. oval. Hence it goes to the rod mill, which brings the $\frac{5}{8}$ -in. oval down to any size required with $\frac{1}{4}$ -in. round as a minimum. All these rolls are cooled by water flowing over them, and are made of chilled cast iron.

From the rod rolls the floor slopes away on both sides at an angle of about 10° for about 35 ft. The flooring is of smooth iron plates. As the end of the rod comes through the first pass, it is seized in tongs by the roll man and put in the second pass; as it comes through that another roll man gets in, who puts it in the third, where the first roll man is by this time awaiting it. As a consequence, a rod may, as it gets in the last passes of the mill, be going through five sets of rolls at once.

Owing to the reduction in diameter, the length is meanwhile enormously increasing, so that it stretches further and further down the inclined floor plates between each

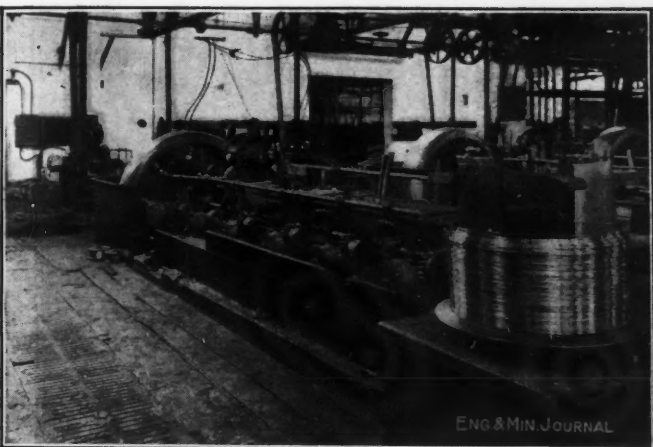


ROD MILL

(Note hot bar in center background ready for rolls, and floor sloping from the passes in the foreground. Continuous furnace in right background.)

lb., 50 in. long by $4\frac{1}{4}$ in. deep by 4 to $3\frac{3}{4}$ in. wide. These are heated in a continuous furnace, the bars being moved by hydraulic ram. This furnace is coal-fired, working under forced draught, with a steam jet under the grate, on which a deep fire is carried. This produces a long flame, completely filling the furnace. The bars travel against the flame.

There is no pyrometer control of the temperature to which they are heated, which is judged only by the eye of the furnaceman. Roughly the heat is cherry red to yellow. If the bars are heated too high, they melt, and in general, the higher the temperature at which they are rolled, the more scale will be produced, and the colder they are rolled, the less scale. While the melting point of the copper indicates an upper limit of heat, the power behind the roughing rolls fixes a lower. The more powerful the roll-drive, the lower the temperature at which the copper can be rolled.



WIRE-DRAWING MACHINE

(Note five carrier wheels, increasing in size toward right. The gears rotate the dies. The rod coil is in the extreme left background.)

pass. The rolls in the rod pass are multiple grooved, and there are guides in front of the rolls which are shifted to throw the rod in the grooves desired for the particular size needed by the mill. A $\frac{5}{8}$ -in. rod is rolled for trolley wire. On the last two passes, a heavy grease is applied to the rod as it goes through the rolls.

From the last rod roll, the copper goes to a steel capstan, which coils it and from which it is taken to the pickling tank. The pickling is done with dilute sulphuric acid, and after washing and drying, the coil rod is ready to get to the wire-drawing machines.

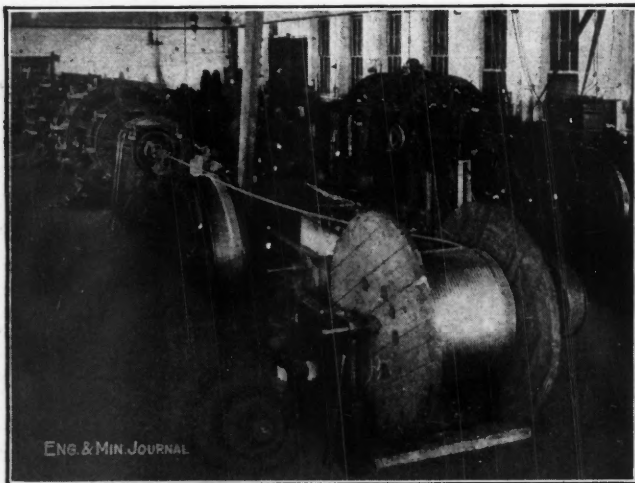
In general, the coarse-wire machines are fitted with chilled-iron dies. These dies are cast with a taper hole, which is then reamed out exactly to size. The essential elements of the drawing machines consist in a block which draws the wire through the dies and upon which it is coiled as drawn, the dies and their supports, and a set of wheels, called carriers, one between each two dies. Five or six dies usually form a train. No general rule can be

*Associate editor, "Engineering and Mining Journal."

given as to the successive reductions. It depends on the softness of the copper, the size of wire being drawn, and the speed of drawing. The end of the rod is swaged down by hand until the various dies can be strung on it in the order in which they are to come. Ten to 12 ft. of extra space are left between the successive dies. In putting the wire on the machine, the first largest die is set in place, and the slack wound around the carrier wheel, the second die placed in its support, and the wire wound around the second carrier, and so on, until the smallest die is in place. The end of the wire is then placed on the block, and the machine started.

All of the carriers between the dies run at the same angular speed. To make up for the increased length between the dies, each carrier is made larger than the last. This increase in diameter is not calculated to any great nicety, however. The slippage of the wire on the carrier and the "draw" in the copper between the carrier and the next die take up a good deal of the difference.

The rod runs through boiled tallow before entering the first die, and after that runs down into soap and water to keep it cool and to lubricate it. If the solution becomes too hot, it affects the tensile strength of the wire injuriously.



CABLE STRANDING MACHINE

It is worth noting that on modern machines the circular dies are in continuous rotation at speeds of 2 or 4 revolutions per second. This is said to add much to the wear of the dies and the accuracy of the wire.

The chilled cast-iron dies are used in practically all work down to No. 15 wire. Beyond that, diamond dies are used, which are pierced in the shop of the company. Brass is then cast around them to hold them. As a diamond die wears or scratches, it is redrilled to a larger size, and when the hole gets up to too large a size to make the diamond's further use worth while, it is sold to manufacturing jewelers to be ground into dust. These diamonds are of inferior quality, selling at about \$2 per carat.

On the smallest size of wire, the successive reductions must be exceedingly light to avoid snapping the wire or breaking the die, and several diamond dies will be used in series. In the various machines, the attendant can usually tell by the wire when a die has cut or worn, but he will often caliper the wire, and will discard the die as soon as it wears beyond the limits of tolerance. Certain

wire drawers use self-hardening-steel dies. These are ground or filed out to exact shape. There is apparently a belief among some workers that a steel die before a diamond die acts as some protection to it, but there seems to be no reason why a carefully watched-iron die does not do as well. The likelihood of the cast-iron die slipping and letting through a large enough wire to split the diamond, seems negligible.

From the drawing machines, the coils of wire go to the annealing furnaces which are now exclusively of the sealed-muffle type, described in the JOURNAL of Nov. 2, 1912. Very fine wire is sometimes annealed in pots, after covering it with copper-scale or sand, to prevent oxidation. The use of the muffle furnaces renders any subsequent pickling unnecessary. If the wire is to be tinned, it runs over a roller down into a bath of flux, goes through a wiper of cotton rope, then down into the tin pot, through a wiper of asbestos cord, then again through a wiper of cotton rope, and on to the reels. Each tin pot takes three or more wires at once.

Further operations with the copper wire (untinned) consist either in simply winding it on spools, or if cable is to be made, of sending it to the stranding machines, where several hundred wires may be twisted into one cable.

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Cuban Iron-Ore Titles

HAVANA CORRESPONDENCE

Interest attaches to a recent development in the protracted litigation involving some of the Cuban iron-ore deposits. The litigation originally involved the titles and was based on the fundamental question as to whether the clay iron ore, a residual product from the decomposition in place of the basic country rock, was "ore" within the meaning of the Spanish law, or whether it was a ferruginous clay—clay not being subject to denouncement as iron ores are. This subject was investigated by universities of Europe and America for the various parties in interest and it seemed to be clear that the clay iron ores of eastern Cuba were ore, applying to them the test of chemical and physical changes in the formation which had taken place and considering them in the line of their scientific origin and relations. This question was not, however, judicially passed on. Recently, however, other factors entered into the case which may have application throughout all of Latin America as regards the validity and procedure of titles of certain deposits. As is already known, the laws of the Latin-American countries are based on Spanish common law, just as the laws of the United States, where not otherwise enacted into statutes or regulations, or by court decision, go back to statute regulations of the time of Queen Elizabeth and to subsequent English decisions.

It appears that the records discovered in Spain disclose decisions and regal decrees made about 800 years ago which define denounceable ores in a manner which would exclude from that class deposits of material which can be moved from the surface without mining, and which are found loose on the surface. Specifications were made later to apply to gold placer deposits. It is well known that the tin placer deposits in Mexico are not denounceable and belongs to the owners of the lands, whereas gold placer deposits under specific law are denounceable.

If this Spanish common law is effective and can be applied to the residual deposits of eastern Cuba, then the titles which were based on denouncement will be adversely affected and the equity of the deposits will be confirmed as part of the land title. This question has not been adjudicated and is only presented for discussion, but it is obvious that its confirmation or denial in the Cuban issue will automatically extend its scope to all the Latin-American countries, in so far as subsequent legislation or decisions have not superseded this ancient regulation and interpretation.

The Seldom-Used Elements

A joint meeting of the New York Section of the American Electrochemical Society with the Society of Chemical Industry, to consider the field of seldom-used elements, was called to order by Lawrence Addicks, on Feb. 6. Mr. Addicks traced the growth of the knowledge of the elements from two of the earliest philosophers through the seven known at the beginning of the Christian era, to 17 at 1050 A.D., 67 in 1891, 78 in 1901 and 82 now accepted. He said it was his understanding that the meeting was held as a sort of protest against this continual discovery of new elements without the discovery of corresponding uses.

The first speaker was Dr. Charles Baskerville, of the College of the City of New York, who spoke on "Opening Up the Field of the Unused Elements." In his paper, and those which followed, the word "element" was used in a very broad sense, which included the substance in either its elemental form or in its compounds. Over one-third of the accepted elements have no use in either their free or combined state. Others may be used in free condition, or as an alloy, but not as chemical compounds, or *vice versa*.

He showed specimens of some of the seldom-used and seldom-seen elements, such as cerium, somewhat resembling lead and tin, and lanthanum, which acts like calcium. It oxidizes readily in air, slakes, and is the only third-group metal normally forming a carbonate. Cerium is becoming cheap, as the price has recently dropped from 250 marks per kg. to 20 marks. Doctor Baskerville emphasized the point that "rare" changes its meaning with these metals. Even rare gases are not always so, great quantities of some of them being now available from the fractionation of liquid air.

An investigation into the factors rendering certain elements little used showed a surprising diversity of cause. Some are unused, because of a true scarcity, such as osmium, of which it is believed there are but a few hundred pounds in the whole available crust of the earth. On the other hand, silicon has but scarcely any uses as an element, yet it composes over 25% of the earth's crust.

Others, as palladium, might be rare because of the selfishness of controlling interests. Occurring in nickeliferous pyrrhotites in quantities too small to be chemically detected, it concentrated in the slimes of the final refined metal in relatively large quantities. This was a metal, concerning which one company had refused to investigate the availability of certain sources, for fear of breaking the market. Still others lacked an appropriate extraction process.

Aluminum and thorium were formerly rare metals which had been removed from that class. Aluminum

had been reduced to one-hundredth of its price of a generation ago, thorium to one two-hundredth, so that 315,000,000 Welsbach mantles had been made from it last year. Thorium was an example of an element cheapened by improved refining processes.

Formerly thorium salts had been prepared by baking pulverized monazite sand, containing 4 to 6% thorium (as phosphate) with sulphuric acid, leaching, throwing out as oxalate, dissolving the oxalate with destruction of the oxalic acid, then throwing down as double ammonium oxalate, and converting to nitrate. Then it was proposed to distill the monazite directly and save the phosphorus.

This, however, left carbides, including silicon carbide, which wore out the grinding machinery. This was obviated by distilling off the silicon as fluoride, and forming a little calcium carbide, which disintegrates the residue when thrown into water. Another improved process is that for cerium, in which Soddy has lately been extracting mesothorium as a byproduct.

Baskerville also spoke of physical chemistry as though he believed its field somewhat exhausted, and that radioactivity offered the best *terra incognita* for chemical exploration.

An instance of a use for rare gases was found in neon, as a detector for Herzian waves. It fluoresces so wonderfully that the nodes and loops of the waves can be followed. Further hope for these rare gases was found in their commercial use in electric bulbs. It might be found, that in quantity, under long exposure, these gases would unite with the metals of the filaments and a new series of compounds be opened up.

Doctor Baskerville exhibited specimens of titanium glass and zirconium glass (cf. *ENG. AND MINING JOURN.*, p. 790, April 20, 1912) and an X-ray tube in which a window of Be-Li-B glass had been let in, replacing the usual Ca-K-Si combination, greatly "softening" the transmitted rays. The possibilities of such replacements were discussed.

The electronic theory of valence was also spoken of, and the possibility of changing valence at will, as offering some great possibilities. For instance, pure lead does not plate on iron, but if molten lead is flowed back and forth while conducting a low-amperage, high-voltage current, it will plate on iron afterward. This was only a hint of what might be done.

In conclusion, he emphasized, rare elements are not always rare, and rarity bears no relationship to utility.

COBALT

Dr. H. T. Kalmus, of the School of Mines, Kingston, Ont., spoke on cobalt. Cobalt suffers from having cheap analogs, and when the older workers tried to figure on methods of substituting cobalt for nickel, they were trying to achieve the commercially impossible. What is needed is a differentiation of its properties from nickel.

The cobalt industry dates back at least to 1520, and an official report of 1792 speaks of 30 cobalt smelters, producing 3000 tons of smalt per annum. However, the German-Austrian district was no longer renowned for its original silver mines, nor for its cobalt, but for radium and bismuth. He thought (his personal opinion only) that Cobalt camp would follow this sequence at least to the point that it would be producing cobalt when the silver was gone.

New Caledonia succeeded Germany in the cobalt monopoly, then the Cobalt camp output forced the price from \$2.50 to 85c. per lb., and shut the older mines down. The output of this new district he estimates at about 1000 tons per annum, of which about one-third is used.

To increase the commercial importance of cobalt, the investigation of the Canadian Bureau of Mines had taken in (a) its properties; (b) electrodeposition; (c) hard alloys; (d) non-corrosive alloys; (e) cobalt steels, which had not been included in (c) and (d). Cobalt may be prepared by reduction of the oxide by carbon, aluminum, carbon monoxide, hydro-carbon gases, etc. Cobalt differs more from nickel than is ordinarily supposed. It is stronger, and by Brinnell test the hardnesses are: Ni:Co: : 65:125. Its melting point is but 32° C. higher than nickel, so references to its infusibility are not correct (Ni, 1435° C.; Co, 1467° C.).

It produces alloys of extreme hardness, especially Mo-, Cr- and W-steels with about 15% of Co. (These are not Haynes' alloys.) Cobalt has the highest tensile strength of any pure element, about 50,000 lb. per sq.in. (Is not this lower than tungsten?—EDITOR.) It is magnetic up to 1100° C. An alloy, Fe₂Co, has a remarkably high permeability in high fields. Cobalt alloys seem to form difficultly corroded roofing plates; cobalt can be plated more quickly than nickel, and it is more silvery. They have also experimented on a "cochrome" wire, in hope of finding something superior to nichrome.

Mr. Addicks suggested that cobalt plate might be more durable than nickel plate from the superior purity of the anodes. The iron with which nickel anodes are deliberately alloyed, to make them coherent, is carried over with the nickel, and the nickel plate rusts. There is not so much iron in the cobalt anode. He also pointed out that in the Katanga copper (carrying 6 to 8% Co) we might look for a cheaper supply of the metal.

Cowles pointed out that an alloy of his 33% Ni, 3½ Al, and the rest Cu gave a tensile strength of 120,000 lb. in the cast alloy, and suggested trying this alloy with cobalt.

Mr. Addicks, in introducing Dr. E. Weintraub, of the General Electric Co., spoke of boron as having an unbalanced development. There was plenty of use for the 20-mule-team kind, but little other.

Doctor Weintraub stated that boron resembles silicon, is usually amorphous, melts about 2400° C., is very hard, harder than any other artificial product except the diamond (if we grant that the diamond really has been artificially prepared), has a high vapor pressure, though not so high as silicon, and at ordinary temperatures has a specific conductivity of 6×10^{-5} . The conductivity doubles, however, for each 15° C. rise in temperature. In this it has no analog.

The conductivity varies so greatly with impurities that it is usual not to speak of boron as having "so many per cent. purity," but of boron as "being of such-and-such conductivity." The fact that as the temperature rises, boron conductors allow more current to pass, leads to an interesting development of boron cutouts in electrical work, for regulation of car-lighting systems, automobile-headlight regulators (where the lights are driven from the motor engine), and in series-system work. The greatest problem was to connect the boron with the line conductors.

R. W. Moore spoke on the present status of tungsten, but this paper was apparently largely a repetition of a

paper of P. Ruff, *Zeit. f. angew. Chem.*, p. 1889, 1912; as well as those, if we remember correctly, by Fink, Coolidge and others in the General Electric Review, Transactions Am. Chem. Soc., American Electrochem. Soc., and the Congress of Applied Chemistry. It dealt mainly with the preparation of ductile tungsten by preparing rods of tungsten powder under heavy pressure, heating these in an atmosphere of hydrogen, then drawing by alternate heating and swaging. Wires of 4 mils had been made in this way. At the last, it required 20 reductions to bring the wire down by $\frac{1}{1000}$ inch.

Mr. Addicks exhibited a beautiful crimson globe and some brownish-red glass made with selenium, and spoke of this metal as having fallen on evil days, even with its use by doctors to keep refractory patients at home by feeding them a selenium pill, thus conferring on them an elegant garlic breath. (This is, of course, the property of tellurium *par excellence*, and it only possessed by selenium to a small degree, probably only insofar as it contains tellurium.—EDITOR.) He also showed a cadmium yellow glass. Mr. Herreshoff made some remarks on the concentration of selenium in electrolytic slime, and its elimination in electrolytic refining.

Apparently there were no mourners over the lack of interest in tellurium, as this substance went unlamented.

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Argonaut Mill and Tailing Plant

BY LEWIS H. EDDY

The plan of installation of a gravity system for disposing of tailing from the stamp mill of the Argonaut mine in Amador County, Calif., contemplates the removal of the mill to a point 700 ft. distant from the present mill site and 250 ft. higher elevation. The new mill site elevation is 130 ft. higher than the collar of the shaft. The mill tailing will be drained by gravity into a large gulch on land owned by the Argonaut Mining Co., of capacity equal to the deposits of 15 to 20 years without restacking.

The present 40-stamp mill is in need of extensive repairs, so the rebuilding at the top of the hill is not so radical an undertaking as might otherwise appear. The new building will be constructed to admit an additional unit of ten stamps, which will probably be immediately installed. The present wooden headframe is old and also in need of repair necessary in any event. A new headframe 55 ft. high will be installed. Both wood and steel are being considered, and it is probable that steel will be used. The ore will be carried from the present shaft collar to the new mill by a tramway composed of double track and two cars in balance. These cars will load at a storage bin at the present headframe. There will be increased dumping ground and longer grizzlies and larger storage bins, so that it will be possible to run the tramway in one shift instead of three.

In increasing the number of stamps from 40 to 50 the stamp duty will be decreased from the present duty of 5 or 5½ tons per stamp to 4 or 4¼ tons per stamp. The present practice in the mill includes 40 to 60% inside amalgamation; but by decreasing the stamp duty the extraction may be largely improved. It is probable also that a system of regrinding the coarse quartz will be

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adopted. Of this coarse quartz about 40% will stay on an 80-mesh screen and about 14% will stay on a 40-mesh screen. Approximately 25% of the coarse quartz will pay to recrusher when the ore is running at good grade, but when running at low grade it does not pay to recrusher through finer mesh because of the large increase in slime. There is about 35 to 40% of the total that will pass 200 mesh and 25 to 30% that will go through 300 mesh, so that regrinding in finer screens will still further increase the slimes.

It is probable that the number of vanners will be increased in the new mill. Numerous tests have been made with another type of concentrator; but it appears that the vanner, which has been so universally adopted in Mother Lode practice has proved the most satisfactory. The preference for the vanner is due not to local prejudice, but to situation and conditions not generally recognized—that the table needs a higher percentage of sulphide in the ore to do equally satisfactory work; so while dealing with less than 2% sulphide in the ore, as is the case at the Argonaut, the vanner will invariably, in handling an unclassified product, get a much higher extraction than any table that has so far been tested in the Jackson district. Nor has classification been successful so far as practice and experiment have demonstrated, and experiment has been carried to a considerable extent by the Argonaut. So it will be interesting to see what the results will be at the Plymouth Consolidated when the new mill at Plymouth is in operation should classification be adopted; although the conditions of practice there may be modified by recrushing, in which case classification should be successful.

Having found inside amalgamation at the Argonaut so necessary to extraction, R. S. Rainsford, general manager, is inclined to stay with the old practice and merely to supplement it by regrinding. The concentrate runs as low as 1½%, so the gold extraction is particularly important; and the ore will not amalgamate without considerable churning in the batteries.

The installation of an extensive and permanent system of tailing flumes is not due solely to the court decree which requires a number of Mother Lode mines to keep the tailings out of the streams, but as well to the necessity for more ground space for present and future surface improvements, and with the view of conserving the tailing for its probable agricultural or even unrecovered mineral value. The plant will be composed of flumes constructed to carry the tailing by gravity to such points as may be desirable. No machinery will be necessary.

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Operation of Montana Mine Safety Law

A section of the Montana statutes makes it unlawful to conduct mining operations through a vertical shaft more than 300 ft. deep, unless the shaft is equipped with a safety cage with steel doors, which must be kept closed when men are being lowered or hoisted, except that, in sinking a shaft, doors need not be used. This provision was lately construed by the Montana Supreme Court, in the case of Maronen vs. Anaconda Copper Mining Co., 136 *Pacific Reporter* 968, in which plaintiff sued for death of a miner who fell from a cage while being hoisted. The court holds that the fact that the law above mentioned prescribes a penalty for violation of its require-

ment does not avoid civil liability on the part of a mine operator for injury or death of a miner resulting from nonobservance of the statute; and that inconvenience in conforming to the requirement that cage doors be kept closed is no excuse for failure to do so. It is, also, decided, however, that the law does not prevent a mining company from imposing the duty of closing the doors upon an employee who has other duties, and, hence, it appearing that it was the duty of the deceased miner to close the doors of the cage himself, there can be no recovery against the company on account of his death, which resulted from his failure to perform that duty.

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Nechi Mines (Colombia) Ltd.

