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An Iron Concentrator of Unusual Design

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SYNOPSIS—The Mount Summit Ore Corporation owns a magnetite deposit in the Hudson Highlands. The concentrating plant employs permanent magnets which deflect the iron from a falling curtain of ore. Other machines adopted from different industries show interesting departures from current practice.

The property of the Mount Summit Ore Corporation is situated at an elevation of 900 ft. in the Highlands of the Hudson, opposite West Point, N. Y. It lies about four miles southeast of the station of Garrison on the New

and magnetite. The rich bands will run 65% in iron, and it is expected to hoist a product carrying 45%. In the shaft there were encountered two 4-ft. bands of the pure magnetite and between these another stringer of the same material. The gangue minerals are the typical minerals of the gneiss, such as hornblende, feldspar and quartz.

The deposit was discovered early in the history of the region and was first worked in 1810, a small shaft having been excavated in the southwest corner of the present opening shown in Fig. 2. Apparently, however, there was



FIG. 1. SHAFT COLLAR

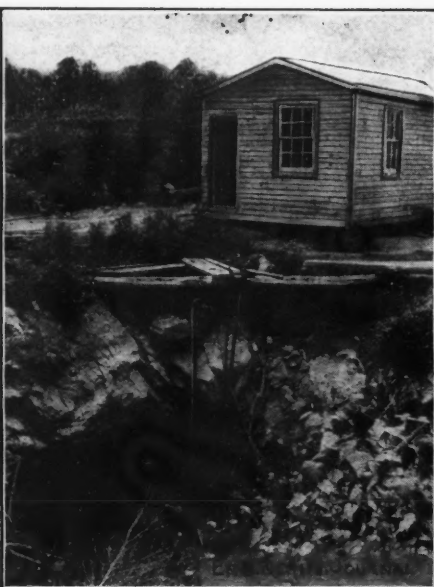


FIG. 2. CORNER OF OLD PIT

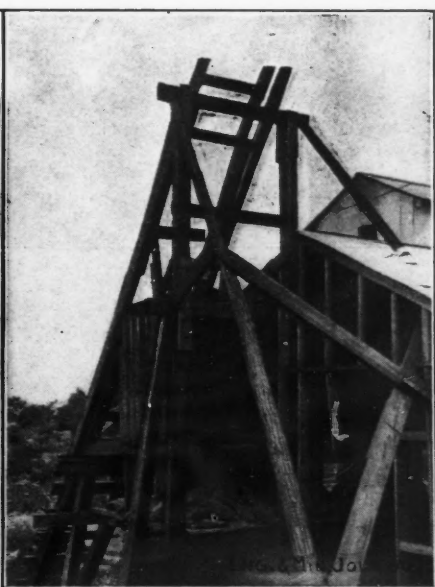


FIG. 3. HEADFRAME AND 10-TON BIN

York Central R.R. The holdings of the company include 40 acres of land in fee, with title to the mineral rights on 100 acres. The deposit is of magnetite and, so far as known, has the dimensions of a large vein, with a northeast strike and a dip of 45° to the southeast, as indicated by the hanging wall. It has been outlined by magnetic surveys and test pits on the outcrop for a distance of 3000 ft. on the strike; its width has not been determined, as no workings have as yet reached the true foot, but it is at least 60 ft. in the portion opened.

The country rock is gneiss with a definite structure which the deposit follows closely on its dip and strike. The deposit shows a banded structure, layers of almost pure magnetite alternating with bands of mixed gneiss

no work of any importance done until the Kingston Iron Co. took hold a few years ago. This company opened a surface pit, shipped some ore after hand cobbing, and left a large amount of mixed material on the dumps. The operations of this company were somewhat erratic, the management at first mistaking the dip for the strike. However, an inclined shaft 22x22 ft. in section was eventually sunk for 90 ft. in the ore and on the true dip. The present owners continued this shaft to the 165-ft. point after reducing its section to 8x12 ft.; and leaving a 10-ft. sump, crosscut to the hanging and drifted about 20 ft. each way. The product of this work, added to what was already on the dump, gives an estimated reserve of 25,000 tons running 30% in iron, which it is proposed

to concentrate and ship before more mining is done. The workings are under water at present. The actual flow of water, however, is small.