Following the present policy of not embarking on any commitment that would interfere with the payment of regular dividends by Oroville Dredging Co., the directors have decided to form an independent company to be called the Nechi Mines (Colombia), Ltd., to take over the 400 acres recently acquired, and thereby to provide the necessary working capital for the equipment of the San Francisco property, across the Nechi River from the Pato mine. The proposed new company will be formed with a capital of £140,000 divided into 140,000 preference shares of 10s. each and 140,000 ordinary shares of 10s. each. The preference shares will be entitled to receive the whole of the profits of the company until the return to each shareholder of the amount paid up thereon. Thereafter they will be entitled to receive a fixed preferential non-cumulative dividend at the rate of 25% per annum. The whole of the ordinary shares, subject to deduction of the payments for securing the option will be allotted credited as fully paid to the Oroville Dredging Co., in part payment of the purchase consideration, the balance of £20,000 being payable in cash. The circular issued by the secretary of Oroville Dredging Co., Ltd., makes the following comment on the commercial possibilities of the new company:

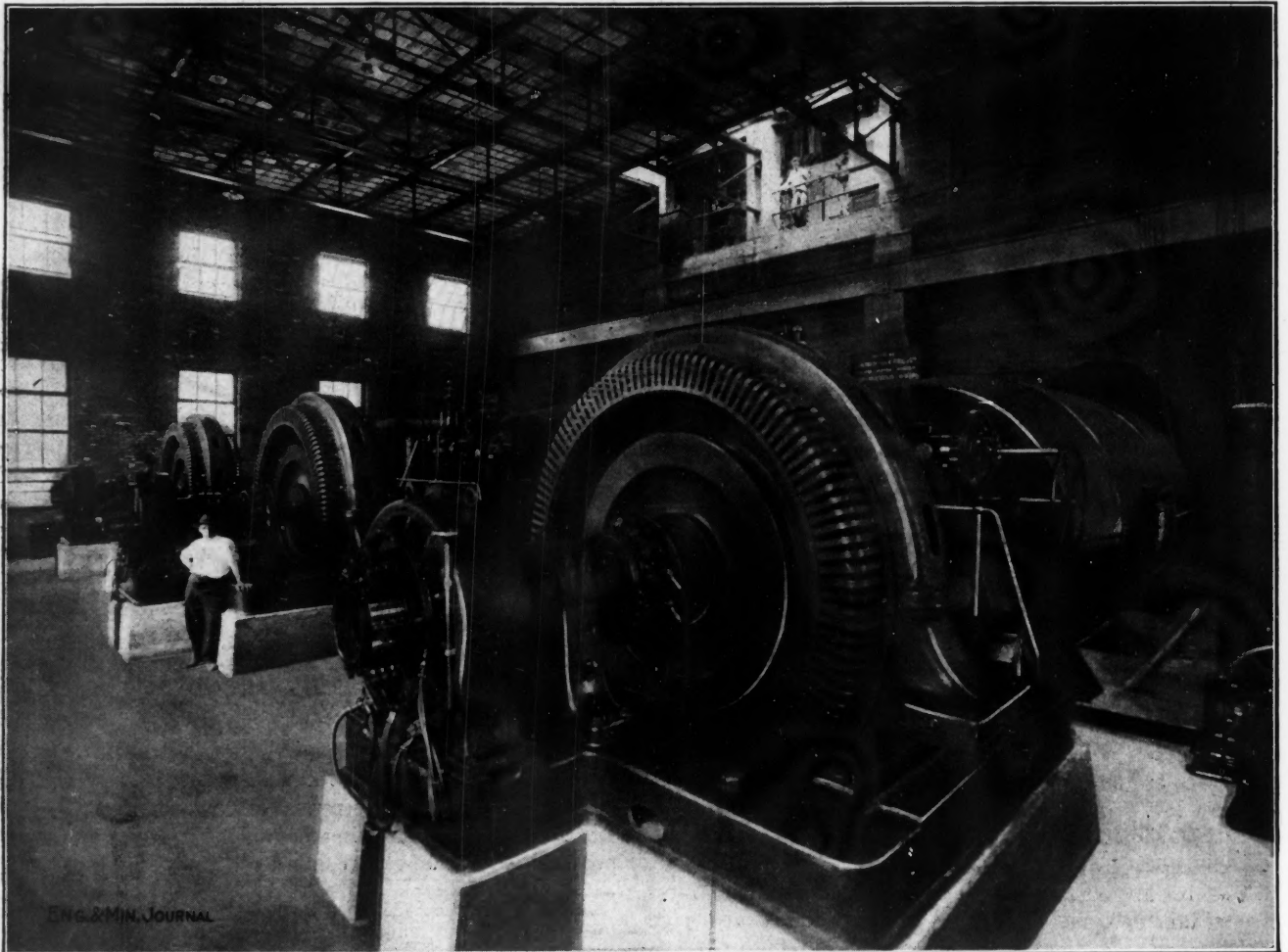
An estimate has been received by the directors indicating that a 9-ft. close-connected bucket dredge of the latest design and construction, can be purchased and erected on the property for approximately £36,000. Calculations based upon the handling of only 20,000 cu.yd. of gravel per week, of an estimated value of 70c. per cu.yd., and allowing 10c. for operating costs, indicate that the new company should be in a position to make earnings at the rate of £120,000 per annum. The above rate of profits would cover the dividend on the preference shares nearly seven times over, while the life of the 90 acres already proved calculated on dredging at the rate of 20,000 cu.yd. per week will be approximately eight years, even if no pay gravel is discovered outside this limit on the remaining 310 acres. Under the scheme as foreshadowed in this circular, allowing 11 months for the construction and erection of the dredge, each subscriber for preference shares should receive in dividends a return of his capital within two years' time, and thereafter an additional 25% per annum during the life of the mine.

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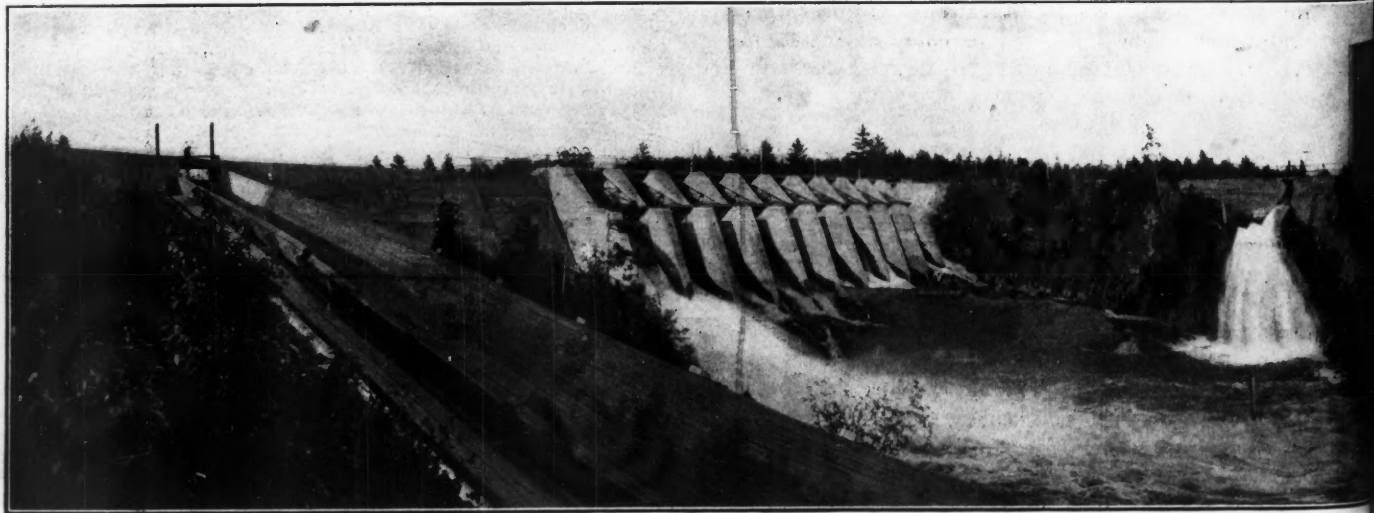
Copeton Diamond Field, Australia

Operations at the Copeton diamond mines are showing a renewed activity, according to the *Australian Mining Standard*, Dec. 4, 1913. An advance has been made in the price paid for local gems and returns are augmented by the sale of tin oxide inclusions. These New South Wales stones are similar to those from Brazil in their physical characteristics, and are stated to be largely sold as coming from there.

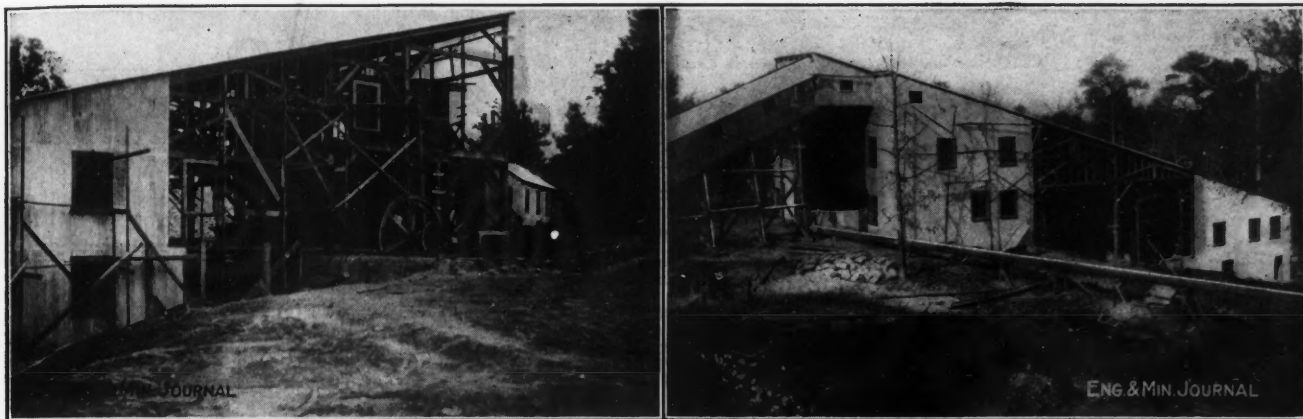
Photographs from the Field



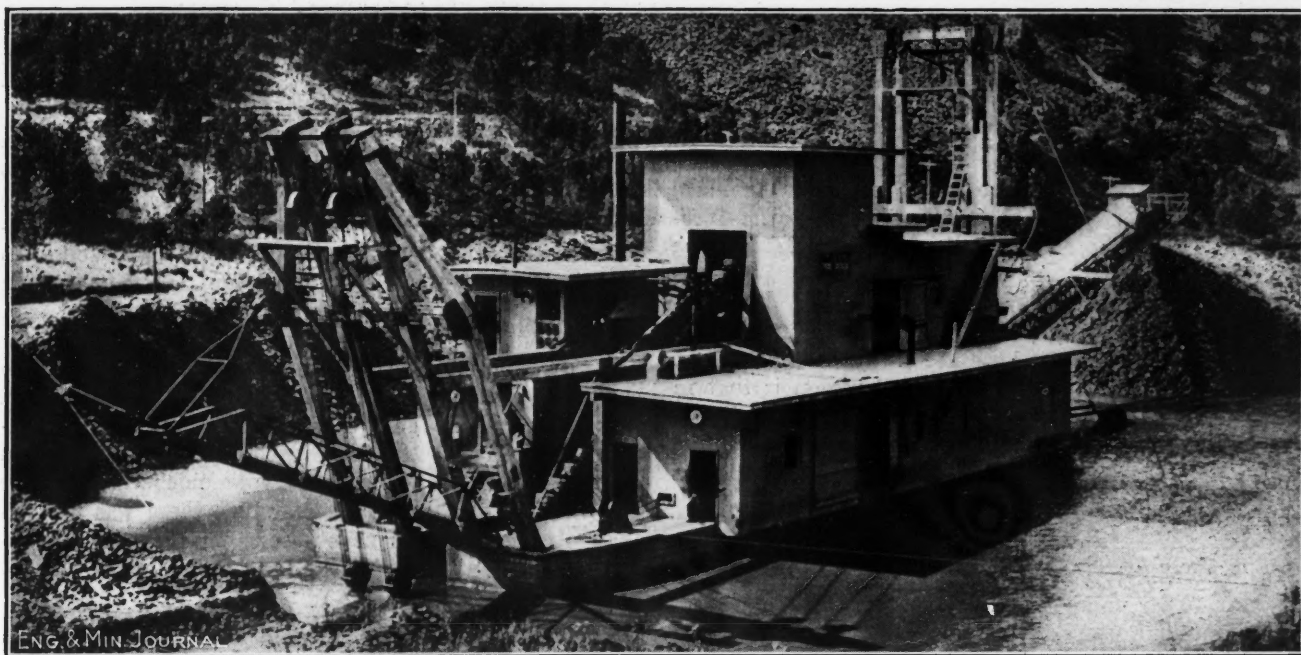
TURBINES AND GENERATORS OF PENINSULAR POWER CO., AT TWIN FALLS, MICH.



HYDRO-ELECTRIC POWER PLANT OF THE PENINSULAR POWER CO., AT TWIN FALLS
Leffels turbines drive five 1250-hp. generators, furnishing power to iron mines at Florence, Wis., and Iron River, Mich.



NEW 50-TON MILL OF UWARRA MINING CO., AT CANDOR, N. C.
 Hendryx agitators can be seen at uninclosed portion of mill in the view at the right.



GOLD DREDGE AT MYSTIC IN THE BLACK HILLS OF SOUTH DAKOTA
 This dredge was built in 1911 and was operated until the latter part of 1913.



ON THE MENOMINEE RIVER, MICH., HAVING A DRAINAGE AREA OF 1790 SQUARE MILES
 This coming season power will be supplied to some mines in the Mastodon field. Current is transmitted at 66,000 volts.

Placer Salting in Santo Domingo

BY J. W. LEDOUX*

SYNOPSIS—An account of extensive salting operations conducted in connection with placer-deposit explorations in Santo Domingo. The practice seems to have been a common one, performed with great dexterity.



At frequent intervals during the past 10 or more years there have been brought to the United States propositions for the investment in mines at Santo Domingo. The most lurid prospectuses and statements have been presented, representing that fabulous wealth exists principally in the shape of gold quartz veins and placer deposits. These placer deposits have been generally represented to exist in the red soils of the plains, or highlands, between the rivers at the foothills of the mountain ranges.

Many people of means have been induced to invest in leases and concessions and several mining engineers of experience have been sent down to make investigations and verify the claims of the promoters. In nearly all cases the engineers have come back with more or less favorable reports, and findings averaging \$10 to \$20 per yd. have been reported for territory covering thousands of acres. The accounts of these deposits have not always referred to the same locality, but the most advertised region is that in the vicinity and within 20 to 50 miles of the city of Santo Domingo, covering the mountainous region at the head waters of the Nigua, Jaina, Isabella and Ozama Rivers.

PHYSICAL CONDITIONS

In this vicinity the rock formations for a distance inland of 10 or more miles, from the sea, consist of coral limestone, and beyond this, metamorphic and igneous rock, such as diorites, syenites, basalts, andesites, trachytes, porphyries and tufa, locally called "nigger-heads," the ledge formations being generally overlaid with red soil, principally clay and gravel. The rivers are steep and torrential, sometimes being almost dry and at other times impassable for weeks continuously. The river beds generally consist of gravel and boulders, occasionally widening out into large deposits, which would form excellent placer dredging ground if sufficient gold were encountered.

Nearly all the soil in this vicinity is gold bearing and the small streams (locally known as "arroyos") frequently contain gold in sufficient quantities to pay the natives, who wash it in a small way with bateas, sometimes earning as much as 40 or 50c. per day.

There are no roads in this vicinity, simply mountain trails, and no mining operation on any considerable scale has as yet been started, but there exist stories of fabulous wealth in gold extracted by the Spaniards several hundred years ago, and there are many evidences of their old workings, especially on the highlands, but reliable tests have been made at and in the vicinity of these workings, none of which have shown commercial

values to exist. The fact that during all this time no one has had the faith or enterprise to install sufficient plant to mine on a large scale is pretty fair evidence that nothing of material value has as yet been discovered.

THE EPISODE OF A. O. BROWN & Co.

I was informed of a large stock flotation scheme, known as the "A. O. Brown" episode, some years ago, when the most gigantic deception was practiced by a Santo Domingo resident on many American investors, and the fraud was afterwards discovered.

Another story that is current states that this same resident of Santo Domingo sent a sample of red soil to a firm in the United States with an inquiry as to its suitability for paint. This firm had its chemist analyze the soil, and he reported that it contained considerable gold. The firm then wrote to the person in Santo Domingo for a larger sample and inquired whether he had much of this same kind of soil. A second large sample was sent and tested in the same way and found to contain even more gold than the first. The firm then started negotiations with the Santo Domingo party, which resulted in an option or agreement to purchase for a large sum of money and the payment down of a large sum. It then started operations and soon discovered that there was no gold of any account where the material came from. It then sued the party for fraud in the Dominican Courts and was nonsuited on the ground that he did not pretend that there was gold in the soil, and that his negotiations were carried on entirely on account of the possible prospective paint value.

PHILADELPHIA MEN BECOME INTERESTED

About a year ago this Santo Domingo party and several associates interested some Philadelphia people in property located along the Jaina River, and these people sent a reputable mining engineer down to examine the property. The engineer on account of his general knowledge of the country and previous experience in similar formations, prior to making the examination, was extremely skeptical of any values, and so advised his principals. Nevertheless, he made the investigation and found that several of the streams emptying into the Jaina River contained gold, for there were many natives, especially women, who made a business of panning gold on these streams. His investigations showed that the river bed was narrow and steep for miles and suddenly widened out into a large deposit of gravel, which would afford excellent ground for dredging, providing it contained gold, and as it was below the mouths of these gold-bearing streams, he thought it was worth a trial. He, therefore, obtained a drill capable of testing the ground, and when he commenced work had only 15 days to make the test, when it was necessary to make a considerable payment for the concession. He sank some half-dozen holes, as well distributed as possible, to test the gravel and found values averaging over 50c. per cu.yd. for an average depth of about 30 ft., and on these findings took

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the chance of wiring his people to make the first payment. Soon after he started other drillings to test this gravel deposit completely, and eventually sank some one hundred holes, 500 to 1000 ft. apart. The average values amounted to over 30c. per yd. During this operation it was found necessary to purchase other concessions on account of conflicting claims and so as to secure entire right to the use of the river. The payments necessary to be made on these concessions covered a period of over a year, and in all, these people paid a good deal of money for the properties and a good deal of money in tests and borings.

In order to make doubly sure of the values before installing the dredge, corroborative tests were made with test pits and independent drillings. This revealed the fact that the findings of the original tests were erroneous, and finally, one of the workmen confessed that the native foreman on the work, the women panners and others had persistently salted the samples from the beginning, the final outcome being a total loss of a large amount of money.

THE BUENA VENTURA CONCESSION

The man notorious in the paint episode induced some Philadelphia parties to investigate a concession known as the "Buena Ventura," which adjoins the Jaina River, and told them the values would average at least \$2 per yd. for thousands of acres. One of these men happened to have some 15 years' prospecting experience in South America, Nicaragua and the western part of the United States, and was familiar with sluicing, panning and all operations connected with placer gold. He was engaged to make the investigation in June, 1913. During his first week on the property he was very favorably impressed, as he obtained values averaging some \$10 or more per cu.yd. Then he did some drilling and digging independently, when the natives were not around, and was surprised to find that he got no values. After this he tested some of the original drillings and found no values, and after two or three weeks' work was convinced that his original work had been salted in every case. This he reported to his people in the United States, and as the alleged owner of the concession was in Philadelphia at the time, he was asked to pay all the money back to these men that they had spent. On his refusal, he was arrested and the case was brought before the Grand Jury, and before letting it go too far he settled the case by paying the people what they demanded.

MR. LEDOUX GOES TO SANTO DOMINGO

In the latter part of July, 1913, some Philadelphia people, who formed a corporation known as the "Jaina Mining & Improvement Co.," employed me to go to Santo Domingo and investigate a concession known as the "Pedro Bran," which adjoins the Buena Ventura and is alleged to be owned by the same party. He had leased to this company the portion of this concession adjoining the Jaina River on the basis of 25% royalty and a payment down of \$4000. One of the members of this company had previously been to Santo Domingo in January, 1913, and was thoroughly acquainted with the owner of the concession and had made numerous borings and tests and found extremely high values amounting to an average of \$30 per cu.yd. or more. He had later reported this to his son, a man of over 40, who being

skeptical, went down with his father to corroborate the tests of the former. The second tests, made some time in May, were even more favorable than the first ones.

I went down in August in company with both of these men and another young man, a son of one of the members of the new company. During the first four days auger borings were made near the places which had been previously tested by this man and his son. The highest value was \$43.20 per cu.yd., and the average of the first 10 holes, which covered a distance of about three miles, was over \$12 per cubic yard.

I then continued the investigation alone with native employees and sank some 80 holes covering a territory four miles long and two miles wide—the average values being over \$11 per cubic yard.

On account of a revolution being started at this time and some other positive reasons, which cannot be stated here, it was necessary to wind up the work before the investigation was satisfactorily completed, and for this reason I spent the last two days in making borings and panning the material without the aid of anyone. Although I had up to this time heard none of the stories above outlined, I was extremely suspicious of the results, and these suspicions were confirmed when I failed to find any gold in my own pannings.

MR. LEDOUX BECOMES SUSPICIOUS

I then went to the United States and made a complete report of the matter and also stated my suspicions, and recommended that I be sent down again with one or more reliable men. My suggestions were adopted by the company. I therefore took one reliable man and went down thoroughly prepared to test the ground by means of an improved "Long Tom" apparatus, which required a hose stream and the use of rakes to disintegrate the clay and concentrate the gravel, which was constantly passed through a sluice containing riffles.

Two pumps were sent down, one to work by hand, requiring four men; the other to work by gasoline. The gasoline pump had a capacity of 125 gal. per min. against 25 ft. head and the other was a diaphragm pressure pump good for 75 gal. per min. under any pressure up to 50 lb. It was decided to make the preliminary tests by the hand pump.

In one of the original tests there were seven auger holes drilled to an average depth of about six feet and covering a space of about 50 ft. in length. The values were over \$20 per cu.yd. The reason why so many shallow holes were sunk here was because rock or boulders were encountered, and an attempt was being made to sink a deep hole.

To verify these findings, a trench 3 ft. wide, 6 ft. deep, covering the entire ground where the holes were dug, was excavated, and the material was hauled by means of an ox cart to the "Long Tom" apparatus, which was located on a small stream some half a mile distant. Not a color of gold was found. In order to be certain that the apparatus was not losing gold, a given amount of fine lead filings was mixed with the material, and in every case, it was recovered in the pan.

SUSPICIONS VERIFIED

We then sank test pits around other holes and panned average samples of the material, and in this way re-

tested 13 more of the original holes, which contained the highest values. These were scattered over an area of three miles long and two miles wide. Not a particle of gold was found in any one of them, and the pans in the majority of cases contained from four to 12 particles of lead, purposely placed there to verify the panning, which was in all cases recovered.

I then went to Santo Domingo and confronted the owner of the concession with the statement that his employees had previously salted nearly all the holes and advised him to pay back to the Philadelphia company all the money it had cost them. This man denied having anything to do with any salting operation and stated that while he was willing to pay all the money back, he was not financially able to do so.

I then took the matter up with the American Minister and gave him a complete report of the facts.

THE PEDRO BRAN CONCESSION

During my first visit in August, in looking over the documents and papers concerning the concession I found that this man had, both as individual and as president of the Barrero Mining Co., which was alleged to be the assignee owner of the Pedro Bran concession, made a lease to some Philadelphia parties of this same property. The lease provided that substantial machinery capable of handling a thousand yards per day should be installed as soon as possible, and that preliminary work must be begun prior to Sept. 13, 1913.

Therefore, the lease to the Jaina Mining & Improvement Co. and the money paid on account of same was a fraudulent transaction while this previous lease was in existence. One of the parties to the lease came to Santo Domingo and began preliminary work about Sept. 3, 1913, and while it was claimed that he got on the wrong property, he and his men swore differently. During their operation, however, five of the employees died suddenly with what was alleged to be fever, but it was afterwards rumored around the city that they had been poisoned. While fever does exist at times among the natives, the fact of so many people dying suddenly within a couple of weeks in the same locality was remarkable.

The alleged owner of the Pedro Bran concession, the Buena Ventura concession, and the President of the Barrero Mining Co. was Ely Dorsey, a man who was supposed to come originally from Virginia and who has been living in Santo Domingo for many years. He was also the owner or part owner of nearly all the other concessions in this neighborhood. Intimately associated with him is one Pardo, the Santo Domingo agent of the Clyde Line, and I am informed that the following parties are more or less interested in the concessions known as the Ozama, Cuallo, Jaina and Santa Rosa: Ely Dorsey, Pardo, Gonzales, Vincento Francischini, Rodriguez, Leonti Vasquez and others. I only know of my personal knowledge that my own samples were salted by employees of Ely Dorsey.

After making this investigation I spent two weeks in making further investigations in other concessions on the head waters of the Jaina River, and while some gold was discovered in the streams and even in the Jaina River itself, suggesting the possibility of commercial value, I am of the firm opinion that there are no *known* paying deposits existing in that territory, and that if anything is hereafter worked it will be as the result of some new discovery.

The purpose of this recital is to warn prospective investors from undertakings of this character. They would be a good deal safer in playing a three-card monte or shell game against an expert swindler.

HOW THE SALTING WAS DONE

It might be interesting to state the probable manner in which this salting was done. From the best of my judgment due to inspection and statements made by some of the Dominicans, the natives engaged in the work carried in their pockets small pellets of clay, prepared fresh each day, and about the size of homeopathic pills. Each one of these contained a few particles of gold. At convenient times these were secreted between the fingers and released among the dirt which was to be panned. The women who did the panning, and who also performed their part in the salting when necessary, carried the particles of gold in the pocket which contained their smoking pipe, and as they were incessant smokers and always smoked before panning, took out a few particles of gold with their pipe and readily dropped it into the pan without discovery. As this operation has been going on for a great many years, there is no doubt that they are as skillful and dexterous as a magician or sleight-of-hand performer. A man who is not informed in advance of all these possibilities has very little chance of discovering the salting.

Another reason why even an engineer is likely to be misled is that the material in all cases contains the quartz gravel and abundant black sand, which is characteristic and a universal accompaniment of gold-bearing placer deposits. It is quite likely that this gravelly clay material contains disseminated through it more or less gold, say to the extent of probably much less than 0.1c. per cu. yd. During a heavy rainfall the small stream which drains a square mile or so of area acts as a sluice and collects whatever gold might be washed from the watershed, but the chances of finding gold in any given place on the watershed by boring would be extremely remote.

The Spaniards in olden times may have obtained considerable gold on this island, but it is not difficult to see how this could be, because they made slaves of the natives and required thousands of them to work practically without wages, pan the gold in the small streams and deliver it to their masters. An average of only 25c. per day for each panner would yield a substantial annual sum.

Mining engineers would generally scout my opinion concerning the existence of gold in the clay formations. I believe that these clay formations were alluvial and originally formed the bottoms of swiftly flowing rivers, which drained from the mountains containing granitic rocks. In the normal flow of these rivers, highly charged with sediment, feldspathic clay would be deposited, but in an unusually heavy freshet, gravel, stones and boulders would be carried down the rivers, and with these occasionally fine particles of gold originally existing in meager quantities in the gold-bearing quartz stringers in the mountains. Finally the rivers would recede due to erosion and leave the highland clay, which was subsequently washed in rills by heavy rainfalls and formed small streams. These streams would then naturally contain the more or less fine particles of gold, which would be concentrated in their bottoms as in a sluice.

Editorials

The Copper Statistics for January

The copper statistics for January were a great surprise. Previous estimates by the wise ranged from an increase of 10,000,000 to 20,000,000 lb. in the stock. Nobody prophesied a decrease. As it turned out, there was a decrease of about 4,000,000 lb. The explanation of this was small production and enormous exports.

The reporting of a rather small production of refined copper, was no cause for surprise. We had previously, in reviewing the statistics for 1913, pointed out that we might in the coming months see some relatively small productions of refined copper in view of the facts that the production of the smelters had been running rather light, while the refiners had apparently used up about all their surplus supply of crude copper.

The large exports were a natural sequence of the large foreign sales that were made in the latter part of December and during nearly all of January. Nobody supposes that all of this copper is going immediately into consumption, but the fact that Europe has been willing to take it indicates confidence in the situation over there, and belief that the supplies will soon be distributed.

In the United States the opposite condition has continued to exist. Nobody here has been willing to stock up and purchases by domestic manufacturers have been chiefly of hand-to-mouth character. In December manufacturers lived chiefly on their previously accumulated supply. By January they had apparently eaten pretty well into that and were obliged to take more copper from the refiners. When the wave of renewed confidence strikes them, we shall probably witness some interesting developments in the statistics.

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The Salted Placers of Santo Domingo

For many years there have been stories of fabulously rich gold placers in Santo Domingo and repeatedly have American engineers and companies become interested in them, only to discover that they had been salted.

One of the spectacular cases was that which happened to the stock-exchange house of A. O. Brown & Co. several years ago. That firm finding that it had been deceived and salted made restitution to its friends that it had led into the venture, and having thus crippled its resources afterward failed, with the satisfaction, however, that in so far as it was concerned, it had acted honorably.

Last year there was a revival of Santo Domingo gold mining interest, especially in Philadelphia. At that time we sounded a warning. However, two Philadelphia groups sent engineers to the island, J. W. Ledoux going for one and H. F. Lefevre for the other. They went to two different properties, dealing with different principals.

Mr. Lefevre recently returned from Santo Domingo and authorized us to say in his name that after extensive

examinations he was satisfied that no commercial deposits of gold existed in Santo Domingo. Mr. Ledoux relates his experience in a communication published elsewhere in this issue of the JOURNAL.

Both Mr. Lefevre and Mr. Ledoux were salted. Mr. Ledoux tells how it was done. Mr. Lefevre's story of how it was done in his case, as he has related it to us, is similar.

Another well known engineer, T. H. France, went to Santo Domingo in 1913 and reported that the properties he examined were no good. Mr. France took his own samples, without assistance, and escaped salting.

Mr. Ledoux, who is the chief engineer of the American Pipe & Construction Co., and is well vouched for to us, writes us that it is his purpose to give as much publicity as possible to this affair. From our information respecting the case of A. O. Brown & Co., of intermediate events, and of the recent cases, which corroborates Mr. Ledoux, it is our opinion that it is high time for publicity.

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The Electric Mine-Hoist

Recent announcements are to the effect that American manufacturers have been entrusted with the design and construction of one electric mine-hoist, the most powerful in the Western Hemisphere, and another the most powerful in the world.

The hoist motor of the larger equipment, which was ordered for the Crown Mines on the Rand, is rated at 4000 hp. continuous delivery, but it is able to deliver 7000 hp. every other minute. It has a total weight of about 140 tons, and is divided into two duplicate units, one at each end of a drum, the largest diameter of which is 20 ft. 8 in. The motor speed is such that for a part of every trip the load of eight tons of ore will travel at the rate of about 39 miles per hr. Now the heaviest steam locomotive in use to-day of about 250 tons, can develop about 2000 hp. temporarily and 1000 to 1500 hp. continuously. The schedule or time-table speed of long-distance express trains in the United States is highest on the Eastern railroads; 39 miles per hour is better than the actual performance of nearly all of them. Looking at it from another point of view, this speed corresponds to approximately 34 knots per hour, of which (barring racing motor-boats) only the swiftest torpedo-boat destroyers are capable, and then for short periods only. The quantity of ore brought to the surface every hour by this hoist will be about 450 tons from a depth of 3500 feet.

The smaller outfit was ordered by the North Butte Mining Co. for its Granite Mountain mine, and includes a motor with a peak capacity of 4500 hp. The maximum rate at which the ore will be hoisted out of the shaft is about 30 miles per hr. The ore will be brought to the surface at about the speed of a local railway train, or, stated differently, just as fast as the Mauretania and Lusitania with their 70,000-hp. engines can steam in

good weather. The hourly capacity will be 300 tons from the 2000-ft. level or 200 tons from the 4000-ft. level.

Thanks to the knowledge and perseverance of an American, H. Ward Leonard, each of these hoists can be started, stopped, or reversed by one man in a few seconds by simply moving a light controller handle. With this invention the necessity for cumbersome, inefficient and expensive controlling apparatus ceased to exist. The essence of the idea consists in furnishing a generator for each motor and effecting the control by varying the field strength of the generator. With this system of control, there are possible safety devices which were either entirely impossible with steam, compressed air or other driving power, or else were complicated and unreliable.

A further advantage, which, however, applies to the electric hoist in general, is the ease with which accurate measurements of energy consumption may be secured. The power bill for an electric hoist is made up with the minimum of computation and the maximum of accuracy.

While both the North Butte and the Crown Mines equipments employ the Leonard method of speed control, they differ in the way in which power is supplied to the generator, each being the representative of a popular type. The Crown Mines hoist motor is fed by a motor-generator set of large size but of standard design, consisting of a 5000-hp. induction motor and two 1650-kw. generators; the whole equipment probably obtains on a busy hoist a maximum overall efficiency, but every variation of load on the hoist motor is transmitted through the motor-generator set to the supply circuit (the peaks being even increased by the losses in the set), so that an extremely unsteady demand on the line results. This arouses the criticism and opposition of the managers of all but the largest power companies and we may not expect any general adoption of these outfits until the number of transmission systems of high capacity in the mining districts has increased.

To meet the objection to a load with high peaks and low valleys, Mr. Leonard suggested connecting a flywheel to the motor-generator set. This expedient found favor in the eyes of a European manufacturer, Mr. Ilgner, from whom, on account of his early championship of the idea, it has taken its name. Such an equipment draws a much more steady current from the line, so that the criticism concerning fluctuating load no longer applies. An Ilgner set is not suitable, however, for a hoist the duty of which consists largely of standing service, because the light-load losses make the operating cost too high.

At least three other expedients with the same end in view, namely, the smoothing out of the variations of the load, are in use. They are: Replacing the flywheel by a generator and a storage battery with the necessary accessories to charge and discharge the battery at the proper times; driving several hoist generators, or one hoist generator and one supplying power for other purposes, from one motor; and operating hoists and other machinery, such as air compressors, from the same motor. The success of the second and third methods requires that the heavy loads on all the machines shall not occur at the same time.

For a great many mines, whether it be on account of the probable life of the property, size of the equipment, favorable power rate, or what not, the first cost of a Leonard equipment is not warranted, and in such places

the hoist driven by a variable-speed motor connected directly to the line is rendering excellent service. The establishment on a commercial basis of the manufacture of high-speed, highly efficient helical gearing has increased the adaptability of motors to this class of installations. Generally the motor is of the induction type with polar wound rotor, although alternating-current commutator-type hoist motors are about to emerge from the experimental stage. Another recent development, eliminating the variable-speed motor, is the combination of a constant-speed, continuously running motor and a hoist with slipping clutches. On account of its simplicity this type seems promising.

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Copper Wire Drawing

We all remember, who have followed the art, that over a decade ago, the Dumoulin process was to revolutionize wire drawing. Copper was to be deposited on a rotating mandrel as cathode, on which was a spiral ridge. The copper would then lie on this cathode just as a small copper wire would appear when wound around a machine screw. From this mandrel a rod would be unwound, which could then be sent to the die-machines. The Dumoulin process was to cut out the cost of wire-bar casting and rod rolling and pickling at once.

Unfortunately, the theories have not yet worked out successfully. The rods made in this way developed too many spots of zero tensile strength when drawn into wire, probably owing to float slime and air-borne dirt, and the wires broke continually. So although we still have hope of seeing some blister copper go directly into wire, as shown by our article on p. 377, this time has not yet come, and the old-fashioned drawing still holds sway.

The electrometallurgist who sees the cost of this process is apt to be contemptuous. The cost of this purely mechanical process is almost equal to that of electrolytic refining. When, however, one sees the care taken at each point of the process; the capital tied up in machinery; the power necessary; and the amount of mill scale, short ends, etc., going back to the wire-bar furnaces, he is driven to the conclusion that perhaps if the electrometallurgist had to conduct the wire-drawers mill, copper wire would not be so cheap as it is now.

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Molybdenum in Cyanide Solutions

Apart from the interest which the cyanide operator must feel in any careful investigation of the effects of any uncommon element on the cyanide process, J. E. Clennell's paper points a moral worth while, which is, not to be too quick on the trigger in discovering new elements. This error Mr. Clennell did not fall into, but that others do so, even in these days of advanced qualitative analysis, can be appreciated when we remember that in the last few years we have suffered from "carolinium," "amaryllium," "canadium," and a new unnamed candidate from Australia, which, it is our remembrance, turned out to be osmiridium, not to mention a number of new gases. We also remember hearing of the startling discovery of a laboratory worker who was electrolyzing silver nitrate to produce fine silver, and who was

much excited for a few days over a new element present which gave a black deposit on the anode (manganese and lead being known to be absent). One of the omnipresent iconoclasts, however, insisted on igniting the black residue, which forthwith turned out to be silver peroxide. This is all said to emphasize that it will pay to exhaust the list of already catalogued elements before announcing a new one.

BY THE WAY

The announcement by a life-insurance president that widows have lost most of the \$77,000,000 traced by the Post Office to investment frauds, says the *Evening Post*, relieves college faculties of an old and unpleasant imputation.

Modern organic chemistry has a language of its own. The following is an example from a recent article: "The dianhydride of 1.8.4.5-naphthalenetetracarboxylic acid was heated for three hours at 170° C. with four times its weight of the diethyl-ester of malonic acid, together with twice its weight of zinc chloride, whereby 5.10-diketo-3.8-dihydroxypyrene was formed, which on distillation with zinc dust gave pyrene, recognized by its characteristic picrate, m. pt. 223° C."

The number of negro laborers employed by the companies in the Witwatersrand Native Labor Association at the end of December was: Gold mines, 150,012; coal mines, 9516; diamond mines, 11,811; total, 171,339. This is a large army to be concentrated in a comparatively narrow limit, and it is no wonder that the companies take pains to keep their laborers in the separate compounds, and to prevent any general communication or concerted action. It must be remembered that most of these negro laborers are of the Kafir and Masai races, both formerly active and warlike peoples.

We reproduce a letter recently received by one of our correspondents, in which the original spelling and capitalization are followed exactly:

Dear Sir I am inclosing you Postage stamps Which i trust you Will send me a sample of Pitchblend Ore That Caryes Radium for analysis, as i am satisfied i have Discovered a Cheap Process for Extracting Radium it is a matter of getting the quantity i evidently have discovered that in my opinion the Experts Does not save the Radium in these Tests.

Yours Truly
M. E.

Accompanying this was a business card that stated:

NOTICE

I charge \$15 per day, including expenses, which expense must be paid in advance. Draft will be attached to report rendered on property or mine examined and sampled, which includes four assays a day while employed. General analysis of ore is \$25 extra. All reports guaranteed to the best of my knowledge, and everything strictly confidential concerning reports.

A correspondent of the *JOURNAL* once commented on the superior ability of the man on the job, such as the superintendent, to solve his local problems, as against that of the comparative stranger, such as the consulting engineer. A little case in support of this view comes to our attention. To a certain mine rather noted for the excellent way in which it has been handled, came representa-

tives of the owner, and after investigations told the management that it could just as well hoist more ore, 650 skips per day instead of 600. The management said it could, but wouldn't, since the increased speed necessary was not safe, and so resigned. The new men took charge and hoisted 667 skips the very first day, 670 the second, and on the third, during the night shift, pulled one of the skips off the track, through into the next skip compartment, and clear into the cage compartment. The resulting damage closed down the mine for several days, which adversely affected the average. Something to be said for the men on the job!

The following extracts from the diary of a mining engineer in Mexico, and the subjoined comments as to general conditions, are so typical that to describe the conditions in many other districts would require only a substitution of names:

Jan. 1—First mail comes in since Dec. 11. Dynamite shortage in camp; Pack roads through San Juan and Tenango held by the Zapatistas, with no serious effort to dislodge them. Troops seem to have orders to make a show of resistance to Zapatistas, but not to either hurt them, nor follow them up.

Jan. 18—Escort of Coahuila Carbineers comes in via Tenango and Ixtapan de la Sal, with several foreigners, and a shipment of dynamite brought by the manager of some mines here. They had a skirmish on the road near Ixtapan.

Jan. 22—Carbineers went out via Arcos, and San Juan.

Feb. 3—Zapatistas in small groups around Taxco.

Mar. 2—News from private sources of the uprising in Mexico and Madero's death.

Mar. 17—Both San Juan and Ixtapan roads open, but dangerous, due to small bands of bandits and Zapatistas.

Apr. 6—Zapatistas in Ixtapan in force; robbed a foreigner and demand ransom for a packtrain of ore.

Apr. 8—Mail came in, sent by private citizen from Toluca. San Juan road open.

Apr. 13—News that the garrison in Taxco has revolted; demand for the surrender of Zacualpan from Zapatistas in Ixtapan.

Apr. 19—Zapatistas near Chontalpan mine, southeast of town three miles. Troops came in via Ixtapan.

Apr. 25—Troops went out to Nostepec and beat the Zapatistas, returning to town.

May 9—Romulo Figueroa with about 1200 men attacked Zacualpan, which was defended by about 100 soldiers with four machine guns, and volunteers of the town.

May 10—A hundred rurales arrive from Sultepec, and the Figueroa forces retire.

The actual time lost from mine operations in 1913 due to Zapatista attacks was 1½ days. Mine forces have had to be cut down frequently because of lack of dynamite; the monopoly does not keep us supplied with dynamite, and frequently we are asked to pay as high as \$25 to \$30 per box of 40% powder.

The population of Zacualpan and Sultepec is strictly for peace, and a responsible government; the miners want to work, and know that no matter who gets into power the great mass of people will have no change in condition. The only disturbances of public order that have occurred here have been due to incursions from Morelos and Guerrero.

Conditions have been far better than during 1912, and since President Huerta has had a cabinet free from the Diaz element the country has been pretty well governed, considering the tremendous handicaps suffered by the government due to northern revolution and the financial embargo carried out by the United States. The forces scattered over the country here, in Morelos and in Guerrero, seem to be out for organized looting; I have heard no political principle advanced by them as an excuse, nor any constructive program proposed by them. The Zapatistas took me prisoner for a short time once, and I tried to find what their ideals are, but could get no reasonable answer further than that the men enjoyed life a great deal more while living on what they can rob. The uprisings in this section cannot be considered to have any connection with those in the North, except that possibly Northern agitators have aided in showing the people how easy it is to lead the bandit life. So far as my knowledge goes, there has not been a single instance of mistreatment of any foreigner in either person or property by the federals in this section; there have been innumerable instances of damage done by "rebels" of various stripes.

Victimizing the Mining Companies

Time was when the ordinary layman was the "come-on" in mining swindles but variations have been introduced in that game and prospectors and companies of small capital desiring to float new issues of stocks have in the last few years been receiving the attention of professional promoters, who in offering to undertake stock-selling campaigns, demand "advance fees for circularizing." On Feb. 6, however, L. B. Adams was arrested in New York on complaint of the postal authorities, who alleged fraudulent use of the mails. Among the specific instances cited was the mailing of letters to P. W. Braniff, secretary of the Coöperative Mining and Development Co., Walla Walla, Wash., and others in which Adams represented that as a security broker he was conducting a campaign to make a market for issues of new securities; that he had a force of sales agents in New England states and had a large following of investors who would be apt to purchase the securities he handled and recommended. It was further charged that Adams falsely represented that he would spend the advance fees demanded for his services, running from \$87 to \$600, in "circularizing" investors, and that, in addition, he would bear one-third of the expense of the campaign of exploitation and sale of stocks and bonds in newly formed corporations.

Our contemporary, *Engineering News*, has received the following letter, which we are reprinting in the interests of our readers.

I desire to call your attention to the arrest of one L. B. Adams, of No. 1 Broadway, New York, on Feb. 6, 1914, charged with using the mails for fraudulent purposes. Adams is a subscriber to your journal and it has been his practice to peruse your columns for the purpose of securing the names of mining and milling companies recently incorporated, or established concerns which are in need of additional capital to extend their business.

Adams immediately gets in touch with such concerns, sending them a blank calling for information as to the capitalization, officers, nature of their business, etc. If the company in question fills out and returns this blank to Adams, he replies with a stock form letter, stating that after such an investigation as he has been able to make he has satisfied himself as to the merits of the concern; represents that he has an organization capable of handling the sale of unlisted securities; that he maintains a sales force and that he has ample facilities for the sale of such securities and recommends that in order to place the matter before the public the company in question circularize from 5000 to 20,000 of his investors, the circularization to consist of facsimile letters addressed to an individual, which usually brings forth a reply which is forwarded to this field organization for personal interviews. This circularization is priced at from \$200 to \$1000, of which Adams states he is willing to pay one-third and pay the expenses of his agents in the field out of his own pockets. He enters into a 60-day contract for the sale of the securities on a 10% commission basis.

It is claimed by the Government that upon the receipt of this advance fee, Adams does not carry into effect the circularization which he promised to do; that he has no organization; does not maintain sales agents in the field and is not in a position to sell the securities of the company which pays him this advance fee.

We are bringing this matter to your attention for the purpose of suggesting that it be given some notice in your paper, with the view of having the attention of your readers brought to the arrest of Adams and, if not inconsistent with the ethics of your paper, that concerns which have paid Adams this advance fee for which they have received no returns, communicate with our Department for the purpose of placing the Department in possession of additional evidence against Adams.

Very respectfully,
H. B. MAYHEW,
Post Office Inspector.

Waste Allowance on Lead Ores

According to press dispatches, notices have been sent to various collectors of customs by Assistant Secretary of the Treasury Hamlin, fixing the wastage allowances on lead-bearing ores smelted and refined in bonded warehouses, according to the customs regulations now in effect. For the Balbach Smelting & Refining Co., Newark, N. J., the Treasury permits a smelting loss on imported lead-bearing ores of 6.45% and a refining loss on foreign lead bullion of 2.07%. For the American Smelting & Refining Co. at its Perth Amboy, N. J., plant the smelting loss is fixed at 20% and the refining loss at 2.32%; at its South Chicago, Ill., plant the refining loss is fixed at 1.59%. For the El Paso Smelting Works, El Paso, Tex., the smelting loss of 18.56% is continued.

Leasing System for Alaska Coal

A bill supposed to embrace the administration's policy for opening and developing Alaska coal lands was introduced in the House by Representative Ferris, of Oklahoma, chairman of the House Public Lands Committee. A leasing system is the principal feature proposed in the bill, which provides for receipt by the government of a royalty of 2c. per ton, plus an acreage charge to each lessee. This acreage charge for the first year is fixed at 25c. per acre, for the next four years at 50c. per acre, and thereafter at \$1 per acre.

Reservation to the government of 5120 acres of the Bering River fields and 7680 acres of the Matanuska fields is provided, and mining of the coal on these tracts is reserved under the President's direction for use in government works—for the navy and in constructing the proposed federal railroad.

Temiscaming @ Hudson Bay

The annual report of the Temiscaming & Hudson Bay Mining Co., Cobalt, Can., for year ended Aug. 31, 1913, shows that the operating company, the Hudson Bay Mines, made a profit of \$132,977.80 during the year and paid \$192,003 in dividends. The production was as follows:

	Hard Ore	Concentrates	Total
Dry weight, tons.....	94.60	648.19	742.79
Total silver, oz.....	199,586.81	460,385.38	659,972.19
Total gross value.....	\$127,950.49	\$277,253.90	\$405,204.39
Net smelter value.....	\$121,405.23	\$250,494.73	\$371,899.96
Per cent. of total.....	32.64	67.36	100

The total cost of production was nearly 18c. per oz. of silver, of which freight and smelting deductions amounted to about 5.25c. per oz. The total cost of mining was \$3.55, which includes development, stoping, tramming, pumping, hoisting and depreciation on mine plants and machinery. Development work was made up of:

Drifts,	173.8 ft. @ \$12.74 per ft.
Crosscut,	269.8 ft. @ 9.72 per ft.
Adit from surface,	35.2 ft. @ 15.83 per ft.
Raising,	41.1 ft. @ 12.56 per ft.
Sinking winze,	121.4 ft. @ 30.39 per ft.

A table of data on concentration shows that 22,437 tons of ore were concentrated; 22,285 tons crushed by stamps or 3.47 tons per stamp per 24 hours; the ratio of concentration was 35 to 1. The cost of milling was \$2.04 per ton.

PERSONALS

George S. Pelton is at the Hotel Astor, New York.

P. K. Lucke will be in Burma making oil examinations until April.

G. Miltenberger has taken charge of the Empire Zinc Co. operations at Pinos Altos.

E. S. Wiard, of Denver, Colo., is designing a mill for the Vindicator mine at Cripple Creek.

Ralph S. Rainsford, general manager of the Argonaut Mining Co., of Jackson, Calif., has been visiting in New York.

Lester W. Strauss, of Lima, Peru, is in Chile on professional work. His Chilean address is Casilla 1174, Valparaiso.

Lloyd William Stephenson, of the U. S. Geological Survey, will be acting professor of paleontology at the University of California.

H. W. Hardinge has left New York for six weeks' tour of the West, visiting practically all of the mining centers before he returns.

Prof. E. B. Durham, of the department of mining in the University of California, will conduct a course in petroleum mining and chemistry.

Ralph W. Deacon, superintendent of the British American Nickel Copper Co., sailed from New York Jan. 31 for a three months' business trip in Europe.

Leslie H. Webb, secretary of the Wedge Mechanical Furnace Co., of Philadelphia, returned, Feb. 8, from a 10 weeks' trip in England, Germany, France and Sweden.