EQUIPMENT AND SEQUENCE OF OPERATIONS

Hoisting was done in the 2-ton skip shown in Fig. 1. The hoist itself is a single-drum Lambert contractor's winch with two 8x10-in. cylinders. A four-drill Rand compressor furnished air for the piston drills while mining. It is of the duplex type with one side missing, designed to permit the addition of a duplicate set of cylinders when it becomes necessary to increase capacity. Steam is furnished by two Erie boilers, one of 80 and one of 150 hp. Soft coal costing \$3.50 per ton at Garrison is burned. The 150-hp. mill engine is of the old Brown type, in which four gridiron valves are actuated by a longitudinal shaft, driven by gearing from the main driving shaft, no eccentrics being used. It is said to give unusual satisfaction.

The skip dumps into a 10-ton bin (Fig. 3) in the small headframe and passes through a 10x22-in. crusher made by the Climax Road Machinery Co. The moving crusher-plate is hinged at the top, as in the Blake type, but motion is not obtained by a toggle; instead there is an eccentric-turned portion in the center of the driving shaft

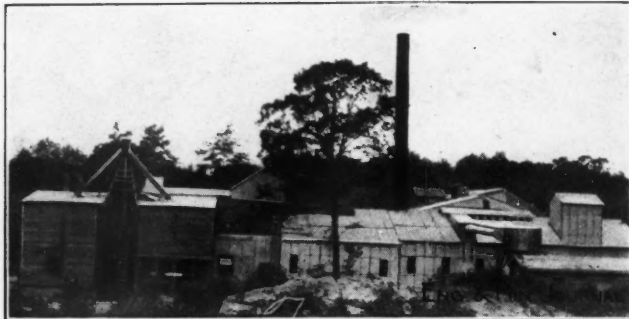


FIG. 4. GENERAL VIEW OF MOUNT SUMMIT PLANT

which acts as a long cam against a roller on the end of an inclined lever, giving the latter a slight movement. This lever is pivoted almost under the crusher moving-plate and motion is communicated by a horizontal link-plate from the lever. There is thus no true toggle movement.

The 1½-in. product from this crusher is elevated by a Jeffrey link-belt bucket elevator and shot down into an American Process drier. This is of the revolving-cylinder type, 4 ft. in diameter by 30 ft. long, discharging into an 8x8x8-ft. dust chamber. The dried product—no roasting is needed—is again elevated by a similar elevator to a 70- or 80-ton bin of ordinary type. From this bin it is discharged through a Webster Manufacturing Co.'s rotary feeder to two No. 2 Gardner crushers. These are swing-hammer machines; the six hammers revolve at 850 r.p.m. on a horizontal shaft, catch the feed at the top, crush it by impact and sweep it over a ¼-in. discharge screen which forms a half cylindrical bottom to the housing. The parts receiving hard wear are of manganese steel.

The ½-in. product is again elevated on a belt-and-bucket elevator to a bin built crib-fashion of 2x6-in. planks. This bin is 16 ft. long, 10 ft. wide and 8 ft. high. It extends over three of the concentrating units.

It will be noted that much of the machinery described is not of the makes or types commonly met with in min-

ing practice; such as the Brown engine, the Climax crusher, the Gardner crusher, the Webster rotary feeder, etc. The unique feature of the mill, however, is the concentrating method, which is installed under the Carter patents.

PERMANENT-MAGNET CONCENTRATORS

Magnetic separation is made use of, but permanent magnets are used. These are ordinary small, steel, horse-shoe magnets, such as are applied to magneto machines. They are set together in 4-ft., horizontal boxes and covered with sheet zinc; a film of ore is allowed to fall past their magnetized ends; the magnetite particles are deflected toward the magnet, the nonmagnetic material falls straight or slightly outward. A vertical knife-edge, parallel to the magnet box, splits the stream and separates the magnetite from the gangue. Part of the magnetite clings to the zinc cover until it builds out and falls by its own weight. The knife-edge is set so as to make a clean concentrate and the reject is conducted by a series of sloping shelves to successive boxes of magnets until it is left reasonably clean of iron. Five of the boxes, supported