Harry Nelson has resigned as superintendent of the Golden Cycle mine in the Cripple Creek district in Colorado. Jasper Robertson, formerly assistant superintendent, has been promoted to the vacancy.

Frederic Keffer, of Greenwood, B. C., engineer and geologist for the British Columbia Copper Co., has been on a visit to family connections in Cleveland, Ohio, whence he went to New York before returning to British Columbia.

Hugh L. Cooper has completed the water-power development of the Mississippi River Power Co. at Keokuk, Iowa, and has opened offices at 101 Park Avenue New York, where he will engage in the practice of general hydraulic engineering.

Dr. F. H. Hatch, one of the vice-presidents of the Institution of Mining and Metallurgy, has accepted the position of consulting engineer of the Kirkland Lake Exploration Co., in Ontario and will shortly arrive in Canada on a tour of inspection.

A. J. O'Malley, assistant mine foreman at the Henry shaft of the Lehigh Valley Coal Co., retired last month when the mine was finally closed. He had worked there continuously as miner and mine foreman since the shaft was opened in 1861—over 52 years.

Arthur E. Eaton, formerly with the exposition department of the Los Angeles Chamber of Commerce has been appointed assistant in the department of mines and metallurgy of the Panama-Pacific Exposition. He is collecting a mineral exhibit in southern California.

Victor F. J. Tlach, managing director Darwin & Milner, Ltd., Sheffield, England, is in this country for a stay of several weeks. Mr. Tlach is especially interested in cobalt high-speed steels, his company being licensed to manufacture that product under the Becker German patents.

Cecil Pocock, for the past five years in Peru, was married in Lima, Peru, Feb. 3, to Miss Gwen Sutton-Flack, of London, England. Mr. Pocock and bride have left for a six months' trip in the United States and Europe. His permanent address is 892 Avenue C, Bayonne, New Jersey.

H. C. Hoover will arrive from San Francisco on Mar. 4 and will sail for London on Mar. 11. During his stay in New York the presentation of the medal of the Mining and Metallurgical Society to him and Mrs. Hoover will be made, probably at a dinner on Mar. 9. The plans for this will be announced later.

William Fleet Robertson, provincial mineralogist for British Columbia, has been appointed provincial assayer as well, the latter office having been vacant ever since the resignation of Herbert Carmichael, who retired at the end of 1912, after having been 20 years in the service of the Provincial Government. D. E. Whittaker remains assistant assayer.

Prof. William M. Davis, of Harvard University, has been lecturing before the colleges of Colorado on geological subjects. The evening of Feb. 3 he spoke at the Colorado School of Mines on "The History of the Front Range." The following forenoon, he spoke on "Theories of Coral Reefs." He has also lectured before the geology students of the University of Boulder.

Dr. Richard Moldenke, Watchung, N. J., has resigned his position as Secretary of the American Foundrymen's Association. This resignation marks the close of a long period of able and indefatigable labor for the advancement of foundry practice in the United States. From a very modest beginning, the American Foundrymen's Association has advanced to a position in the front rank of the societies which in the past 20 years have done so much to put the manufacture of iron and steel on a strictly scientific basis. Dr. Moldenke has given his time and energy without limit to the association and his name will always be inseparably connected with the advancement of foundry practice in America. Although he retires from active service he will continue to assist the new secretary in the editing of the "Proceedings" and some other work.

OBITUARY

John M. Wilson died at El Paso, Tex., Feb. 3, aged 78 years. He was well known as a mine operator and manager for the Hearst interests in Mexico.

Prof. Calvin M. Woodward, professor emeritus and formerly dean of the engineering schools of Washington University, St. Louis, died in that city, Jan. 12, aged 76 years. He was known for many years as an engineer and educator of high reputation.

SOCIETIES

Mining & Metallurgical Society—This society will have a dinner in New York on Mar. 9, at which the presentation of its medal to Mr. and Mrs. Hoover will be made. Ladies will be invited and members may bring guests. The price of the tickets will be \$5 per person, wine extra. The precise time and place will be announced as soon as possible. The society has extended to the members of the American Institute of Mining Engineers the invitation to participate in this dinner and function upon the same terms as members of the society. All persons desiring to attend are requested to apply for tickets to E. G. Spilsbury, 45 Broadway, New York, as early as possible.

American Institute of Mining Engineers—The Executive Committee of the New York Section has arranged for the annual meeting, and announces the following brief program: Monday, 7 p.m.—registration and distribution of badges. 8:15 p.m.—address of welcome followed by smoker and collation. Ladies invited.

Tuesday, Wednesday, Thursday—Annual meeting and technical sessions. Arrangements will be made for luncheon each day in the Engineering Societies Building.

Admission tickets were required for the following evenings: Tuesday, 8:15 p.m.—illustrated lecture by H. W. DuBois on "Placer Mining in British Columbia," at the American Museum of Natural History, 77th Street and Central Park West. Inspection of large-scale models of the Copper Queen mine and stope, the gift of Dr. James Douglas to the Museum. These have been constructed along entirely new lines for such exhibits. This will be followed by a collation. Wednesday, 6:15 p.m.—Reception and subscription banquet at the Waldorf-Astoria. Tickets, \$5 per plate.

The technical program includes general sessions morning and evening on Tuesday. On Wednesday there will be two simultaneous sessions in the morning and afternoon, at one of which papers on Iron and Steel will be presented, at the other papers on Mining Law. At a short general session in the afternoon an illustrated paper on "Mining of Bituminous Coal" will be presented. Thursday, morning and afternoon, separate sessions will be held on Mining Geology and on Petroleum and Gas; closing with an illustrated address on "Oil and Gas Sands." A large number of papers are announced for this meeting.

American Institute of Mining Engineers—On Jan. 31, about 40 members of the Institute met at the Hotel Sterling, Wilkes-Barre, Penn., for the purpose of discussing plans for the formation of a local section in the Pennsylvania anthracite region. President Rand; Prof. Joseph W. Richards, of the

Board of Directors; Dr. H. M. Chance, Chairman of the Committee on Coal & Coke, and Secretary Stoughton, were among the guests present. R. V. Norris acted as master of ceremonies, and arrangements were all made in advance by a committee under the leadership of Charles Enzian, to whom an enthusiastic vote of thanks was accorded at the dinner. An address was made by President Rand, followed by Prof. Richards, who outlined the procedure necessary for the formation of a local section. Addresses were then made by W. J. Richards, F. W. Chase, C. F. Huber, R. J. Foster, F. A. Hill, H. M. Chance, Bradley Stoughton, and others, after which a rising vote was taken, and it was unanimously decided to petition the board of directors for the establishment of the Pennsylvania Anthracite Local Station. More than the required number of members then signed the petition, and President Rand announced the appointment of a committee to organize the section and arrange for a meeting in accordance with their by-laws, consisting of R. V. Norris, W. J. Richards, R. J. Foster, Edwin Ludlow, C. F. Huber, Charles Enzian, Douglas Bunting, F. A. Hill, and J. M. Humphrey.

Canadian National Clay Products Association—The annual convention was held at the King Edward Hotel, Toronto, Jan. 28-30. The chair was occupied by President Charles A. Millar, of Toronto. Controller J. O. McCarthy extended a welcome to the gathering on behalf of the city. In his opening address the president predicted a period of great building activity and stated that a number of brick plants, which had closed down last year, would be reopened. The election of officers resulted as follows: President, Charles A. Millar, Toronto; first vice-president, J. Stevens, Portage la Prairie, Man.; second vice-president, J. S. McConnell, Milton, Ont.; third vice-president J. E. Frid, Hamilton, Ont.; secretary-treasurer John R. Walsh, Toronto. A large number of technical papers were read, including the following: "Types and Construction of Kiln Furnaces," by John F. Wilde, Calgary, Alta.; "Formation and Different Kinds of Clay," Prof. A. P. Coleman, Toronto; "Lame Ducks in the Clay Products Business," by Joseph Keele, Canadian Geological Survey; "Ceramic Schools and Their Value," by Prof. Edward Orton, Jr., Columbus, Ohio; "The Course of Ceramics to be Started in Toronto Technical School," by Dr. McKay, Toronto, and "Tile," by Prof. Day, of Guelph, Ont. The annual banquet was held on the evening of Jan. 29, the principal speeches being made by Theo. Randall, secretary of the National Brick Manufacturers' Association of the U. S., and M. E. Gregory.

INDUSTRIAL NEWS

The American Bridge Co. has received the contract for the steel work of the new smelting plant of the International Smelting & Refining Co., at Miami, Ariz.

The A. S. Cameron Steam Pump Works is now offering a complete line of single-stage, double-suction volute, and single-suction multistage turbine pumps for mine service.

E. J. de Sabla resigned from the presidency of the General Petroleum Co. at San Francisco on Jan. 26 and was succeeded by Captain John Barneson. Victor Etienne Jr. succeeded to the position of vice-president.

Negotiations are in progress for the formation of a corporation to take over the Northern California Power Company Consolidated and the Oro Electric Corporation. The consolidation of these companies contemplates only electric lighting and power industries and will not include the California gold dredging interests of the Oro Electric Corporation. The Northern California has more power than it can dispose of and the Oro Electric is obliged to purchase power from other companies.

TRADE CATALOGS

Standard Spiral Pipe Works, Chicago, Ill. Catalog No. 4. Standard reinforced spiral pipe. 36 pp. Illus., 4x9 inches.

Ruggles-Cole Engineering Co., Hudson Terminal, New York. Catalog No. 14. Dryers. 48 pp. Illustrated, 6x9 inches.

Fred M. Prescott Pump Co., Milwaukee, Wis. Bulletin P-106. Duty test of duplex Missabe water-works power pump. 4 pp. Illus., 6x9 inches.

Harrison Safety Boiler Works, Philadelphia, Penn. Engineering Leaflet No. 16. Cochran hot-water meters and metering heaters. 48 pp. Illustrated, 6x9 inches.

NEW PATENTS

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

ALUMINUM SOLDER, Flux for. Hugo Hammar, Delhi, N. Y. (U. S. No. 1,083,828; Jan. 6, 1914.)

LADLE for Molten Metal. Samuel T. Wellman, Cleveland, Ohio. (U. S. No. 1,084,912; Jan. 20, 1914.)

OPEN-HEARTH FURNACE PORTS, Improvements in. D. Carnegie, London, Eng. (Brit. No. 6851 of 1913.)

SLIME ROASTING, Apparatus for. Rowland T. Wales, Chrome, N. J. (U. S. No. 1,085,831; Feb. 3, 1914.)

SLUICE BOX. John C. Wilson and John E. Quick, Coquille, Ore. (U. S. No. 1,085,516; Jan. 27, 1914.)

REFINING—Furnace for Refining Metals. Edwin Cooper Wills, Frederick, Md. (U. S. No. 1,084,991; Jan. 20, 1914.)

ALUMINUM—Process for Obtaining Aluminum. Parker C. McIlhenny, Great Neck, N. Y. (U. S. No. 1,083,691; Jan. 6, 1914.)

CONCENTRATOR—Ore Concentrator. Clarence I. Glassbrook, Salt Lake City, Utah. (U. S. No. 1,083,531; Jan. 6, 1914.)

SEPARATORS—Improvements in Magnetic Separators. H. J. H. Nathorst, Malmberget, Sweden. (Brit. No. 12,368 of 1913.)

BROMINE—Process for the Recovery of Bromine. Arthur E. Schaefer, Saginaw, Mich. (U. S. No. 1,085,944; Feb. 3, 1914.)

SILVER ORES, Metallurgical Treatment of. Oscar Dyckerhoff, Karlsruhe, Germany. (U. S. No. 1,085,675; Feb. 3, 1914.)

LEACHING—Process of Electrolytic Production of Copper. Noak Victor Hybinette, Christiania, Norway. (U. S. No. 1,084,150; Jan. 13, 1914.)

CRUSHING—Lining for Ball or Pebble Mills. Hans A. Hansen and Joseph M. Schmueser, Smuggler, Colo. (U. S. No. 1,083,400; Jan. 6, 1914.)

DRILL—Hammer Drill. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,084,270; Jan. 13, 1914.)

PHOSPHORIC ACID—Process of Manufacturing Phosphoric Acid. Fernand Brunschwig, Brooklyn, N. Y. (U. S. No. 1,083,429; Jan. 6, 1914.)

ALLOYS—A Method for the Separation of Elements in Alloys and Other Chemical Substances. A. L. Fletcher, Dublin, Ireland. (Brit. No. 29,537 of 1912.)

THORIUM—Production of Metallic Thorium. William C. Arsem, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,085,098; Jan. 27, 1914.)

COPPER REFINING—Metallurgical Furnace. Lawrence Addicks, Perth Amboy, and Clarence L. Brower, Chrome, N. J. (U. S. No. 1,083,719; Jan. 6, 1914.)

CYANOGEN COMPOUNDS—Synthetic Production of Cyanogen Compounds and the Like. John E. Bucher, Coventry, R. I. (U. S. No. 1,082,845; Dec. 30, 1913.)

TUNNEL FURNACES, Car-Feeding Device for. Alfred H. Cowles, Seward, N. J., assignor to The Electric Smelting & Aluminum Co. (U. S. No. 1,086,278; Feb. 3, 1914.)

ELECTRIC FURNACE—Improvements in and Relating to the Reduction of Zinc Ores in the Electric Furnace. W. McA. Johnson, Hartford, Conn. (Brit. No. 27,881 of 1912.)

STEEL, Containing Titanium. Auguste J. Rossi, Niagara Falls, N. Y., assignor to The Titanium Alloy Manufacturers' Co., New York, N. Y. (U. S. No. 1,085,488; Jan. 27, 1914.)

SMELTER FUMES—Apparatus for Arresting Smelter Fumes and Recovering Their Values. Charles S. Vadner, Salt Lake City, Utah. (U. S. No. 1,085,712; Feb. 3, 1914.)

CARBON—Apparatus for Graphitizing Carbon. P. L. T. Heroult, New York, N. Y., assignor to Electrode Co. of America, Niagara Falls, N. Y. (U. S. No. 1,084,274; Jan. 13, 1914.)

LEACHING—Apparatus for Extracting Metals from their Ores. Henry S. MacKay, Riverside, Calif., assignor to MacKay Copper Process Co., Riverside, Calif. (U. S. No. 1,084,351; Jan. 13, 1914.)

STEEL HARDENING—Method of Treating Steel. Auguste J. Rossi, Niagara Falls, N. Y., assignor to The Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,084,036; Jan. 13, 1914.)

GALVANIZING—Apparatus for Galvanizing or Otherwise Coating Metallic Sheets with Metal. David Jones, Castell Grenig and Henry Folland, Brondeg, Gianamman, Waies. (U. S. No. 1,085,495; Jan. 6, 1914.)

FLOTATION PROCESS—Apparatus for Ore Concentration. Walter Broadbridge and Allen Crawford Howard, London, England, assignors to Minerals Separation Ltd., London, England. (U. S. No. 1,084,196; Jan. 13, 1914.)

DRILLS—Dust Remover for Rock Drills. Vilhelm Philip Kessel, San Francisco, Calif., assignor, by mesne assignments, to said Vilhelm Philip Kessel and A. Jorgensen, San Francisco, Calif. (U. S. No. 1,084,152; Jan. 10, 1914.)

BLAST-FURNACE GASES, Gas Burner for. Hermann Keibel, Mülheim-on-the-Ruhr, Germany, assignor to the Firm of Deutsch-Luxemburgische Bergwerks- und Hütten-Aktiengesellschaft, Mülheim-on-the-Ruhr, Germany. (U. S. No. 1,083,496; Jan. 6, 1914.)

BRIQUETTING—Apparatus for Preparing Pulverulent Materials for Molding or Briquetting. Ellsworth B. A. Zwayer, Hoboken, and Roland A. Zwayer, Perth Amboy, N. J., assignors to The Zwayer Fuel Co., New York, N. Y. (U. S. No. 1,084,819; and 1,084,820; Jan. 20, 1914.)

Editorial Correspondence

SAN FRANCISCO—Feb. 4

Outlook for California Type of Dredge construction in 1914 is encouraging, though there are no new contracts announced for new installations in the United States. The Yuba Construction Co. has contracts for reconstruction of two dredges in the Hammonton field in Yuba County and one in the Snelling district in Merced County, Yuba No. 5, which was sunk last summer, and Yuba No. 3 will be rebuilt. Both were put in commission in 1905 and both have wooden hulls. The new construction will be all steel. The hull is conceded to be the more economical, provided the life of the field will warrant the extra cost. The Yuba Basin fields are approximately good for 15 years' more dredging. The contract for the reconstruction of Yosemite dredge in Merced County calls for a wooden hull. The Yuba dredges to be rebuilt are each $7\frac{1}{2}$ cu.ft. bucket capacity. The Yosemite dredge is $3\frac{1}{2}$ cu.ft. bucket capacity. Work on these reconstructions will begin in the first half of the year. It is probable that other reconstructions will be contracted early in the year.

Mining Laws of California and the Federal Statutes on location and entry have been issued in standard form by the California State Mining Bureau. Besides the mining act, which recreated the mining bureau, the book includes three of the operative laws passed by the legislature of 1913, and in an appendix two of the inoperative laws, but omits the workmen's compensation, insurance and safety act, which vitally affects the mining industry. The omission is doubtless due to the length of the compensation act and to the further fact that this act is issued by the Industrial Accident Commission. However, the omission of the inoperative laws and the inclusion of the compensation act would have rendered greater service to the mining industry. At any rate the mining-bureau publication would have added to its value had it contained reference to the compensation act and stated where it may be obtained, or what is better, the mining bureau might be provided with a supply of this publication for distribution. Mining men look to the bureau for this kind of information. The inoperative laws referred to are the "blue sky" law and the water commission act, which were rendered inoperative by the referendum and are to be submitted to vote at the next general election.

Rate of Compensation Insurance demanded by the State Compensation Insurance Fund is deemed a hardship upon the mining industry and will deter many investors from undertaking the reopening of old mines and the development of new ones. Two instances of the great cost entailed by insuring with the state fund are typical. The cost of insurance of the Kennedy Mining & Milling Co. would be about \$26,000 per annum. The company employs nearly 400 men. The Kennedy will insure with the regular companies, presumably at less rate than is charged by the state. The Argonaut, a neighbor of the Kennedy, will be obliged to spend about \$12,000 per year for insurance. A report comes from Tuolumne County that resumption of operations at the New Albany mine has been interrupted and will probably be abandoned on account of the demands of the compensation act and the high rate of insurance. The money was said to be ready for reopening the mine, but was withheld pending closer scrutiny of the law and assurance that the rate of insurance would not be prohibitive. It is not unlikely that some of the larger mines in the state will resort to systematic extraction of high-grade ores, excluding the low-grade, rather than continue operation with a large force of men and full milling capacity.

DENVER—Feb. 6

Withdrawal of Carnotite Lands from location, as recently proposed, still agitates mining men of Colorado. Although this threatened withdrawal has been declared off by Government officials, prospectors are not taking any chances and they have been active lately in the western portion of this state and in eastern Utah. Grand Junction has been the chief outfitting point for prospecting parties who will not wait until the open season but are now laboring through the unusually deep snows and are laying out claims. Despite

the declaration of Frank L. Hess that all the known, desirable lands in the Paradox and other mineralized areas have been taken up, dozens of locations are being recorded in the offices of the county clerks. It is also said that there is a good demand for leases on carnotite properties. The announcements from Washington that the lands will not be withdrawn but that the purchase of the valuable mineral contents of the ores in these lands will be reserved by the Federal authorities have reassured most of the prospectors and mine owners.

Mine Drainage is a topic that is again prominently before the mining men of Colorado. There are many long adits in the state that were projected for transportation and drainage purposes, but the fact remains that few of these enterprises have proved successful from the financial standpoint of the projectors. It must also be admitted that not a few of these bores failed to open up valuable ground and hence drainage was unnecessary. Drainage tunnels in some districts have been driven by private or corporate enterprise, while in other instances they have been fostered by community interests and subscriptions. Representative of the first class are the Yak and the Argo tunnels, while the Roosevelt tunnel is a good example of the latter. Nearly every old mining district in Colorado has reached a stage in which the desire for mining at greater depth is met by the important obstacle of heavy pumping expense, and it would seem only rational that communistic ideas would prevail and that all operators would be brought together into a project that would benefit all. But many past efforts along such a line go to prove the futility, as a rule, of such projects. A project is now afoot looking to the unwatering and development of new mining ground by the completion of the old Boulder County tunnel that was years ago started at Cardinal and driven about 3000 ft. toward the town of Caribou. The tunnel will have to be continued until its total length is approximately $1\frac{1}{4}$ miles before it taps the desired area. Henry P. Lowe has secured options on several properties in this area and is engaged in financing this work. The outcome of his financing is awaited with interest as the terms of his options require him to begin operations within 90 days.

SALT LAKE CITY—Feb. 5

The New Metallurgical Research Station at the University of Utah, which is being jointly established by the United States Bureau of Mines and the state, received an impetus by the arrival of Prof. D. A. Lyon, acting chief metallurgist of the Bureau of Mines, and R. M. Keeney, also of the bureau. Professor Lyon will remain in Utah some time, organizing and supervising the work of the new station; and bringing it into coordination with the work of the bureau in Denver, San Francisco and other places, and until a permanent head has been selected. Before leaving Utah, Professor Lyon will make himself familiar with the mining and metallurgical problems requiring attention in this section.

East Tintic Consolidated Reversal made by the Assistant Secretary of the Interior, Feb. 2, in the case of the East Tintic Consolidated Mining Co., reversing a previous decision of the General Land Office which had canceled mineral entries for the Great Eastern No. 1 and thirteen other lode claims in Tintic, is of general as well as of local interest. The commissioner of the General Land Office, in March, 1911, held that two Keystone drill holes on the Great Eastern No. 6 claim were not available as common improvements for adjoining claims. An appeal was made to the Secretary of the Interior, who in September, 1911, gave a decision, evading the drill-hole question; and holding that there were no valid discoveries on any of the 14 claims, directed that the entire entry be canceled. This decision caused widespread interest and protest, as it was taken to mean that in order to obtain patent it was necessary not only to have a vein in place, but to have pay ore at the discovery. As a result, applications for patents at the Salt Lake land office fell off 75 to 80%. A rehearing was asked, and denied. When the new administration came in, an application to vacate the decision and for the exercise of supervisory power by the Secretary of the Interior was made on the ground that this was a case of extraordinary importance. This was allowed. Arguments covering the entire case were given

at Washington in November, 1913. It was contended that the Department in the East Tintic case had misconstrued the law on the subject of discovery and misapplied it to the facts of that case. It was also contended that the drill work, such as had been done on the East Tintic property, was entitled to be applied not only on the claim, but as a common improvement for all of the claims benefited. Both of these contentions were sustained, in the decision recently rendered. This means that discoveries such as exist on the claims in question are sufficient, and that it is not necessary to have ore in commercial or paying quantity. Many claims which have been withheld can now proceed to patent, without fear that discoveries such as had formerly been considered valid would be held invalid, and the claims canceled.

BUTTE—Feb. 3

In the Minerals Separation vs. Butte & Superior Case, Attorney J. Bruce Kremer has gone to San Francisco to appear before the U. S. Court of Appeals in the case won by the Minerals Separation Co. against Hyde.

The Bullwhacker Leaching Plant of 250 tons daily capacity will be in operation in a few days. The machinery is installed and finishing touches are being put on. The electrolytic-cell house contains 24 tanks of 8 tons capacity each; the electrical connections have been made. A motor generator of 3000 amperes at 75 volts also has been installed, sufficient to precipitate 4400 lb. of copper daily. Dispensing with filtration of the solution, a trouble which hindered the early experiments, and for a time threatened a handicap of a formidable proportion, is now possible.

The Mincrity Holders of the Parrot Company are preparing to take up the case against the Anaconda Copper Mining Co. in which an effort is to be made to set aside the sale of the property of the Parrot company to the Anaconda company on the ground that the sale was brought about by unfair means and that the Parrot stockholders were consequently deprived of a large amount of money. The Anaconda company purchased the Parrot property for 90,000 shares of stock after a majority of the stockholders of the company had voted in favor of the sale.

CALUMET—Feb. 7

The Congressional Committee that is to make an investigation into the Michigan copper country strike was to arrive at Hancock Feb. 7, and go into session early the following week. Conditions have been quiet for the last few weeks and the communities are getting back into the old-time peaceful trend. What is left of the strike is in the hands of the local union officials and no executive of the Western Federation of Miners is here with the exception of the general-attorney, Hilton, who arrived at Hancock yesterday. It is significant that there are a number of men who continue to hold out who are content not to work, but to subsist on the weekly allowance given by the union, and will continue to do so as long as the benefits are maintained. A fire was discovered on the eighth-level drift of the No. 3 Winona shaft during the week. This drift was walled in and no material damage was done and hoisting was not interfered with. The Winona is shipping about 300 tons of rock daily to the mill; operations being confined to No. 3 shaft, but it is likely that No. 4 shaft will be opened in the near future. Experiments are being carried on at the mill in hope of increasing the savings of the fine copper. The White Pine Copper Co. has closed a contract for the machinery for a 1000-ton mill, delivery having been arranged for so that material will be hauled in while the snow is on the ground. This property together with the Victoria are the only mines working in Ontonagon County. The Mass is operating its pumps, but the Lake, South Lake, Indiana and Algoma are flooded.

BRAINERD—Feb. 2

Recent Developments on the Cuyuna seem to confirm the statement heretofore made that the district is preeminently the "poor man's" iron range. With scarcely an exception, all deposits discovered in the last year or two have been by local stock companies or local individuals of moderate means. The Cuyuna Central Iron Co., in Sec. 27-47-29 is an example of this, as is also the Cuyuna Iron & Manganese Ore Co., in Sec. 10-46-29, adjoining the Pennington pit. The property of this company was more or less thoroughly explored by the Republic Iron & Steel Co. some years ago and dropped as of little value, but recent developments are reported to show a considerable body of ore of good grade. The Mangan Iron & Steel Co. property, adjoining the last named, is another instance. The consuming interests have, in the Cuyuna district, seemed to follow the policy of letting the "little fellow" take the exploration hazards, and then paying him his fair profit if he found merchantable

ore. This will, when these properties become productive, result in retaining locally a considerable portion of the financial returns from the district's mineral wealth. The Cuyuna is unique among the iron ranges in this respect. During the last year, activities have been largely confined to that part of the range north and west of Crosby and Ironton. A fair estimate of the ore reserve increase from this portion of the district during the last year would probably be in excess of 15,000,000 tons exclusive of the tonnage increase at the Rowe mine, which is made up largely of concentrating ore only recently classed as a merchantable product. The Thompson mine of the Inland Steel Co. also has a large deposit of such material, which consists of a mixture of ore and quartz.

ISHPEMING—Feb. 6

The Profit-Sharing Plan of the Steel Corporation, in effect now for several years, is decidedly popular with the employees of that company on the Marquette iron range. The applications for stock on the basis of the distribution announced a few weeks ago have been the largest recorded in any year since the adoption of the plan. Requests for shares have been made by 49½% of the employees. Most of the applicants already were stockholders. Some of these men, those who have been acquiring Steel securities since the date the company first granted the privilege, now receive dividends four times a year, while a considerable portion of the stock held by the employees provides for bonuses which are payable the latter part of January. A great majority of the Marquette range men holding stock have been in the employ of the company for many years, some for 25, and others for 30 to 40 years. Few of the shareholders have sold any portion of their original holdings and practically all of them have each year purchased their limit of stock.

COBALT—Feb. 7

The Recent Drop in Nipissing is believed to be preliminary to a cut in the dividend. At present, this company is paying at the rate of 30% per annum on a capitalization of \$6,000,000, the quarterly dividends being 5% and 2½% bonus. It is probable that the bonus will be dropped. The Nipissing, in common with the majority of Cobalt mines, is approaching the end of its high-grade ore reserves, although there are still large tonnages of low-grade ore available. It is understood that during the last year, the company has not developed the tonnage of high-grade ore anticipated and the statements for the last few months show that the net value of the ore mined was \$170,000. As dividend requirements call for \$150,000 and working expenses are between \$50,000 and \$60,000 per month, it is evident that unless a decided change for the better takes place, that a reduction in the dividend rate may be expected. The company is, however, in an enviable position, having a cash surplus of approximately \$900,000 and large reserves of low-grade ore in addition to a still considerable amount of high-grade ore.

SOUTH PORCUPINE—Feb. 6

Attempts to Amalgamate Pearl Lake Mines have been made during the last few months, involving the McIntyre, Porcupine Gold Mines or Vipond, Pearl Lake, Jupiter and Plenaarum. Of these mines, only the McIntyre is working and the margin of profit from operations is small. In addition to the above companies, the people interested in this deal would also like to take in the Schumacher and two properties belonging to the Timmins-McMartin-Dunlop syndicate which adjoin the Porcupine Gold Mines. The Vipond, Plenaarum and Jupiter have small tonnages of ore developed which would be difficult to work at a profit with individual mills but which might be profitable with a combined mill. The Pearl Lake shaft on the opposite side of the lake from the McIntyre could develop the Pearl Lake, Jupiter and Plenaarum. A crosscut under the lake would connect these workings with those of the McIntyre property which could develop the McIntyre, and Schumacher. Ore from the Vipond and the adjoining ground could be handled in a central mill by means of an aerial tram. It is not known yet if these negotiations are likely to succeed.

GUADALAJARA—Jan. 28

Bandits Are Being Actively Pursued in the Hostotipaquillo district following recent kidnapping of Louis Baird, assistant manager of Espada Mines Co., and a number have been killed. The surviving members of some of the bands routed have dispersed. A ransom of 3000 pesos was demanded for Baird's release, but he was later given his liberty on payment of 500 pesos. The rebel band of Julian Medina was driven out of district some time ago. There is much activity at present at El Favor, Mololoa, Casados, Espada and Cinco Minas camps.

The Mining News

ALASKA

FIFTEEN CLAIMS IN THE KAMISHAK BAY DISTRICT have been purchased by J. D. Meenach, former owner of the Ellamar mines, representing Arizona and British Columbia men. More than \$500,000 is involved. Kamishak Bay is in Cook Inlet country. In connection with purchase of mines and development of property it is planned to construct a railroad 16 miles long from workings to tidewater.

TANANA GOLD FIELDS MINING CO.—Erection of an electric plant, near properties, in Tanana gold field district, to transmit power to properties in Fairbanks district and vicinity is planned. John L. Timmins is now on Coast and if work is decided on, engineers and power experts will take up work on his return early in March.

ARIZONA

Cochise County

HERMITAGE (Hereford)—New mill, 7 miles south of Hereford, has been turned over to company after a successful test run. A large tonnage of ore is blocked out at mines, six miles from mill, in Huachuca mountains. Ores are chiefly lead-zinc but carry silver.

Gila County

INSPIRATION CONSOLIDATED (Miami)—On evening of Jan. 30, a dirt slide occurred in Geneva railroad cut, between millsite and Inspiration camp, and test mill was forced to suspend operation as ore train was unable to pass through cut. Aside from cleaning and repairing machinery, no work was done in mill from Jan. 31 to afternoon of Feb. 3. Cut has now been cleared sufficiently to allow passing of trains and all work will be resumed.

Greenlee County

TWIN PEAKS (Duncan)—Framework of new mill is in place. It is expected that plant will be in operation within two months. In meantime considerable work is being done in mine. Results of tests on a large scale have shown excellent results by cyanidation.

CHASE CREEK (Clifton)—A large compressor and power drills have been installed at these mines, a few miles from Clifton, where a long crosscut tunnel is being driven to cut several veins. First vein has been cut, showing a mineralized zone 20 ft. wide carrying considerable copper.

Maricopa County

MAMMOTH (Mesa)—A strike of high-grade gold ore is reported. Several tons have been sacked for shipment. Thirty men are employed in blocking out ore.

SUNFLOWER CINNABAR MINING CO. (Phoenix)—A large mass of crystals of chloride of mercury was recently found, and specimen will be sent to National museum at Washington.

RELIEF (Peoria)—Cyanide plant is again in operation. Underground development will probably be started at an early date. A considerable amount of good milling ore has been opened up by former development.

Mohave County

RUTH (Kingman)—A small bar of bullion was shipped recently.

WHALE (Copper Cañon)—A mill is to be built to treat copper-molybdenum ores. A compressor plant and power drills have been installed.

GOLCONDA (Oatman)—A crosscut is being driven to north from 100-ft. level, toward original find in old Ben Doran shaft. Mine is operated by California Southern Corporation.

Pinal County

DISCOVERY OF HIGH-GRADE GOLD ORE, near Ray, has caused considerable excitement. Discovery was made 5 miles northeast of town, not far from county road between mouth of Devils cañon and Haley-Souffrein claims, on summit of Mescal range. Vein is 20 ft. wide and makes a bold outcrop in schist and diabase. Attractive specimens of free-milling ore were brought into Ray and almost immediately a small stampede was on. Walter Riggins, the discoverer, has staked nine claims and has sold a third interest to J. C. Devine, superintendent, and L. C. Gates, manager of the Ray Consolidated. Work is under way on original location and adjoining group of eleven claims is also being opened up. New find has drawn a large number of prospectors into district and created quite a boom.

LONDON-ARIZONA (Winkelman)—A new headframe is being built at main shaft, which will be retimbered. When this work is finished and new hoisting equipment is in place, work on shaft will be resumed.

RAY-ARIZONA (Kelvin)—A fine body of copper ore is reported in incline shaft at depth of 190 ft. This property adjoins Kelvin-Sultana on west, and has been prospected by churn drilling during last year.

KELVIN-SULTANA (Kelvin)—No. 2 raise, which is nearly holed through, is in 3 ft. of chalcopyrite. No. 1 winze has passed out of vein into foot wall at depth of 87 ft. Work in 3-compartment shaft is progressing well, exceptionally good progress being made. A carload of sulphide ores from 300-ft. level was shipped to Hayden recently. Eastern men have taken a bond and lease on this company's property in Baboquivari districts, 60 miles south of Tucson. During 1913 regular shipments were made to Douglas, ores carrying from \$40 to \$100 in silver and gold. New owners

have outlined a six-months' plan of development work with view of erecting concentrating and cyaniding plant if ore developed warrants it.

Yavapai County

CHERRY CREEK MINING CO (Cherry Creek)—First diamond-drill hole was completed recently; depth was 900 ft. A new hole was begun at once. It is intention to prospect thoroughly.

POORMAN (Walker)—A new hoist has just been received and work of unwatering shaft will be begun at once. Sinking will begin as soon as possible and from 200-ft. level a long crosscut is to be driven to parallel vein.

ANTELOPE (Yarnell)—This and the old Yarnell mine was recently purchased by Gold Cliff company, represented by W. E. Sharp, of Philadelphia. New owners announce that exploration on a large scale will begin at once. Yarnell is one of the old mines in northern part of state, which has produced considerably though operated by crudest methods. For several years it has been tied up in litigation.

CALIFORNIA

Nevada County

KENOSHA (Grass Valley)—It is reported that the mine has been jumped.

OSCEOLA (Rough and Ready)—Mine has been reopened by E. W. Tarr under bond. The 300-ft. tunnel will be advanced and crosscuts driven to vein.

FRUITVALE (Moores Flat)—Recent rains have supplied water for power and development with machine drills has been resumed. Tunnel on vein has reached 700-ft. point at a vertical depth of 400 feet.

BLACK BEAR-METROPOLITAN (Moores Flat)—These two claims cover cross veins which are being prospected by tunnel. J. C. Lew has purchased an interest of W. S. Gregory in Black Bear and control of Metropolitan. Gregory is developing Mizpah, which adjoins.

Plumas County

ROSE QUARTZ (Quincy)—Mill was temporarily closed down at end of December, owing to freezing of water supply.

SENECA MINING & MILLING CO. (Seneca)—Apex suit by J. J. Reilly, of Reno, has been decided in U. S. District court in favor of Del Monte mine, owned by Reilly, as against White Lily, owned by company. Resumption of mining and milling operations will follow a compromise by which both parties will be able to proceed. It is reported that five stamps will be added to Dunn mill and extraction of ore continued from White Lily, apex of which was decided to be within Del Monte surface lines. White Lily has been one of the large producers of northern Plumas under management of Dunn Bros.

San Bernardino County

POTASH AND SODA DEPOSITS are reported to have been located in Ord mining district, 18 miles south of Newberry. Placer locations have been filed on 5440 acres by E. A. Rasor, of San Bernardino and others. It is reported also that potash has been discovered near Lavic, about 60 miles southeast of Barstow, where it is said deposits are at an elevation of 500 ft. above floor of desert. These claims are being developed by M. Mulcahy and others of Bakersfield.

MIERS IRON MINES (Otis)—Five hundred tons of ore have been hauled to Riverside; 1000 tons more will be hauled, and entire lot shipped by San Pedro, Los Angeles & Salt Lake R.R. to furnaces.

Shasta County

FARMERS PROTECTIVE ASSOCIATION has reorganized, electing following officers: H. T. White, president; George Baker, vice-president; W. C. Barkaloo, treasurer; Lambert E. Gibson, secretary. About 50 farmers attended election. Theodore A. Bell, of San Francisco, and Charles H. Braynard, of Redding, recently engaged as attorneys, advised with association. It is reported that another suit will be brought against Mammoth Copper Co., charging violation of terms of decree of U. S. district court regarding escape of fume from smelter, provided farmers are able to show their crops are being damaged.

MT. SHASTA (Redding)—Mine has been closed and purchase bond surrendered to owners.

ESPERANZA (Harrison Gulch)—Coal has been discovered in this gold and silver mine on 500-ft. level. It is reported that coal will be developed for local market.

BALAKLALA (Coram)—Sampling mill was destroyed by fire, Jan. 22. Loss, about \$25,000. Other portions of smelting plant were saved by company's fire crew.

MAMMOTH (Kennett)—Negotiations are said to be in progress for the taking over of copper claims prospected by Shasta Exploration Co., lying between Balaklala and Mountain Copper Co. properties.

Tuolumne County

HOPE (Sonora)—Driving of tunnel to tap old diggings has been resumed.

BLACK OAK (Sculdsbyville)—Preparations are being made for deepening 1700-ft. shaft to 1900 ft. A new electric pump will be installed.

COLUMBUS (Tuolumne)—It is reported that mine is being examined. Main shaft is 200 ft. deep and has been prospected by drifting an aggregate of 2000 feet.

HOPE—Tunnel is being driven in good ore. A raise of 115 ft. to connect with winze is contemplated. If development warrants a Huntington mill will be installed.

EAGLE-SHAWMUT (Shawmut)—The 2200-ft. tunnel that taps vein at 1800-ft. shaft is being widened to admit laying of another track. A motor car will be installed for ore hauling.

DUTCH (Jamestown)—Water resulting from interruption of development caused by recent storms has been lowered with electric pump. Drifting on 100-ft. level will begin soon. A spur track is to be built to connect with Sierra Ry.

HAZEL DELL (Columbia)—West drift from 500-ft. cross-cut tunnel is being extended from 120-ft. point. Vein is disclosed in this and 310-ft. east drift. Installation of a mill and cyanide plant is contemplated if developments warrant.

COLORADO

Chaffee County

BELLE OF GRANITE (Granite)—This old mining property that has been idle for years, lies close to line between Chaffee and Lake Counties. It has just been revived under ownership of a newly incorporated company with title, Loyal Gold Mining Co.

Clear Creek County

CENTRAL COLORADO—Development has been resumed.

PRUDENTIAL TUNNEL—Property is being cleaned up preparatory to resumption of work in main heading which will be advanced into Republican Mountain.

TENNESSEE MINING & MILLING CO.—Entire property of this company, situated in Upper Union mining district, will be sold at sheriff's sale, at Idaho Springs, Feb. 9.

LINCOLN MINING & MILLING CO.—Company has succeeded in recovering its property which was sold for taxes in 1909. Following an action before district court, tax deeds were declared void and ordered canceled.

DULUTH-EMPIRE—Financial arrangements have been made to continue development in tunnel. Company has recently made milling tests on its ore in various custom mills, to determine best method of treatment. Erection of a small mill is under consideration.

GOLDEN GLORY—Development operations which were stopped by December snow storm have been resumed. Cross-cut tunnel in Saxon Mountain is now 1635 ft. long. Heading is making water rapidly and rock has shown a decided increase in mineralization during last few feet of advance.

ANAMOSA—Lessees Hanson and Rendahl are developing a vein 16 to 20 in. wide assaying 100 oz. silver. This ore is shipped with little sorting. A streak of smelting ore 8 in. wide and assaying 300 oz. silver has been followed for 30 ft. This development is on 500-ft. level 450 ft. from portal of adit. Drift will be advanced 200 feet.

BELLEVUE-HUDSON—This property on Columbia Mountain will be developed by Southwestern Mines Corporation, of Boston. It is planned to do work through Rochester tunnel, which corresponds to ninth level. The 200-ft. shaft will be unwatered and Animosa vein will be opened by a new southwest drift. Recent development has opened several small deposits of milling ore.

ARAPAHOE MINING & MILLING CO.—This is a new corporation organized to purchase or lease mining properties in Clear Creek district. Company has secured control of Bertha mill at Idaho Springs and will improve and remodel plant with view of treating its own and custom ores. A 50-ton Denver quartz mill and automatic feeder have been purchased from Denver Quartz Mill & Crusher Co., and an Isbell concentrator has been ordered from the Denver Engineering Works Co. New company plans to have its mill in operation by Mar. 1.

Dolores County

ROGER TICHBOURNE GROUP (Rico)—Property adjoining Rico-Wellington is changing hands for a consideration said to be \$10,000. Original owner was J. W. Sirrell.

RICO-WELLINGTON (Rico)—Mountain Spring adit is being driven to reach Sheridan vein, which is expected to produce abundantly. When necessary 1000 ft. of tunnel is done, bore will be main mouth of mine.

Eagle County

BLEAK HOUSE (Gilman)—It is reported that T. B. Burbridge, of Cripple Creek, has purchased this property for \$20,000. Success Leasing & Mining Co., that has been working mine, has secured a 3-year extension and will continue as before.

Gilpin County

QUARTZ HILL (Central City)—George Bancroft, of Denver, has been examining a number of properties on this mountain in hope of discovering more mines that contain pitchblende.

Lake County

BIG FOUR (Leadville)—An examination is being made of this property for Eastern men, who are negotiating for interests in company.

LOUISVILLE (Leadville)—Shipments of silver and lead ore have recently been sent through Yak tunnel because of snow blockade of roads on surface.

SUGAR LOAF TUNNEL (Leadville)—Manager Zaitz expects to reach objective point in this bore within next month and should then open up one vein that formerly produced heavily through shafts.

MATCHLESS (Leadville)—This old mine, on Fryer Hill, is under lease to A. Stephenson, who is shipping siliceous ore regularly, and is actively engaged in promoting an unwatering scheme that will benefit all mines on hill.

LORD CLYDE (Leadville)—Machinery is in place at this old shaft and search is being made for reserves of ore that it has been understood were neglected years ago by early operators, but which are now attractive because of changed metallurgical conditions.

YAK TUNNEL (Leadville)—Mines operating through this bore are producing regularly. Lower levels of Silver Cord are producing high-grade silver ore. Vega and Diamond mines near breast of tunnel are shipping oxidized lead ores. White Cap is producing two sorts of ore, high-grade silver and zinc sulphide.

NFW DISCOVERY (Leadville)—This mine, with a name that is now deceiving, is regularly shipping from Hoffer lease. Exploitation of workings indicates that early shippers of rich silver ore must have found silver to sometimes have a gangue of zinc carbonate, for this mineral appears to have been purposely broken as ore. Present lessees are working virgin ground and with good chances for encountering more bonanza silver orebodies.

San Miguel County

WELLER (Telluride)—This new company is doing well. Two cleanups from mill have been made and both retorts have been satisfactory. Shipment of smelting concentrates will soon begin.

Summit County

COUNTRY BOY (Breckenridge)—A 400-ton lot of zinc sulphide ore was shipped to the Lanyon-Starr Smelting Co., Bartlesville, Okla., from lease of Simcoe Mining & Milling Co.

RELIANCE (Breckenridge)—Dredge of this company continues in service all winter. None of boats of other dredging companies have endeavored to operate this winter and probably will not resume until May.

STANDARD (Breckenridge)—S. B. and M. A. Wright are operating this Gibson Hill property, and are averaging four or five cars per month, during winter, of screened ore, that is shipped to Leadville for smelting. Ore carries principally silver but contains also some lead and gold. Next summer, lump ore will be shipped.

WELLINGTON (Breckenridge)—Magnetic separating mill is again in commission. As soon as market price of zinc and railroad shipping facilities improve, it is planned to resume operation in wet mill. Development continues on third, fourth and fifth levels and good bodies of ore have been blocked out. Ore shaft has been retimbered and company is apparently planning for future extensive production.

Teller County

VINDICATOR (Victor)—Annual meeting was to be held at main office of company, at Denver, Feb. 12.

GOLDEN CYCLE (Goldfield)—A new leasing system, modeled after "split-check" system, in use on Portland for last year, has just been inaugurated on levels above the tenth. Blocks are 300 ft. square by 200 ft. depth. On this system company furnishes all supplies, compressed air, hoisting, etc., while lessee furnishes labor, and mill returns are divided equally.

IDAHO

Coeur d'Alene District

CALEDONIA (Keliogg)—It is reported locally that Charles McKinnis, manager, stated in Spokane lately that mine will be operating steadily within six weeks, barring unexpected delays. Company since settlement of litigation with Bunker Hill & Sullivan, has been working a considerable force retimbering old workings, lifting raises, driving crosscuts, and preparing property for resumption of operations. As rapidly as different divisions of work were finished men were laid off until now there are but a few employed, which has given rise to rumors that mine was to be shut down again. Rehabilitation of Caledonia is completed, and there is nothing more to be done until raise connecting workings with long lower tunnel of Bunker Hill is finished and mill repaired. Work on both is being done as rapidly as possible.

TAMARACK-CUSTER (Wallace)—Plans for future development contemplate running a long lower tunnel to tap known orebodies at depth, doing away with aerial tramway now conveying ores from mine to mill. With construction of proposed tunnel a new 300-ton concentrator is to be built on Nine Mile, presumably on ground recently acquired by company, near Bunn station, which would deliver concentrates directly to Nine Mile branch of Northern Pacific. Erection of new mill will require acquisition of additional water rights. All contemplated improvements are to be done through revenue derived from sale of ore from mine. It was decided at annual meeting week before last to create and maintain a surplus fund of \$100,000 before any developments and improvements are commenced. With decision to maintain a surplus of \$100,000 and to make all of proposed developments and improvements from sale of ores from mine, payment of dividends seems remote. The surplus fund is now \$65,000. Placing some of 220,000 shares of treasury stock on market to defray expenses of improvement was not favored by majority. Operations at mine are progressing favorably and some new orebodies have been uncovered.

MICHIGAN

Iron

YOUNGS (Iron River)—It is likely that this mine will be taken over by Wickwire Steel Co., as Huron Mining Co. owner of property, has gone into bankruptcy. It was only a few weeks ago that Groveland Mining Co., which operated Groveland mine in Dickinson County, which operated bankruptcy. Two companies are controlled by same men and were promoted by G. W. Youngs, of Iron River. History of two concerns is complicated and it is not known just how present troubles will be straightened out. McDonald mine at Crystal Falls, also belongs to Huron Mining Co., but was closed several weeks ago and men employed there are still waiting for their wages, which they will probably receive.

MINNESOTA

Cuyuna Range

SHIPPING HAS CEASED at Crosby, Pennington and Thompson pits, awaiting opening of shipping season. Armour No. 2 is working full, stockpiling product, as is also Kennedy at Cuyuna.

CUYUNA-MILLE LACS (Crosby)—All-rail shipments have been temporarily discontinued and about 6000 tons has been put in stock.

ROWE (Riverton)—In his annual report to parent company, Pittsburgh Steel Co., General Manager J. C. Barr states that 100,000,000 tons averaging 56% iron, had been located.

CANADIAN-CUYUNA ORE CO. (Brainerd)—Work will start on a timber shaft within 30 days. Tonnage from this mine will be hauled by Northern Pacific Ry., which will soon begin construction of a 1½-mile spur.

CUYUNA-DULUTH (Ironton)—Now cutting a pumping station on 300 level. Mining being carried on at first level and sublevel; 16,000 tons, running 60 to 64% iron, on stockpile.