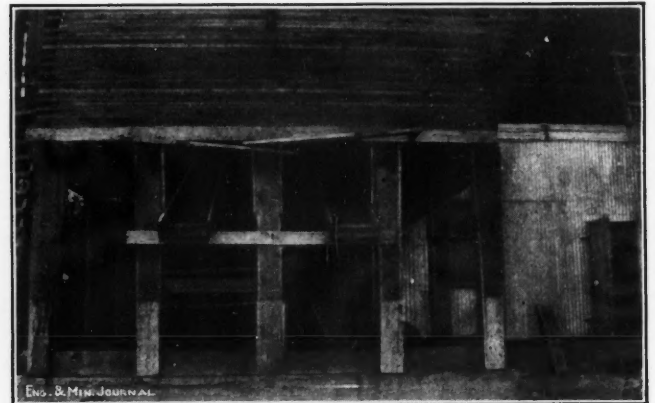


FIG. 5. LOADING CHUTES FROM CONCENTRATE BIN

in a frame, one below the other, constitute a concentrating unit. The concentrate from each box is combined by a series of sloping shelves and removed by a belt conveyor on which it finally falls. The reject from the first set of three units is discharged on a belt conveyor running parallel to the concentrate conveyor and is elevated by a belt-and-bucket elevator to a crib bin similar to the first. This bin feeds two units, identical in construction with the others. The reject from these is discarded, being removed on a third belt conveyor. The concentrate is discharged on the concentrate conveyor. Thus the ore is passed in succession past 10 sets of magnets, which should give a tailing low in iron.

The concentrate, after discharge from the belt, is hoisted by a belt-and-bucket elevator to the concentrate shipping bin, a crib structure 16x16 ft. by 10 ft. high. The tailing is also hoisted to a similar bin 16x16 ft. by 17 ft. high. It is intended to ship the concentrate by motor truck to Garrison, and employ the tailing in building or road construction.

At the time of examination, work was suspended, as after a short run it was found that the dust and finer material interfered with operations and it became necessary to install a suction system to remove this at critical points. This system includes a Buffalo Forge Co.'s fan

with galvanized-iron pipe connections to the dust chamber of the drier, to the two Gardner crushers, to the top of the bin over the first block of concentrators, and to a point behind each of the 25 magnet boxes. The dust is blown to a conical dust collector of the type used in lumber and planing mills.

When in operation it is expected that 200 tons of a 65 to 67% product will be made. No hand sorting is contemplated, although much of the ore would seem to

will bear an appreciable haulage charge. The availability of the concentrating method remains to be determined. It is absurdly simple and cheap in first cost and operation, without moving parts or power charges in the

ANALYSES OF MOUNT SUMMIT ORE AND CONCENTRATES

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Moisture.....			0.15	0.15	0.13		0.12		
Iron.....	51.34	66.59	60.02	68.95	64.40	66.57	69.94	66.57	66.42
Silica.....	19.56	3.63	12.14	2.12	3.27	0.94	1.12	0.94	4.75
Sulphur.....	0.49	0.26	0.19	0.16	0.27	0.13	0.12	0.13	0.15
Phosphorus.....	0.13	0.03	0.13	0.03	0.11	0.12	0.07	0.12	0.03
Titanium.....	trace	trace	trace	trace	trace	0.04	none	0.04	0.20
Barium.....	2.88	0.48				0.01	none	none	
Manganese.....	0.07					0.07	none	0.17	
Chromium.....								0.01	

Nos. 1, 3, 5, 6, 7, 8 are ore from mine. Nos. 2, 4, 9 concentrates. The assays made by Simonds & Wainwright; Stillwell & Gladding; Low Moor Iron Co.; J. J. Fanheiser; I. Colony; Ledoux & Co.,

concentrator proper. If it works even moderately well, it may solve some problems for the small plant. A large loss in the discard could be tolerated for the sake of minimizing capital and operating charges.

For the material of this article our thanks are due to L. J. Ferry, secretary, and John G. Pearse, president of the company, who offered every facility for examination.