CUYUNA CENTRAL IRON CO. (Iron Mountain)—Holdings of this new company, located near recently platted townsite of Iron Mountain, have recently come into prominence, due to explorations showing up a considerable tonnage of bessemer ore, running as high as 65% iron. Company is operating a Star churn drill on one of its tracts, with avowedly good results, being only such rig in use on any of iron ranges. Company is controlled by Duluth men.

Mesabi Range

ROYALTIES DUE GREAT NORTHERN ORE TRUSTEES—While definite tonnages of iron ore removed from Great Northern lands by Steel Corporation during 1913 have not been announced, minimums amount to 5,250,000 tons at \$1.054 per ton, or a total of \$5,533,500. Agreement calls for following tonnages and royalties:

Year	Tons mined	Royalty per ton	Total amount
1907	750,000	\$0.85	\$637,500
1908	1,500,000	0.884	1,326,000
1909	2,250,000	0.918	2,065,500
1910	3,000,000	0.952	2,865,000
1911	3,750,000	0.986	3,697,500
1912	4,500,000	1.02	4,590,000
1913	5,250,000	1.054	5,533,500
1914	6,000,000	1.088	6,528,000
	27,000,000		\$27,243,000

As per notice served one year ago, leases will be dropped by Steel Corporation at end of 1914. Arthur Iron Mining Co. was organized about one year ago as a subsidiary of Great Northern interests, to operate Great Northern ore properties independently. It has been rumored from time to time that erection of a number of blast furnaces and a steel plant was contemplated at Superior, Wis., opposite Duluth, Minn. It is certain that Great Northern interests would have to exercise much diligence to dispose of 6,000,000 tons of ore annually to independent consumers, to keep up annual output of their properties. It, therefore, seems inevitable that they must, within a year or two, enter ranks of consumers.

LA RUE (Nashwauk)—Stripping has been finished for season by Butler Bros., contractors, who have shipped their equipment to Buhl.

HAWKINS (Nashwauk)—All men available are at work in mining operations, and, in addition, stripping operations are being carried forward and will continue throughout winter. One shovel is working on big filter ditch being excavated at O'Brien Lake.

MISSOURI-KANSAS-OKLAHOMA

Joplin District

ZINC ORE HAS BEEN FOUND ON UNITED ZINC CO.'S land at Carl Junction by company composed of E. L. Gorman and associates. Operations are in progress at the 110-ft. level. A mill recovery of 14% zinc has been made.

B. O. G. CO. (Granby, Mo.)—Operations resumed after two-weeks' shutdown for repairs.

GUTHRIE CO. (Carl Junction, Mo.)—New shaft is being sunk to develop lead deposit.

FRY LAND (Neck City, Mo.)—Company has obtained lease on 40 acres for drilling campaign.

GRAY CAT MINING CO. (Galena, Kan.)—A large face of zinc ore has been found in the shaft.

BLACK HAWK (Spring City, Mo.)—Drifting now is in progress. Ore is found at 120-ft. level.

NEW ENGLAND ZINC CO. (Klondike, Kan.)—Good run of zinc ore encountered on Edwards land.

PANTED & CO. (Granby, Mo.)—Rich blende is being worked at Fortune Teller mine at 110-ft. level.

TEXIMO LEASE (Neck City, Mo.)—E. M. McKay & Co. have shaft in ore. Ore trammed to Teximo mill.

HORNADAY & CO. (Central City, Mo.)—Shaft in good ore on Connor land. Small concentrator operated near mine.

McCORKLE HILL (Webb City, Mo.)—Benjamin Aylor is drilling on tract extensively. Has found ore at 225-ft. level.

CHARLES JUNIOR MINING CO. (Joplin, Mo.)—Shaft is completed to orebody, found by drilling. Three holes showed mineralized ground.

NILSON LAND (Carl Junction, Mo.)—Large pumps have been installed to drain land. Shaft just entering zinc ore deposits encountered by drill.

PICHER LEAD CO. OF JOPLIN has entered Miami, Okla., field for drilling campaign, five drill rigs now working. Company has 2000 acres under lease.

HAWKINS (Nashwauk)—All men available are at work in mining operations, and, in addition, stripping operations are being carried forward and will continue throughout winter. One shovel is working on big filter ditch being excavated at O'Brien Lake.

MONTANA

Beaverhead County

GRAPHITE WAS SHIPPED FROM DILLON Jan. 30. A carload left Dillon for Pittsburgh, Penn., that was taken from the mine belonging to Pearl I. Smith and Charles Robbins in Axe's cañon. Graphite is said to be high grade.

Deer Lodge County

VENEZUELA (Georgetown)—Suit has been filed in district court at Anaconda, against Butte-Georgetown Mining & Milling Co., by Arthur Fortier and John H. Standall, for possession of this fraction lode claim. Plaintiffs assert that company has entered a portion of their claim.

Granite County

SUNRISE (Phillipsburg)—In absence of manager, miners have threatened to go on strike to obtain certain concessions which company had under consideration. It is expected that the differences will be settled upon the return of Mr. McLure from St. Louis.

Lewis and Clark County

RICH GOLD ORE IN SCRATCH GRAVEL MINING DISTRICT, a few miles south of Helena, is being opened up. Deposits are properties of Col. Thomas Cruse and of Copper-Silver Co., operated by E. R. Parnell and associates of Helena. From Cruse mine ore is hauled regularly to railroad one mile from mine and shipping from Copper-Silver property will begin soon.

FRANKLIN—High-grade galena ore has been opened in bottom of incline shaft being sunk on this property in Scratch Gravel district, near Helena. Ore was found at an incline depth of 280 ft. and a vertical depth of 180 ft. Colonel Cruse, of Helena, is interested.

Madison County

EL ORO DREDGING CO. (Twin Bridges)—This company of Oroville, Calif., has secured option on 21,000 acres of placer ground north and south of Twin Bridges at a price of \$100 per acre and for a period of 12 months. H. F. Jackson, local representative of company, has announced that a sum of \$250,000 has been set aside for prospecting ground at once by Keystone drills and that company is making preparations for placing two large dredges, costing \$160,000 and \$200,000 on ground if results of drilling warrant it.

WHITE CHIEF COPPER CO. (Caldwell)—Development work on property of this company in Tobacco range of mountains about 18 miles south of Caldwell, nearest shipping point on Northern Pacific Ry., has recently uncovered a rich vein of galena ore in a new tunnel on White Chief claim. Vein previously exploited in upper tunnel carries copper, silver and gold; hundreds of tons of this ore are now lying on dump awaiting shipment. Lack of facilities makes it necessary that ore net at last \$25 per ton to make shipping profitable. On Iron Crown claim an inclined shaft has been sunk on a vein which at bottom is 3 ft. wide and carries gold and silver to value of \$40 per ton. It is proposed to equip this shaft with a hoisting and pumping plant for further development and to erect a small concentrator to treat copper and lead ores.

Meagher County

COPPER STATE MINING CO. (White Sulphur Springs)—A vein of ore 50 ft. wide and rich in zinc has been developed in this property which is on north fork of Smith River. Force of men now at work will soon be increased to open vein on an extensive scale.

GEORGE HURD COAL MINE (Hedgesville)—Exploration of this mine which was leased last summer by Hurd from Northern Pacific Ry. Co. proves it to be probably one of the best coal mines in central Montana. It is about nine miles east of Hedgesville, and, although it was opened about six years ago, not much work was done until within last three months, during which time more than 200 tons of coal has been taken from mine by farmers living on ground that overlies coal beds.

Silver Bow County

ELLA (Butte)—A new electric hoist is being installed at this mine which has recently been purchased by Anaconda from Reins company. Shaft is 500 ft. deep and practically free from water so that development work will be started as soon as hoist is ready for operation.

NETTIE (Butte)—At this property, in extreme western limit of Butte district and owned by Anaconda company, pumping is principal work now being done. Three pumps with a capacity of 550 gal. per min. are working against a steady flow of 250 gal. per min., and as extensive underground workings are full of water, progress is rather slow. The 150-ft. level has not yet been reached.

BUTTE CENTRAL (Butte)—On Jan. 30 Sheriff Driscoll received a copy of order of United States court in Boston, showing that Austin Pinkham has been appointed receiver for mining company and that James M. Oldstead is referee in bankruptcy. This order takes property out of the hands of sheriff and places it in custody of John E. Rothwell as representative of court in which bankruptcy proceedings were taken.

CORBIN COPPER CO. (Butte)—An extension of time of 60 days was granted to company in which to make its last payment for Gambrinus claim, in West Side residence district of Butte. Balance due on \$150,000 purchase price is \$74,200, which amount, it was hoped, could be raised by assessment ordered some time ago. Stockholders, however, have been slow in making payments so that extension of time became necessary.

PILOT-BUTTE (Butte)—Although pending litigation with Anaconda company has to some extent interfered with certain development work, shaft sinking has been steadily carried on. During January shaft was deepened 85 ft., and is now within 25 ft. of 2200 level. As soon as this is reached, a station will be cut and a crosscut driven for middle vein, which, it is expected, will be reached by Mar. 10. For sinking shaft to sump below 2200 level a separate hoist will be installed, main hoist having been used for sinking purposes heretofore.

BUTTE & SUPERIOR (Butte)—A revised smelting contract has been made with American Metal Co. by which latter is to make in future a settlement at regular intervals for silver and lead in zinc concentrates for which Butte & Superior received no returns heretofore. There will also be a reduction of freight rates due to a considerable lowering of moisture from concentrates prior to shipping. A campaign for cutting down general operating expenses has resulted in December costs being lowest ever reported. Working profits for year ended Dec. 31, 1913, are estimated to be not less than \$900,000.

TIMBER BUTTE MILLING CO. (Butte)—New mill which is to treat zinc ores from W. A. Clark's Elm Orlu mine is rapidly nearing completion and is expected to be ready for operation by May 1. In building foundations, floor supports, pillars, etc., a great amount of concrete has been used. Location of mill on northeast slope of Timber Butte provides ample dumping ground for many years to come. Being on a hill permits ore to travel by gravity through mill after it has once been elevated to top. This will be done by conveyors which take ore that has passed through large breakers, near railroad track at foot of mill, to bins at head. It will then be crushed in rolls and Hardinge mills, coarse concentrates being made on Wilfley and James tables. Fines will go to flotation plant where Minerals Separation process will be used. Concentrates will go to settling tanks, then into bins to be loaded on railroad cars for shipment. Water is brought to mill in iron pipes, two miles from Clark's Hamilton ranch wells and is then pumped 300 ft. to mill storage tanks. Electric power will be used for running all machinery. Cost of plant which will have a capacity of from 350 to 400 tons per day, was \$600,000.

NEVADA

Churchill County

NEVADA HILLS (Fairview)—Report for Dec. 1913 shows 4140 tons milled; gross value, \$42,515; loss in tailing, \$6289; net costs, \$30,825; net profits, \$5401; assets, \$186,802.

Elko County

EASTERN STAR (Golden Circle)—Development work is opening up ore of good grade.

ELKO PRINCE (Gold Circle)—It is stated that a mill will be built in near future. Development work will be done on a larger scale than heretofore. Other mines in Gold Circle District now being operated are Esmeralda, Rex and Colorado, the latter two by lessees.

Humboldt County

CASEY JONES (Rochester)—Hornsilver has been discovered by lessees.

RAVEN LEASE (Rochester)—Shipment of 30 tons, assaying \$450 in gold per ton, has been made from this property on Lincoln Hill.

CLAUSEN LEASE (Rochester)—This lease on block No. 3 of Rochester Mines Co. has cut on tunnel level, an ore-shoot 4 ft. wide assaying \$65.

RECOVERY MINES CO. (Golconda)—Vein has been cut by crosscut from shaft. Tunnel to cut vein at depth has been started. Compressor will be installed.

DOLBEAR MINING CO. (Lovelock)—Foundations for new 12-pipe retort are being built. Furnace is to be of special design, minimizing escape of mercury vapor. Road building is also being done.

GOLDBANKS QUICKSILVER MINES CO. (Goldbanks)—New 12-ton retort furnace has been completed and is being dried out preparatory to steady operation. Trestle and ore bins at mine, tram to treatment plant and buildings at mine and plant have been finished. Water is supplied through 3-mile pipe line. Operations will commence as soon as possible; bad roads, due to storms, have delayed transportation of supplies.

Mineral County

RAILROAD FROM MINA TO KEELER is running again, drifts in White Mountain Pass having been cleared.

SARRIAS (Luning)—A force of 35 men is now employed in development. Shipments will be made in the near future.

NEVADA BLACK & GOLD MARBLE CO. (Mina)—A carload of black and gold marble is now ready for shipment to San Francisco where it will be used for decorative purposes.

Nye County

PLACER OPERATIONS AT ROUND MOUNTAIN produced about \$100,000 during working season of 1913.

ASSOCIATION MILLS (Manhattan)—Moore-Clancy electro-cyanide process is being installed.

TONOPAH MERGER (Tonopah)—Shoot of good-grade ore, 8-ft. wide, has been cut on 1170-ft. level, 800 ft. from shaft.

MONARCH PITTSBURG (Tonopah)—Winze is being sunk from 1000-ft. level. Station has been cut and 35-hp. electric hoist installed.

JIM BUTLER (Tonopah)—Drifting is being done in good-grade ore on the Sixth and Seventh levels in Wandering Boy shaft and stopping on 700-ft. level of Desert Queen shaft.

TONOPAH GOLD ZONE (Gold Mountain)—Drifting in lower tunnel is being continued. Ore is being stoped in upper tunnel; first shipment, which assayed \$30, has been made.

TONOPAH-MIDWAY (Tonopah)—East and west drifts on 635-ft. level are being advanced in good-grade ore, and drifting on low-grade ore is being done on 1200-ft. level.

BUCKEYE-BELMONT (Tonopah)—Timber of No. 3 shaft is being repaired; work is completed to 150-ft. point. Stations will be cut and sumps sunk on 865- and 1000-ft. levels, and pumps will be installed to raise water from 1000-ft. level to 865-ft. level, and from there to surface. No. 5 Cameron pump will be used in shaft sinking.

MANHATTAN CONSOLIDATED (Manhattan)—Mine is being unwatered and mining will be resumed. Tests will be made on the ore by California Extraction Co., of Oakland,

and if tests are successful, that company's process will be installed for treatment of milling ore. Ore contains arsenic and antimony and cannot be treated by ordinary cyanide methods.

CARRARA MINING & MILLING LEASING SYNDICATE (Carrara)—Company has purchased three 15-ton Chilean mills belonging to old Gold Bullfrog Mining Co., and has moved one unit to Carrara and is now finishing erection of same. A 200-ton ore bin has been completed and the tracks from two leases owned on Bare Mountain have been laid from ore chute to bin. Carload shipments of ore from leases have run from \$30 to \$115 per ton in gold. Ore is free-milling calcite, and high-grade has been found on foot wall and along calcite seams. Mill ore will run from \$8 to \$10 per ton and it is intention to sweeten average with high grade and treat around a \$20 product at start. Mill is to be run by a 35-hp. gasoline engine, ore going through crushers and then to mill, the gold being caught on plates and tailing saved to be cyanided later. Present plans indicate the mill will start operations by Feb. 20. Water is obtained at Carrara, being brought down from Gold Center in a 5-in. pipe line, seven miles above. Carrara is a new town, on the Las Vegas & Tonopah R.R. and 2½ miles from the marble quarries operated by the American Carrara Marble Co.

Storey County

CONFIDENCE-CHALLENGE-IMPERIAL (Virginia City)—Severe storms have damaged power lines and work has been delayed in consequence.

COMSTOCK PUMPING ASSOCIATION (Virginia City)—Water in Consolidated Virginia winze has been lowered 7 ft. below 2700-ft. level. This level has been under water since 1886, but apparently will require few repairs. No. 2 pump will be lowered another lift and pumping continued. Consolidated Virginia winze and 2500-ft. level are being cleaned out and repaired.

Washoe County

NEVADA STATE MINE OWNERS' ASSOCIATION held meeting in Reno, Jan. 27, 1914, for election of officers. Following were elected: John G. Kirchen of Tonopah, president; Albert Burch, of Goldfield and C. B. Lakenan of Ely, vice-presidents; W. B. Alexander, of Reno, secretary and treasurer; Executive Committee, John G. Kirchen, Albert Burch, C. B. Lakenan, W. A. Bradley, Frederick Bradshaw, L. G. Campbell and W. H. Bradshaw.

NEW MEXICO

Grant County

BELL & WRIGHT (Pinos Altos)—These lessees are encountering largest gold quartz veins ever discovered in history of camp. Other workings in camp are striking rich ore.

Luna County

MAHONEY (Deming)—Property has been closed down owing to the present low price of zinc. Has been good producer.

Otero County

PLACER (Orogrande)—Operations have been suspended for short time to remodel plant.

LUCKY (Brice)—Property has been reopened by J. R. and H. D. Darrock who have purchased half interest from D. M. Gaylord; 21 men are at work constructing tram road.

Socorro County

DEADWOOD (Mogollon)—A pipe line is being laid up gulch from mill to convey drainage past open crevices in vein and lessen underground flow in mine.

EMPIRE ZINC CO. (Kelly)—Tri-Bullion mines and mill have been taken over. Considerable alterations will be made in mill and much new machinery will be installed.

PACIFIC MINES CO. (Mogollon)—Shaft is being retimbered and got in shape to sink an additional 200 ft. Drifts will be run at intervals both ways on vein. About 15 tons of ore per day are shipped to custom mill.

PRECIOUS METALS MINING CO. (Mogollon)—Oreshoot recently discovered is proving highly satisfactory. Drift has been extended into it for some 60 ft., with ore full width of opening. Winzes and raises will be driven at intervals to fully explore orebody. This is first important discovery in south part of district and effect is already noticed in activity on adjacent properties.

OREGON

Baker County

RAINBOW (Mormon Basin)—There are now 125 men employed at this mine and more are constantly being taken on as workings are being opened up. The 75-ton amalgamation and cyanide plant is in continuous operation, in fact it has not been idle since installed, over a year ago.

Curry County

BEACH MINING NEAR GOLD BEACH and at Port Orford, is being carried on upon an extensive scale. Miners report good pay with less overburden to work than for several years past. The black sands are collected in various ways, from beach sluice, which has to be moved off beach at high tide, to expensive equipment of donkey engines and scrapers or centrifugal pumps. After these concentrates are secured the coarse gold and platinum are easily taken from the sands but the larger values are in fine gold and platinum and to save which a number of experiments are being tried by the different miners.

KALAMAZOO (Gold Beach)—This is the most productive beach mine in the state. Much work is being done at the mine at this time.

Douglas County

NICKEL—A new company has been organized to take over this mine on Old Piney mountain. The new improvements include erection of a \$50,000 smelter.

Jackson County

BEAR CREEK—Forbes Co. is making arrangements to equip this property with a dredge. It has thoroughly prospected ground and finds good pay gravel.

TENNESSEE

Polk County

DUCKTOWN SULPHUR, IRON & COPPER CO. (Isabella)—A 50-ton Minerals Separation test unit is in successful operation. The main object of these large scale tests is to produce from low-grade ores a coarse concentrate high in sulphur, and low in silica. The results have been gratifying.

UTAH

Carbon County

UTAH FUEL—Improvements this year to be made by this company include construction of over 100 miners' cottages, and installation of much new equipment. More power has been provided at Sunnyside for mine, and to light and pump water for town. Castle Gate power plant is also being enlarged.

Juab County

TINTIC SHIPMENTS for week ended Jan. 30—amounting to 117 cars—were less than usual, owing to bad weather.

YANKEE (Eureka)—Work is being done on 200-, 1700- and 2000-ft. levels.

VICTORIA (Eureka)—Ore is being mined at rate of about five cars weekly, and overdraft of \$25,000 is being reduced.

LEHI TINTIC (Eureka)—Drifting is being done from lower main tunnel 350 to 375 ft. from surface, to reach Empire fissure. Limestone is slightly mineralized.

DRAGON CONSOLIDATED (Silver City)—Two veins, developed to some extent on 800 are being followed on 1000, where ore in commercial quantity is looked for.

BLACK JACK (Robinson)—Some bunches of shipping ore have been found in Star section, where work was recently taken up, though most ore in this part of mine is of milling grade.

MAY DAY (Eureka)—During January, shipments amounted to 14 cars, about equally divided between zinc and lead-silver ore. Lessees working on upper tunnel have opened a face of lead-silver ore in new ground.

IRON BLOSSOM (Silver City)—Development on 1700 is especially encouraging. Shipments are being made from new vein on 500, and same ore has been opened in a raise 60 ft. above 600. Prospecting on 1900 is being continued.

LOWER MAMMOTH (Mammoth)—A financial statement by this company shows \$10,842 to have been received during year just ended from sale of 806 tons of zinc ore; 101 tons of copper ore; and 68 tons of lead ore. With cash on hand, Jan. 1913, amounting to \$1162; an overdraft of \$2262 Dec. 31, 1913; and \$10,000 from assessments, total receipts were \$26,326. Disbursements were of like amount.

Salt Lake County

ALTA CONSOLIDATED (Alta)—A car of high-grade ore has been shipped. Tramway is again operating. Most of main snowslides have come down. Superior Gulch slide came in small bunches, doing no damage.

SOUTH HECLA (Alta)—Development is being done in three places. A crosscut from bottom of winze below level is approaching vein. Another drift reaching under old Wedge shaft shows mineralization.

CLIFF (Alta)—This company has taken a lease on City Rocks ground, and on Michigan-Utah above Cleaves tunnel. Several smaller leases were bought out. Preparations for beginning work are being made. Electric power will be used.

UTAH COPPER (Bingham)—January production is expected to be 11,000,000 lb. Up to time of heavy fall of snow an average of 23,000 tons of ore daily was handled; and later 20,000 tons. Production for 1913 was 119,000,000 lb. copper, as compared to 93,514,000 lb. for 1911, next highest year. Production for 1914 is expected to exceed previous records.

MICHIGAN-UTAH (Alta)—Twenty-five men are employed on tram and underground. Ore is being broken in workings below Cleaves tunnel. A slide on Big Cottonwood side recently took out power line of Utah Power & Light Co., which supplies mine with electric power. This is being repaired. Settlement has been received on 37 tons of ore—the last consignment—from the City Rocks section, which carried lead, silver and copper, with a little gold.

MONTANA-BINGHAM (Bingham)—Lower tunnel is now in a distance of 2550 ft., and is being driven for development and transportation of ores from Bingham Amalgamated, Starless, Keystone Extension, Congor and Fortuna, as well as Montana-Bingham, but nothing will be done toward building a mill until after properties are thoroughly developed and it is known how much milling ore can be depended upon; it will probably be two to three years before anything definite is done regarding mill. About 1,500,000 tons are now blocked out in various properties.

Summit County

PARK CITY SHIPMENTS for week ended Jan. 30 amounted to 1,897,380 pounds.

THOMPSON-QUINCY (Park City)—Ore in a drift from Harrington raise has widened from 1 to 3 ft. of first-class, with some milling.

Salt Lake County

SILVER KING CONSOLIDATED (Park City)—Development work on 1550 is furnishing ore. Ore bins are full, and about 30 tons per day are being shipped.

JOHN THE REVELATOR (Park City)—This property is five miles south of Park City near Snake Creek tunnel. A payment on purchase price has been made by Salt Lakers to J. E. Galigher, former owner.

SILVER KING COALITION (Park City)—Cement work on station on Alliance tunnel level has been completed, and machinery is being installed, to be used in operating shaft between Alliance tunnel and 1000-ft. level. It is expected that new shaft will be in commission by Feb. 15, when a considerable addition will be made to working force.

WASHINGTON

Ferry County

BEECHER—Pinne & LaCost, Orient, lessees of this mine are making preparations to ship the gold ore, some of which assays as high as \$500 per ton. Improvements are to be made.

Okanogan County

PRIZE—With addition of electric power at this mine, it is planned to operate it on a much larger scale, coming season. This property is under the control of Ellemeham Operating & Development Co. of Oroville.

Snohomish County

WAYSIDE—It is reported that an English syndicate has obtained control of this property which has been idle for four years, and that mine will be opened in near future.

Stevens County

CHEWELAH COPPER KING (Chewelah)—This company will build a 100-ton smelter. Improvement will cost over \$50,000.

UNITED COPPER (Chewelah)—Among other extensive improvements that have been made at this mine during last year is a plant with a capacity of 150 tons per day. A new tunnel is now being driven, and as soon as this is completed electric hauling equipment will be added.

CANADA

British Columbia

TWO MEN DIED IN MT. MACDONALD TUNNEL and eight men had narrow escapes from death, Jan. 28, from poisoned air following a blast in tunnel being driven by Canadian Pacific Ry. through Mt. Macdonald. Tunnel is now in 850 ft.

PORTLAND CANAL TUNNEL is in over 3000 ft. and manager W. J. Elmendorf reports cutting of two veins, one of which is 40 ft. and other 100 ft. wide. They were reached just where expected, but in neither case did tunnel strike ore. Vein matter carried a few ounces in silver and very little gold. Drifts are being driven, known as Melba and Lucky Boy, along these veins, to see if lenses of ore can be found. Ore in upper workings of Portland Canal mine is lenticular.

Ontario

PORPHYRY HILL (South Porcupine)—Another car load of high-grade ore has been shipped from this property which was formerly known as Preston East Dome. Ore will average about \$175 per ton.

KIRKLAND LAKE EXPLORATION CO. (Swastika)—Dr. Hatch, vice-president, Institute of Mining & Metallurgy, will act as consulting engineer for this company, which controls several properties in Kirkland Lake District.

HOLLINGER RESERVE (Timmins)—It is understood that General Development Co., of New York which is controlled by Lewisohns will exercise its option on this property. It is understood that price is approximately \$800,000. 60% interest.

SCHUMACHER (Schumacher)—This is a recently incorporated company with a capital of \$2,000,000 in shares of \$5 each. Company owns 160 acres adjoining Acme and McIntyre mines. Development work on the 100-ft. level has been satisfactory and main vein will shortly be opened on 200-ft. level.

MCINTYRE (Schumacher)—Advices from mine state that a new vein has been found in crosscut from 600-ft. level, first samples averaging \$8.40. Another new vein has been found on 300-ft. level of No. 5 shaft south of No. 5 vein. Development to date gives an average of \$11 over a width of 4½ feet.

TOUGH-OAKES (Swastika)—Annual report states that when No. 2 vein passed from conglomerate into porphyry, widths and grades latter formation were greater than in conglomerate. This development will be of great importance to company as it was generally expected that rich ores would not persist in porphyry.

MEXICO

Chihuahua

AMERICAN SMELTING & REFINING CO. (Chihuahua)—Two furnaces at Chihuahua have been blown in.

Jalisco

ESCORPION—Ore is being blocked out preparatory to erection of a 10-stamp mill and cyanide plant. Work is being carried on with funds resulting from opening, last year, of a high-grade shoot, which yielded 100,000 pesos.

CHONTALPAN—Five additional stamps have been ordered for mill. Then stamps are in operation, and an extraction of 85% is being obtained by cyanidation. High-grade ore is being stopped and shipped to Europe. December production was worth over 70,000 pesos. Company has raised its dividend rate from 1 peso to 1.50 pesos per share monthly.

AMPARO MINING CO. (Etzatlan)—This company will show increased earnings in its 1913 annual report, soon to be presented at annual meeting in Philadelphia. Company paid 16% on \$2,000,000 capital, and increased considerably its reserve fund. Due to uncertainty of smeltery operations in Mexico, Amparo has arranged to make regular shipments of concentrates to Selby plant in California.

CINCO MINAS CO. (Hostotipaquillo)—Crushing was commenced at new reduction plant, Jan. 15, and 30 stamps are dropping. It is expected that mill will reach a capacity of 300 tons of ore within a short time. Plant was designed by, and built under direction of, Godfrey D. Doveton, who died there, Jan. 20, as result of injuries sustained when starting up the mill. There is a big tonnage of milling ore blocked out, and company will soon rank as one of the most important producers in this part of Mexico. Enterprise is controlled by the Marcus Daly estate, Justice J. W. Gerard, now ambassador to Germany, being president.

The Market Report

METAL MARKETS

NEW YORK—Jan. 11

The metal markets have shown some changes, but no great variations during the week. The more marked feature is the continued heavy export of copper.

MONTHLY INDEX NUMBERS

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

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

Copper, Tin, Lead and Zinc

Copper—The market showed signs of weakening on Feb. 5, when sales were made at 14¼c., delivered, usual terms, and at concessions therefrom. On Feb. 6-9 there was some further shading, although the largest producers stood firm in their asking price. There were sellers at 14.65@14.75c., delivered, usual terms, and transactions at 14.55c., cash, New York, were reported. Apparently the hesitation in the market was caused by uncertainty respecting the forthcoming statistics. When the latter were out, proving to be unexpectedly good, the market stiffened. On Feb. 11 there were sellers at 14.80c., delivered, usual terms, for February or February-March contracts. For futures, producers were asking higher prices; up to 14¾c., delivered, usual terms.

The volume of business during the last week was only of moderate proportions, and appears to have been more in sales for export than in domestic business. In the former, sellers seemed to be quite willing to meet the foreign competition. The Europeans began buying more actively after the statistics were published. The European consumers are reported to be not well covered ahead. It is noteworthy that in the face of the large exports from the United States, the stocks in European warehouses continue to decrease, which is evidence of the fact that consumption over there is good, and supplies in the hands of consumers are low. The demand in this country is improving slowly, but steadily and there has been a fair amount of business done from day to day.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 15¼@16c., overload lots at mill.

Standard Copper—On Thursday, spot standard was £65 18s. 9d.; three months, £66 6s. 3d. On Friday, Feb. 6, spot declined to £65, and three months to £65 10s. It hung around these figures on Feb. 9, and on Feb. 10, advanced to £65 15s. for spot and £66 5s. for three months. Today, Feb. 11, the market closes at £65 15s. for spot and £66 5s. for three months.

Tin—The market ruled firm during the latter part of last week, and considerable purchases by consumers were made on this side. Dealers took advantage of the offers that were made from the other side, and were therefore disappointed when, instead of opening higher, the market in London showed a decline at the beginning of this week. It seemed that there was some liquidation of long stock, but after that was accomplished the market again became firmer. It is noteworthy that prompt and near-by material on this side seems again to be in few hands, and a premium of up to ¼c. per lb. was exacted over the import basis. The market closes quiet at £184 5s. for spot and £185 10s. for three months, and about 40¾c. for February tin here.

Lead—This market has been very flat in the absence of buying demand, while producers have been quick in reducing prices with the hope of effecting business, but not with great success in spite of sharp concessions. Offers to sell at 4.02½, St. Louis, were made as early as Friday last, without interesting buyers. Some tonnage was reported sold at 3.97½, St. Louis, on Feb. 6. The New York market has been rather uncertain. Up to Feb. 11, the A. S. & R. Co. maintained its price at 4.15c., but on Feb. 6 outsiders began to

shade that price and from Feb. 7 to Feb. 11, there were offers to sell at 4.10c. with intimations that business might be consummated at a shade under that. On Feb. 11, the A. S. & R. Co. reduced at 4c., New York, and 3.92½c., St. Louis, and independents offered to sell as low as 3.90c., St. Louis, the exact position of the latter market being quite uncertain in view of the sudden and radical cut.

The London market is slightly lower, good Spanish lead being quoted £19 10s., and English lead 12s. 6d. higher.

Spelter—During the first three days of the week, a considerable tonnage was reported sold at 5.25c., St. Louis. In the last three days sales of some quantity were made at around 5.27½ cents.

The London market is unchanged, good ordinaries being quoted £21 7s. 6d.; special 5s. higher.

DAILY PRICES OF METALS

NEW YORK

Feb.	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.
5	4.8590	57½	@14.75	14.60	40½	4.15	4.02½	5.37½	5.22½
6	4.8575	57½	@14.75	14.65	41	4.12½	4.00	5.42	5.27½
7	4.8560	57½	@14.75	14.60	41	4.12½	3.95	5.37	5.22½
9	4.8565	57½	@14.75	14.55	40½	4.07½	3.95	5.40	5.25
10	4.8570	57½	@14.75	14.60	40½	4.07½	3.95	5.40	5.25
11	4.8550	57½	@14.75	14.60	40½	4.00	3.90	5.40	5.25

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

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

LONDON

Feb.	Silver	Copper				Tin		Lead		Zinc	
		£ per Ton	Cts. per lb.	3 Mos.	Best Sel'd	Spot	3 Mos.	£ per Ton	Cts. per lb.	£ per Ton	Cts. per lb.
5	26½	65½	14.33	66½	71	185½	186½	19½	4.29	21½	4.64
6	26½	65	14.12	65½	70	185½	186½	19½	4.24	21½	4.64
7	26½	65	14.12	65½	69½	182½	184	19½	4.26	21½	4.64
9	26½	65	14.28	66½	70½	184½	185½	19½	4.21	21½	4.64
10	26½	65½	14.28	66½	70½	184½	185½	19½	4.24	21½	4.64

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

Other Metals

Aluminum—Business is rather better, but still inclined to be quiet. Quotations are unchanged at 18½@19c. per lb. for No. 1 ingots, New York. The latest London quotation is £81@83 per long ton—equal to 17.60@18.03c. per lb.—for ingots.

Antimony—A fair business is forward both for spot and future delivery. Prices are firm at 7.20@7.35c. per lb. for Cookson's, and 7@7¼c. for Hallett's. For Hungarian, Chinese and other outside brands, 6@6¼c. per lb. is asked.

Quicksilver—Business has been good with fair sales. New York quotations are \$39 per flask of 75 lb. for large lots. Jobbing price is 54c. per lb. San Francisco, \$38.50 per flask for domestic orders. London price is £7 10s. per flask, with £7 quoted from second hands.

Gold, Silver and Platinum

Gold—On the open market in London gold remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was some demand from the Continent, but not enough to cause any premium to be paid. In New York an additional \$2,000,000 was taken for export to France this week.

Sales of gold bars from the United States Assay office at New York in January were \$2,914,533; an increase of \$25,972 over January of last year.

The cable reports Transvaal gold in January at 651,000 oz., or \$13,456,170; which is 21,000 oz. less than in December, and 138,390 oz. less than in January of last year.

Iridium—There is no change in this metal. Supply is about up to demand and dealers continue to ask \$75@78 per oz., New York.

Platinum—There is talk of higher prices, but the market does not seem to be at all disturbed. Business is rather quiet, and prices are unchanged. Dealers ask \$43@44 per oz. for refined platinum and \$46@49 per oz. for hard metal.

Silver is being maintained at the level of about 26½d., without much speculation in the London market. Surplus supplies held by the Syndicate are being gradually liquidated. This process of relieving the market of its silver plethora is facilitated by the contraction of supplies from Mexico.

Exports of silver from London to the East, Jan. 1 to Jan. 29, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£ 997,000	£ 436,000	D. £ 561,000
China.....	10,000	10,000	.....
Total.....	£1,007,000	£ 446,000	D. £ 561,000

Coined silver in the United States, Feb. 1, is estimated by the Treasury Department as follows: Standard dollars, \$565,734,263, subsidiary coins, \$178,931,955; total, \$744,666,218. Of the dollars \$483,909,000 are held in the Treasury against silver certificates outstanding.

The United States Mint has bought 300,000 oz. for subsidiary coinage.

Zinc and Lead Ore Markets

JOPLIN, MO.—Feb. 7

Zinc blende sold as high as \$45, the assay base ranging from \$41.50 to \$42.50, the metal base from \$40 to \$41.50 per ton of 60% zinc. The calamine base price is \$21@24 per ton of 40% zinc. The average of all grades is \$41.82 per ton. Lead sold as high as \$54.50, and no report is made of a base above \$50 per ton of 80% metal contents. The average of all grades is \$50.78 per ton. Blizzard number two swept the district Friday, the mercury dropping from freezing to zero, the coldest weather yet experienced this winter.

SHIPMENTS WEEK ENDED FEB. 7

	Blende	Calamine	Lead	Value
Total this week..	10,592,610	435,320	1,781,530	\$271,170
Total six weeks..	61,049,070	3,492,550	11,386,530	\$1,552,345
Blende value, \$221,490; six weeks, \$1,229,235.				
Calamine value, the week, \$4450; six weeks, \$38,475.				
Lead value, the week, \$45,230; six weeks, \$284,635.				

MONTANA ZINC ORE

The Butte & Superior in January produced 5679 tons of concentrates, averaging 51% zinc.

PLATTEVILLE, WIS.—Feb. 7

The price of ore advanced another mark this week, the base price paid for 60% zinc ore being \$42 per ton; the base price for 80% lead ore \$53 per ton.

SHIPMENTS WEEK ENDED FEB. 7

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,634,170	75,000	1,149,120
Year	15,904,270	498,140	5,785,130

Shipped during week to separating plants—3,084,950 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Feb. 11

The Steel Corporation statement given below was even more favorable than expected, and more than bears out reports in the past few weeks of trade improvement. It would appear that the new bookings in January were fully double those of December.

Strictly new buying in steel products has slightly decreased as compared with January, but is still fairly heavy, and specifications against contracts already made are excellent. The steel mills are working at an average of fully 65% of capacity and the tendency is to increase operations.

The steel trade having shown an ability to improve without any railroad buying, it is being predicted in some quarters that the railroads will be forced into the market for self protection, as prices might get away from them if they waited until the rate decision before making any purchases.

The spurt in pig iron last week has quieted down a little, but there is still a good business in basic and foundry iron.

The United States Steel Corporation reports unfilled orders on its books, Jan. 31, at 4,613,680 tons of material; an increase of 331,572 tons over Dec. 31. This is the first increase reported in any month for more than a year.

Pig-Iron Production—The reports of the blast furnaces, as collected and published by the "Iron Age," show that on Feb. 1 there were 197 coke and anthracite stacks in blast, having a total daily production of 63,500 tons; a decrease of 2600 tons from Jan. 1. Making allowance for the charcoal furnaces, the make of pig iron in the United States in January was 1,915,000 tons. Of this 1,261,430 tons, or 65.4% of the total, was made in furnaces owned and operated by steel works.

PITTSBURGH—Feb. 10

The week has been a quiet one with respect to new developments in the market, but none of the recently acquired strength has been lost. Mills in the Pittsburgh and Valley districts are operating at an average of more than 70% of full capacity, and some are operating almost full. It is understood that operations in the Chicago district are not as heavy as in the Pittsburgh district, while some of the more easterly lake-front plants are far from busy.

The advance in plates, bars and shapes from 1.20c. to 1.25c., announced by some leading steel products at the beginning of the month, has not proved as general as was expected. While shapes seem firm at 1.25c., bars can be bought at 1.20c. in the case of the most desirable business, while in plates 1.20c. is the usual market and 1.25c. obtains only in case of contracts for second quarter. However, the market seems to be firming up and 1.25c. may soon be the minimum on all steel products.

Bookings in the sheet industry are increasing and mills are rapidly filling up for delivery to April 1, while they still refuse to make contracts for second quarter. Operations have increased until the average is now fully 80% of capacity. Concessions from a basis of 2c. for black sheets and 3c. for galvanized are now made by only a few mills, and usually amount to only \$1 a ton.

Bookings of wire products and steel pipe have been heavier since the advances of Feb. 2, though such bookings are practically altogether in the form of specifications against old contracts.

Pig Iron—The market in basic iron has quieted down since last week's activity and it is unlikely there will be much heavy buying for awhile. Bessemer shows a little more activity, but it is not settled yet whether furnaces can secure the advanced price of \$14.25 or \$14.50 which they are now quoting. Foundry iron is somewhat more active and occasional sales of fair sized tonnages are made at \$13.50, Valley, a price which until the past few days obtained only on very small lots. A sale of 500 tons for delivery to July 1 is reported at \$13.50. The Westinghouse Electric & Manufacturing Co. is being quoted prices considerably above the prompt market, in view of its inquiry being for delivery through December, and it is not certain that purchases will be made. We quote: Bessemer, \$14@14.25; basic, \$13.25; malleable, \$13.25; No. 2 foundry, \$13.25@13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—There is a moderate amount of business being placed at the advanced price of \$38, Baltimore, since only limited tonnages were offered at the \$35 special cut price.

Steel—The market is quiet as consumers were covered fairly well into the second quarter at recent low prices. Occasional sales of 1000- or 2000-ton lots are being made at the present market, \$21 for billets and \$22 for sheet bars, delivery to Apr. 1, with an advance of \$1 for second quarter. Rods are \$26@27, Pittsburgh.

FOREIGN IRON NOTES

British Pig Iron Production for the full year is reported as below by the British Iron Trade Association, in long tons:

	1910	1911	1912	1913
First half.....	4,993,745	5,110,823	3,606,147	5,410,627
Second half.....	5,223,277	4,607,815	5,282,977	5,068,544
Total.....	10,217,022	9,718,638	8,889,124	10,479,171

The production for first half of 1912 was cut down by the coal strike. In normal years the make of the second half of the year is generally a little below that of the first half.

IRON ORE

Ore is reported as moving slowly from the Lake Erie docks, and the winter deliveries to furnaces will probably be considerably below those of last year.

Imports of Iron Ore in Germany for the full year were 12,120,090 metric tons in 1912, and 14,019,045 in 1913; increase, 1,898,955 tons. Exports were 2,309,628 tons in 1912, and 2,613,158 in 1913; increase, 303,530 tons. Imports of manganese ore were 523,125 tons in 1912, and 680,371 in 1913; increase, 157,246 tons; exports, 7790 tons in 1912 and 9388 in 1913; increase 1402 tons.

Iron Ore Production in France in 1913 was 21,500,000 metric tons, of which 15,023,740 tons were from the Briey Basin. The total is an increase of 3,000,000 tons over the preceding year.

COKE

Coke production in the Connellsville region for the week was 301,055 tons. Shipments were 298,541 tons, according to the Connellsville "Courier". Production in the Upper Connellsville and Greensburg districts was 39,496 tons.

Anthracite Shipments in January were 6,336,419 long tons in 1913 and 5,175,732 in 1914; a decrease of 1,160,687 tons. These January shipments this year were the lightest for 10 years.

Coal Production of Austria year ended Dec. 31, in metric tons:

	1912	1913	Changes
Coal mined.....	15,663,821	16,336,602	I. 672,781
Brown coal mined.....	26,417,758	27,407,129	I. 989,371
Coke made.....	2,307,995	2,584,281	I. 276,286
Briquettes made.....	401,059	437,099	I. 36,040

Of the briquettes reported last year 241,887 tons were made from heavy coal or lignite.

Foreign Fuel Trade of Germany year ended, Dec. 31, 1913, in metric tons:

	Exports	Imports	Excess
Coal.....	34,573,514	10,540,018	Exp. 24,033,496
Brown coal.....	60,345	6,986,681	Imp. 6,926,336
Coke.....	6,411,418	592,661	Exp. 5,818,757
Briquettes.....	3,163,742	147,417	Exp. 3,016,325
Total.....	44,209,019	18,266,777	Exp. 25,942,242
Total, 1912.....	39,799,009	18,424,047	Exp. 21,374,962

Of the briquettes exported last year 861,135 tons were made of brown coal or lignite.

CHEMICALS

NEW YORK—Feb. 11

The general market is steady but quiet, and business is not specially active.

Arsenic—The market is still dull with only moderate sales and a good supply. Prices are \$2.75@3 per 100 lb. and are rather easy.

Copper Sulphate—A fair business is forward at unchanged prices. The quotations are \$4.80 per 100 lb. for carload lots and \$5.05 per 100 lb. for smaller parcels.

Nitrate of Soda—Business continues rather slow. Stocks are large and prices rather weak. Current quotations are 2.20@2.25c. per lb. for both spot and futures.

Sulphate of Ammonia—The make of sulphate of ammonia in Great Britain in 1913 was: Gas works, 182,000; blast furnaces, 19,000; shale oil works, 62,000; coke ovens, gas producers, etc., 157,000; total, 420,000 long tons, an increase of 32,000 tons over 1912. The production for the year in France was 74,500 tons, an increase of 5500 tons; in Belgium, 52,000 tons, an increase of 8300 tons.

PETROLEUM

Oil production in California in December was 8,491,438 bbl. There were 32 new wells completed. The shipments were 8,092,738 bbl. for the month.

NEW CALEDONIA ORES

Shipments of ores from New Caledonia 11 months ended Nov. 30 are reported by the "Bulletin du Commerce" of Noumea at 80,660 metric tons of nickel ore and 55,454 tons of chrome ore. Exports of metals were 6302 tons of nickel matte.

COPPER SMELTER'S REPORTS

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

	September	October	November	December	January
Alaska shipments	2,261,216	1,951,883	3,391,300	3,104,155	.....
Anaconda.....	22,600,000	18,400,000	25,250,000	25,100,000	24,400,000
Arizona, Ltd.....	1,800,000	3,550,000	2,800,000	1,920,000	3,474,000
Copper Queen.....	8,434,803	8,292,029	7,115,991	9,033,459	.....
Calumet & Ariz.....	4,000,000	4,500,000	4,600,000	5,230,000	.....
Chino.....	4,196,296	4,767,466	4,270,821	4,390,018	.....
Detroit.....	2,102,818	1,861,878	1,922,352	2,021,034	.....
East Butte.....	1,235,018	1,040,997	1,002,190	1,324,560	.....
Giroux.....	198,178	156,084	250,000	.....	.....
Mason Valley.....	918,000	1,052,000	1,174,000	.....	.....
Mammoth.....	1,750,000	1,700,000	1,700,000	1,400,000	1,625,000
Nevada Con.....	4,441,671	5,898,046	5,443,647	5,343,862	.....
Ohio.....	688,900	698,691	772,120	722,940	.....
Old Dominion.....	2,670,000	2,037,000	2,450,000	2,613,039	2,797,000
Ray.....	4,336,434	4,725,419	4,753,964	5,075,202	5,705,000
Shannon.....	1,233,000	1,216,000	1,110,000	1,078,000	.....
South Utah.....	241,843	232,269	225,072	.....	.....
Tennessee.....	1,309,985	1,392,162	1,666,753	1,700,000	.....
United Verde*.....	3,000,000	3,000,000	3,000,000	3,000,000	.....
Utah Copper Co.....	11,463,905	9,929,478	10,787,426	10,306,646	.....
Lake Superior*.....	6,950,008	5,500,000	6,600,000	.....	.....
Non-rep. mines*.....	6,000,000	6,200,000	6,000,000	6,250,000	.....
Total prod.....	91,836,075	88,102,302	96,285,636	.....	.....
Imp., bars, etc.....	35,703,660	21,935,023	21,796,866	.....	.....
Total blister.....	127,539,735	110,037,325	118,082,502	.....	.....
Imp. ore & matte.....	10,800,162	5,062,015	8,980,186	.....	.....
Total Amer.....	138,339,897	115,099,340	127,062,688	.....	.....
Miami†.....	2,688,000	2,862,050	3,230,000	3,210,000	3,258,950
Shattuck-Arizona.....	1,163,237	993,224	995,429	1,050,781	.....
British Col. Cop.....	621,120	688,581	.....	.....	.....
Granby.....	1,824,659	1,718,258	1,944,145	1,605,382	.....
Mexican Cos.....	.....	.....	.....	.....	.....
Boleof.....	2,369,920	2,424,800	2,315,040	2,315,040	.....
Cananea.....	3,148,000	3,682,000	3,800,000	3,646,000	3,460,000
Mocetzuma.....	3,024,121	3,178,136	3,517,800	3,139,613	.....
Other Foreign:	.....	.....	.....	.....	.....
Braden, Chile.....	1,332,000	2,006,000	1,592,000	2,122,000	2,430,000
Cape Cop., S. Af.....	607,040	712,320	649,600	.....	.....
Kyshtim, Russia.....	1,187,000	.....	.....	.....	.....
Spassky, Russia.....	1,025,920	983,360	904,960	900,480	.....
Exports from:	.....	.....	.....	.....	.....
Chile.....	5,600,000	6,160,000	7,616,000	10,640,000	.....
Australia.....	6,944,000	7,728,000	11,200,000	3,720,000	.....
Arrivals-Europe†.....	9,661,120	18,040,960	9,107,840	13,787,200	.....

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

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
II, '13	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.....	136,251,849	76,585,471	77,099,306	122,302,890	81,244,800	203,547,690
IV.....	135,353,402	78,158,837	85,894,727	104,269,279	87,180,800	191,450,079
V.....	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.....	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.....	138,074,602	58,904,101	78,480,071	52,814,606	77,904,000	124,808,606
VIII.....	131,632,362	78,649,801	73,483,469	53,594,945	66,420,480	120,015,385
IX.....	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X.....	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI.....	134,087,708	48,658,858	70,067,803	32,566,382	48,787,200	81,353,582
XII.....	138,990,421	21,938,570	73,542,413	47,929,429	46,592,000	94,521,429
Yr., '13	1,622,450,820	767,261,760	869,062,784	.....	.....	.....
I, 1914	131,770,274	47,956,955	87,955,501	91,438,867	53,916,800	145,355,667
II.....	.....	.....	.....	87,296,685	50,108,800	137,405,485

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

Mining Companies—United States

Name of Company and Situation	State	Shares		Dividends		
		Issued	Par	Total	Latest	Amt.
Acacia, g.	Colo.	1,438,989	\$ 1	122,004	Jan '11	\$0.01
Adams, s.l.c.	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeck, c.	Mich.	50,000	25	2,100,000	Oct. '13	3.00
Alaska Mexican, g.	Alas.	180,000	5	3,273,381	Nov. '13	0.20
Alaska Treadwell, g.	Alas.	200,000	25	13,785,000	Dec. '13	1.00
Alaska United, g.	Alas.	180,200	5	1,576,750	Nov. '13	0.50
Am. Zinc, Lead & Sm.	U. S.	165,360	25	985,820	Apr. '13	0.50
Anacosta, c.	Mont.	4,332,500	25	81,418,125	Oct. '13	0.75
Argonaut, g.	Calif.	200,000	5	1,200,000	June '10	0.05
Arizona Copper, pf.	Ariz.	1,426,120	1.20	1,890,621	Oct. '13	0.05
Arizona Copper, com.	Ariz.	1,519,896	1.20	15,984,474	Nov. '13	0.10
Bagdad-Chase, g. pf.	Calif.	84,819	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	100,000	25	7,950,000	Dec. '13	2.00
Bingham N. H., c.	Utah	228,690	5	339,957	Nov. '13	0.10
Boranza Dev., g.	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	Calif.	200,000	1	791,000	Dec. '13	0.05
Bunker Hill & Sul., l.s.	Ida.	327,000	10	14,729,250	Dec. '13	0.25
Butte-Alex Scott, c.	Mont.	74,000	10	148,000	Oct. '13	0.50
Butte & Ballaklava, c.	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	596,353	10	19,026,805	Dec. '13	1.25
Calumet & Hecla, c.	Mich.	100,000	25	123,250,000	Dec. '13	6.00
Camp Bird, g.s.	Colo.	1,100,051	5	9,650,812	Aug. '13	0.24
Centen'l-Eur., l.s.g.c.	Utah	100,000	5	3,900,000	Oct. '13	1.50
Center Creek, l.z.	Mo.	100,000	10	495,000	Nov. '13	0.05
Champion, c.	Mich.	100,000	25	8,500,000	Oct. '13	1.00
Chief Consolidated, s.g.l.	Utah	876,453	1	174,277	Aug. '13	0.10
Cliff, g.	Utah	300,000	1	90,000	Jan. '13	0.10
Cliff, g.	Alas.	100,000	1	210,000	Oct. '13	0.01
Colo. Gold Dredging.	Colo.	100,000	10	300,000	Oct. '13	0.25
Colorado, l.s.g.	Utah	1,000,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s.	Utah	285,540	5	226,832	Oct. '07	0.20
Commercial Gold.	Ore.	1,750,000	1	43,750	Dec. '10	0.00
Con. Mercur, g.	Utah	1,000,000	1	3,445,313	July '13	0.03
Continental, z.l.	Mo.	22,000	25	297,000	July '13	0.50
Copper Range Con., c.	Mich.	393,445	100	13,985,021	Oct. '13	0.75
Daly Judge, s.l.	Utah	300,000	1	675,000	Dec. '13	0.15
Daly West, s.l.	Utah	180,000	20	6,606,000	Jan. '13	0.00
Doctor Jackpot, g.	Colo.	3,000,000	0.10	45,000	Mar. '11	0.00
Doer Run, l.	Mo.	65,782	100	3,550,969	Dec. '13	0.76
Eagle & Blue Bell, g.s.l.	Utah	893,146	1	178,629	Nov. '13	0.05
Elkton Con., g.	Colo.	2,500,000	1	3,279,460	Nov. '13	0.12
El Paso, g.	Colo.	490,000	5	1,658,545	Mar. '13	0.12
Ernestine, g.s.	N. M.	300,000	5	165,000	Mar. '13	0.05
Fed. M. & S., com.	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho	120,000	100	8,387,643	Dec. '13	1.50
Florence, g.	Neav.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Neav.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	214,000	Nov. '13	0.02
Frontier, z.	Wis.	1,250	100	146,202	Nov. '13	2.00
Gemini-Key'ne, l.g.s.	Utah	5,000	100	2,230,000	Dec. '13	0.00
Gold Chain, g.	Utah	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor.	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	100,000	Dec. '12	0.00
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	2,595,000	Dec. '13	0.03
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.40
Goldfield Con., g.	Neav.	3,558,367	10	26,330,470	Oct. '13	0.05
Grand Central, g.	Utah	500,000	1	1,545,750	Sept. '13	0.05
Granite, g.	Colo.	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g.	Cal.	900,000	1	971,000	Dec. '13	0.01
Hecla, l.s.	Idaho	1,000,000	0.25	2,970,000	Dec. '13	0.02
Hercules, l.s.	Idaho	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	S. D.	218,400	100	34,271,966	Dec. '13	1.65
Horn Silver, l.s.z.	Utah	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	216,832	July '13	0.00
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	1,770,000	Oct. '13	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,850,000	Oct. '13	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	175,000	Aug. '12	0.01
Kendall, g.	Mont.	500,000	5	1,475,000	Nov. '12	0.02
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Piquette, z.l.	Wis.	20,000	1	187,500	Apr. '13	0.50
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0.00
Liberty Bell, g.	Colo.	130,551	5	1,452,338	Sept. '11	0.05
Little Bell, l.s.	Utah	300,000	1	75,000	Mar. '11	0.03
Little Florence, g.	Neav.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah	400,000	25	2,300,000	July '13	0.05
Mary McKinley, g.	Colo.	1,309,252	1	1,116,938	Jan. '14	0.02
May Day, g.s.l.	Utah	800,000	0.25	132,000	Feb. '13	0.03
Mexican, g.s.	Utah	201,600	2.50	20,160	Aug. '11	0.10
Miami, c.	Ariz.	664,993	5	2,688,910	Nov. '13	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk, g.s.	Mich.	100,000	25	3,175,000	Aug. '13	2.00
Monarch-Mad's, g.s.l.	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	Neav.	921,865	1	530,000	Dec. '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.44
National, g.	Neav.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Neav.	1,999,524	5	14,727,271	Dec. '13	0.87
New Century, z.l.	Mo.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	Cal.	100,000	5	1,730,000	Dec. '13	0.10
North Butte, c.	Mont.	410,000	15	11,275,000	Oct. '13	0.50
North Star, g.	Cal.	250,000	10	4,086,986	Dec. '13	0.20
Old Domin'n, M. & Sm.	Ariz.	162,000	25	3,361,000	Oct. '13	1.25
Ophir, s.g.	Neav.	201,600	3	2,068,360	Jan. '12	0.10
Ophongo, g.s.l.	Utah	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging.	Cal.	700,000	5	1,383,036	Dec. '09	0.12
Osoeola, c.	Mich.	96,150	25	11,891,225	Oct. '13	2.00
Parrot, c.	Mont.	229,850	10	7,290,227	Nov. '13	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	87,500	Feb. '10	0.01
Pioneer, g.	Alas.	5,000,000	1	2,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Ida.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g.	Neav.	2,790,000	1	659,600	Nov. '13	0.02
Portland, g.	Colo.	3,000,000	1	9,387,080	Dec. '13	0.02
Quilp, g.	Wash.	1,500,000	1	67,500	Feb. '13	0.01
Quincy, c.	Mich.	110,000	25	20,952,500	Dec. '13	1.25
Republic, g.	Wash.	1,000,000	1	85,000	Dec. '10	0.01
Rochester, l.s.	Mo.	4,900	100	188,396	Dec. '10	0.50

Mining Companies—United States—(Continued)

Name of Company and Situation	State	Shares		Dividends		
		Issued	Par	Total	Latest	Amt.
Round Mountain, g.	Neav.	866,426	\$ 1	\$ 363,365	Aug. '13	\$0.04
Seven Troughs Coal, g.	Neav.	1,500,000	1	37,500	July '12	0.02
St. Joseph, l.	Mo.	1,000,000	10	9,058,357	Dec. '13	0.10
Shannon, c.	Ariz.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	1,575,000	Oct. '13	0.50
Silver King Coal, l.s.	Utah	1,250,000	5	2,346,585	Dec. '13	0.15
Sioux Con., s.l.g.	Utah	745,389	1	872,097	July '11	0.12
Skidoo, g.	Cal.	1,000,000	5	275,000	May '12	0.02
Snowstorm, c.g.	Ida.	1,500,000	1	1,192,103	Oct. '13	0.02
South Eureka, g.	Calif.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	Cal.	178,394	10	5,274,767	Nov. '13	0.25
Stratton's Indl., g.	Colo.	1,000,000	0.60	425,250	May '13	0.06
Success, z.	Ida.	1,500,000	1	925,000	May '13	0.02
Superior & Pitts., c.	Ariz.	1,499,793	10	5,939,184	Dec. '13	0.38
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	3,856,250	Dec. '13	0.75
Tomboy, g.s.	Colo.	300,000	4.85	3,332,245	Dec. '13	0.48
Tom Reed, g. s.t.	Ariz.	909,555	1	1,610,008	Dec. '13	0.06
Tonopah Belt, s.g.	Neav.	1,500,000	1	5,243,000	Nov. '13	0.10
Tonopah Ext., g.s.	Neav.	943,433	1	424,529	Oct. '13	0.05
Tonopah of Nev., s.g.	Neav.	1,000,000	1	11,100,000	Sept. '13	0.25
Tri-Mountain, c.	Mich.	100,000	25	1,450,000	Dec. '13	2.00
Tuolumne, c.	Mont.	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l.	Utah	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.), c.	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	Ariz.	23,000	10	1,529,500	Oct. '13	7.50
United Verde, c.	Ariz.	300,000	10	33,472,000	Dec. '13	0.75
Utah, s.l.	Utah	100,000	10	281,860	Dec. '10	0.02
Utah, c.	Utah	2,797,182	10	20,978,865	Sept. '13	0.75
Utah Con., c.	Utah	300,000	5	7,950,000	Nov. '13	0.50
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,767,000	Oct. '13	0.03
Wasp No. 2, g.	S. D.	500,000	1	436,965	Oct. '13	0.01
Wellington Mines, g.	Colo.	10,000,000	1	300,000	July '13	0.00
Wolverine, c.	Mich.	60,000	25	7,740,000	Apr. '13	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.00
Yak, s.l.	Colo.	1,000,000	1	1,927,655	July '13	0.02
Yankee Con., g.s.	Utah	1,000,000	1	143,500	Jan. '13	0.01
Yellow Aster, g.	Cal.	100,000	10	1,186,789	Dec. '13	0.05
Yellow Pine, l.s.	Neav.	1,000,000	1	343,008	Dec. '13	0.02
Yukon Gold, g.	Alas.	3,500,000	5	5,572,500	Dec. '13	0.07

Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,876	\$100	\$81,276,429	Nov. '13	\$1.50
Am. Sm. & Ref., com.	U. S.	500,000	100	25,333,333	Dec. '13	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	46,458,333	Dec. '13	1.75
Am. Smelters, pf. A.	U. S.	170,000	100	8,130,000	Oct. '13	1.50
Am. Smelters, pf. B.	U. S.	300,000	100	12,357,000	Oct. '13	1.25

Assessments			
Company	Delinq.	Sale	Amt.
Amador, Ida.	Jan. 20	Feb. 21	\$0.025
Arctic, Ida., postponed.	Feb. 28		.00025
Aurora Ore P. & R., Utah	Feb. 6	Feb. 25	0.30
Caledonia, Nev.	Jan. 31	Feb. 25	0.10
Carbonate Center, Ida post'd.		Feb. 27	0.001
Cedar-Talisman, Utah	Feb. 4	Feb. 24	0.05
Central Eureka, Calif.	Jan. 16	Feb. 17	0.05
Comet Placer, Nev.	Feb. 10	Feb. 28	0.03
East Hercules, Ida., postponed.		Feb. 28	0.0015
Ely Cons., Nev.	Dec. 31	Feb. 26	0.03
Golden Reef, Utah	Jan. 31	Mar. 2	0.005
Jack Waite, Ida. post'd.		Feb. 16	0.01
Legal Tender, Ida., postponed.		Feb. 23	0.001
Lime Creek, Ida.	Feb. 2	Mar. 2	0.002
Ophir, Nev.	Feb. 3	Feb. 24	0.10
Roanoke, Ida.	Jan. 20	Feb. 20	0.002
Snowstorm, Ida.	Feb. 3	Mar. 3	0.002
Stansbury, Utah	Jan. 24	Feb. 23	0.01
St. Mary's, Utah		Feb. 23	0.02
Sunset, Nev.	Jan. 12	Mar. 2	0.02
Tarbox, Ida.	Jan. 27	Feb. 27	0.002
Tomahawk, Nev.	Jan. 31	Mar. 2	0.01
Umatilla, Nev.	Jan. 23	Mar. 2	0.01
Union Chief, Utah	Feb. 9	Mar. 2	0.01
Utah, Nev.	Jan. 29	Feb. 24	0.03
White Cloud, Utah	Jan. 30	Feb. 24	0.005
Yellow Jacket, Nev.	Jan. 26	Feb. 24	0.10

Monthly Average Prices of Metals

SILVER						
Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.642		27.190	28.357	
March	58.375	57.870		26.875	26.069	
April	59.207	59.490		28.284	27.416	
May	60.880	60.361		28.038	27.825	
June	61.290	58.990		28.215	27.199	
July	60.654	58.721		27.919	27.074	
August	61.606	59.293		28.375	27.335	
September	63.078	60.640		29.088	27.986	
October	63.471	60.793		29.299	28.083	
November	62.792	58.995		29.012	27.263	
December	63.365	57.760		29.320	26.720	
Year	60.835	59.791		28.042	27.570	

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

COPPER						
Month	New York				London Standard	
	Electrolytic		Lake		1913	1914
	1913	1914	1913	1914		
January	16.488	14.223	16.767	14.772	71.741	64.304
February	14.971		15.253		65.519	
March	14.713		14.930		65.329	
April	15.291		15.565		68.111	
May	15.436		15.738		68.807	
June	14.672		14.871		67.140	
July	14.190		14.563		64.166	
August	15.400		15.904		69.200	
September	16.328		16.799		73.125	
October	16.337		16.913		73.383	
November	15.182		16.022		68.275	
December	14.224		14.904		65.223	
Year	15.269		15.686		68.335	

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

TIN				
Month	New York		London	
	1913	1914	1913	1914
January	50.298	37.779	238.273	171.905
February	48.766		229.140	
March	46.832		213.615	
April	49.115		224.159	
May	49.038		224.143	
June	44.820		207.208	
July	40.260		183.511	
August	41.582		188.731	
September	42.410		193.074	
October	40.462		184.837	
November	39.810		180.69	
December	37.635		171.786	
Av. year	44.25		206.279	

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

LEAD						
Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325		4.175		16.550	
March	4.327		4.177		15.977	
April	4.331		4.242		17.597	
May	4.332		4.226		18.923	
June	4.325		4.190		20.226	
July	4.353		4.223		20.038	
August	4.624		4.550		20.406	
September	4.698		4.579		20.648	
October	4.402		4.253		20.302	
November	4.293		4.146		19.334	
December	4.047		3.929		17.798	
Year	4.370		4.238		18.743	

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

SPELTER						
Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6.854	5.112	26.114	21.583
February	6.239		6.089		25.338	
March	6.078		5.926		24.605	
April	5.641		5.491		25.313	
May	5.406		5.256		24.583	
June	5.124		4.974		22.143	
July	5.278		5.128		20.592	
August	5.658		5.508		20.706	
September	5.694		5.444		21.148	
October	5.340		5.188		20.614	
November	5.229		5.083		20.581	
December	5.156		5.004		21.214	
Year	5.648		5.504		22.746	

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

PIG IRON IN PITTSBURGH						
Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	\$18.15	\$14.94	\$17.35	\$13.23	\$18.59	\$13.90
February	18.15		17.22		18.13	
March	18.15		16.96		17.53	
April	17.90		16.71		16.40	
May	17.68		15.80		15.40	
June	17.14		15.40		15.10	
July	16.31		15.13		14.74	
August	16.63		15.00		14.88	
September	16.65		15.04		14.93	
October	16.60		14.61		14.80	
November	16.03		13.91		14.40	
December	15.71		13.71		14.28	
Year	\$17.09		\$15.57		\$15.77	

STOCK QUOTATIONS

COLO. SPRINGS Feb. 9				SALT LAKE Feb. 9			
Name of Comp.	Bid.	Name of Comp.	Bid.	Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.02	Beck Tunnel	.05	Acacia	.02	Beck Tunnel	.05
Cripple Crk Con.	.009	Black Jack	.07	Cripple Crk Con.	.009	Black Jack	.07
C. K. & N.	.08	Cedar Talisman	.00	C. K. & N.	.08	Cedar Talisman	.00
Doctor Jack Pot.	.06	Colorado Mining	.11	Doctor Jack Pot.	.06	Colorado Mining	.11
Elkton Con.	.50	Crown Point	.01	Elkton Con.	.50	Crown Point	.01
El Paso	2.00	Daly-Judge	5.00	El Paso	2.00	Daly-Judge	5.00
Findlay	.02	Gold Chain	.11	Findlay	.02	Gold Chain	.11
Gold Dollar	.05	Grand Central	.58	Gold Dollar	.05	Grand Central	.58
Gold Sovereign	.01	Iron Blossom	1.17	Gold Sovereign	.01	Iron Blossom	1.17
Golden Cycle	1.50	Little Bell	.10	Golden Cycle	1.50	Little Bell	.10
Isabella	.09	Lower Mammoth	.01	Isabella	.09	Lower Mammoth	.01
Jack Pot.	.05	Mason V lley	2.50	Jack Pot.	.05	Mason V lley	2.50
Jennie Sample	.04	May Day	.06	Jennie Sample	.04	May Day	.06
Jerry Johnson	.03	Nevada Hills	.39	Jerry Johnson	.03	Nevada Hills	.39
Lexington	.02	New York	.01	Lexington	.02	New York	.01
Old Gold	.01	Prince Con.	.17	Old Gold	.01	Prince Con.	.17
Mary McKloney	.58	Silver King Coal'n.	3.45	Mary McKloney	.58	Silver King Coal'n.	3.45
Pharmacist	.01	Stoux Con.	.01	Pharmacist	.01	Stoux Con.	.01
Portland	1.06	Uncle Sam	.06	Portland	1.06	Uncle Sam	.06
Vindicator	.82	Yankee	.03	Vindicator	.82	Yankee	.03

TORONTO Feb. 9			
Name of Comp.	Bid.	Name of Comp.	Bid.
Balloy	.04	Foley O'Brien	.17
Conlagas	7.50	Hollinger	16.50
Right of Way	.02	Imperial	.02
T. & Hudson Bay	71.00	Jupiter	.08
Timiskaming	.13	Pearl Lake	.07
Wettlaufer-Lor.	.06	Porcu. Gold	.12
Big Dome	16.75	Preston E. D.	.01
Crown Chartered	.00	Rea	.15
Doble	1.10	Swastika	.02
Dome Exten.	.06	West Dome	.08

SAN FRANCISCO Feb. 9			
Name of Comp.	Bid.	Name of Comp.	Bid.
Comstock Stocks		Misc. Nev. & Cal.	
Alta	1.07	Belmont	7.80
Belcher	.32	Jim Butler	1.02
Best & Belcher	.04	MacNamara	.11
Caledonia	1.20	Midway	.42
Challenge Con.	.10	Mont.-Tonopah	1.10
Chollar	.02	North Star	.43
Confidence	.30	West End Con.	1.35
Con. Virginia	.14	Atlanta	.17
Crown Point	.29	Booth	.06
Gould & Curry	.01	C.O.D. Con.	.04
Hale & Norcross	.06	Comb. Frac.	.12
Mexican	1.10	Jumbo Extension	.29
Occidental	.70	Pitts.-Silver Peak	.36
Ophir	.17	Round Mountain	.42
Overman	.18	Sandstorm Kendall	.10
Potosi	.01	Silver Peak	.08
Savage	.07	Argonaut	12.50
Sierra Nevada	.05	Bunker Hill	1.75
Union Con.	.08	Central Eureka	.46
Yellow Jacket	.30	So. Eureka	1.75

N. Y. EXCH. Feb. 9				BOSTON EXCH Feb. 9			
Name of Comp.	Clg.	Name of Comp.	Clg.	Name of Comp.	Clg.	Name of Comp.	Clg.
Amalgamated	77	Adventure	11	Am. Agrl. Chem.	53	Abmeek	290
Am. Agrl. Chem.	53	Alaska Gold M.	21	Am. Sm. & Ref., com	691	Algonah	11
Am. Sm. & Ref., com	691	Algonah	11	Am. Sm. & Ref., pf.	103	Allouez	40
Am. Sm. Sec. pf. B.	83	Allouez	40	Anaconda	37	Am. Zinc	20
Anaconda	37	Am. Zinc	20	Batopilas Min.	1	Ariz. Con., cts.	5
Batopilas Min.	1	Ariz. Con., cts.	5	Bethlehem Steel, pf.	76	Bonanza	.60
Bethlehem Steel, pf.	76	Bonanza	.60	Chino	43	Boston & Corbin	1.50
Chino	43	Boston & Corbin	1.50	Federal M. & S., pf.	36	Butte & Balak	4
Federal M. & S., pf.	36	Butte & Balak	4	Great Nor. ore, ctf	36	Calumet & Ariz.	68
Great Nor. ore, ctf	36	Calumet & Ariz.	68	Guggen. Exp.	50	Calumet & Hecla	445
Guggen. Exp.	50	Calumet & Hecla	445	Homestake	115	Centennial	18
Homestake	115	Centennial	18	Inspiration Con.	17	Cliff	1
Inspiration Con.	17	Cliff	1	Miami Copper	23	Copper Range	39
Miami Copper	23	Copper Range	39	Nat'l Lead, com.	49	Daly West	2
Nat'l Lead, com.	49	Daly West	2	National Lead, pf.	106	East Butte	12
National Lead, pf.	106	East Butte	12	Nev. Consol.	16	Franklin	3
Nev. Consol.	16	Franklin	3	Phelps Dodge	183	Granby	88
Phelps Dodge	183	Granby	88	Pittsburg Coal, pf.	92	Hancock	20
Pittsburg Coal, pf.	92	Hancock	20	Quicksilver, pf.	21	Hedley Gold	28
Quicksilver, pf.	21	Hedley Gold	28	Ray Con.	20	Helvetia	40
Ray Con.	20	Helvetia	40	Republic I&S, com.	25	Indiana	5
Republic I&S, com.	25	Indiana	5	Republic I&S, pf.	88	Island Crk, com.	47
Republic I&S, pf.	88	Island Crk, com.	47	Sloss Sheld, com.	33	Island Crk, pfd.	85
Sloss Sheld, com.	33	Island Crk, pfd.	85	Sloss Sheld, pf.	90	Isle Royale	22
Sloss Sheld, pf.	90	Isle Royale	22	Tennessee Copper	36	Keweenaw	3
Tennessee Copper	36	Keweenaw	3	Utah Copper	55	Lake	9
Utah Copper	55	Lake	9	U. S. Steel, con.	65	La Salle	4
U. S. Steel, con.	65	La Salle	4	U. S. Steel, pf.	110	Mass.	21
U. S. Steel, pf.	110	Mass.	21	Va. Car. Chem., pf.	103	Michigan	1
Va. Car. Chem., pf.	103	Michigan	1			Mohawk	44

N. Y. CURB Feb. 9			
Name of Comp.	Clg.	Name of Comp.	Clg.
Ariz. Belmont	.03	New Arcadian	3
Barn			