New Circular Shaft on the Rand

A circular shaft has been sunk on the advice of an English colliery engineer to develop the deeper areas of the New Modderfontein company. The mine is a large one, producing through outcrop incline shafts. The new shaft is 18 ft. in diameter. Sinking was started on Jan. 2, 1911, and was stopped at a depth of 2258 ft. on Nov. 16, 1912. Thus the average rate of sinking for 22½ months was 100 ft. per month. The cost of the shaft was £22 1s. 7d. per ft., of which £14 9s. 5d. was sinking and £7 12s. 2d. was bricking and lining. In comparing these costs with those of a modern five-compartment rectangular shaft, it must be noted that apparently no general charges are included in this statement. In the published costs of rectangular shafts on developing mines, from £1 to £3 per ft. is added for these.

The cost of this shaft cannot be considered cheap compared with the cost of sinking a five-compartment rectangular shaft, as practically no water was encountered in sinking. The speed of sinking is, of course, very low compared with rectangular shafts and the surface equipment is not adapted for rapid sinking compared with a shaft equipped with shops. The shaft around the collar is lined with concrete 36 in. thick, with two feet of brickwork to 100 ft. and one ft. to 1600 ft. Below this point it was not bricked at all until sinking was finished. Ordinary bricks were put in to 600 ft.; below this, concrete blocks were employed. These were made in segments at the mine. Lining and sinking went on alternately. Small machine drills and hand labor were employed. About 32 hand-hammer holes were put in to break from 2 to 3 ft. of ground. At the 1000-ft. level, a sump to hold 35,000 gal. was constructed. The general opinion of Rand engineers is that this shaft might be made equal to a five-compartment rectangular shaft in hoisting capacity, but that it offers few advantages to offset numerous disadvantages for this field. One of the objects of using the circular form was to provide a maximum cross-section together with a smooth lining for ventilating purposes. There will be no timbering and wire-rope guides will be employed. It will be interesting to observe how these answer the requirements of high-speed hoisting which presumably will be necessary.

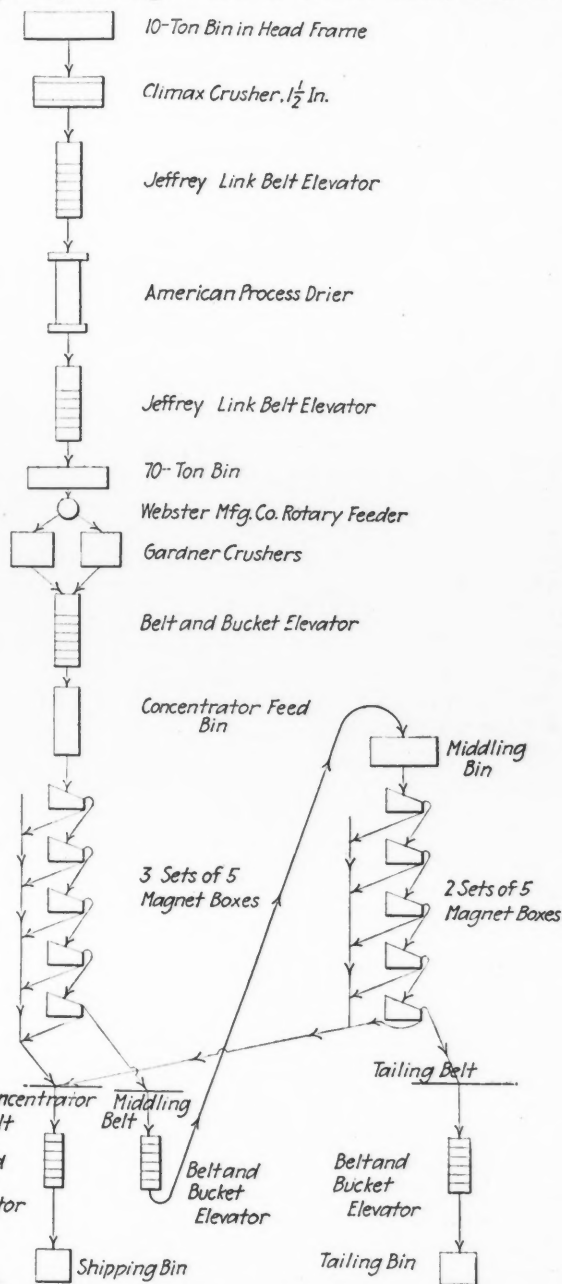


FIG. 6. FLOW SHEET OF IRON CONCENTRATOR

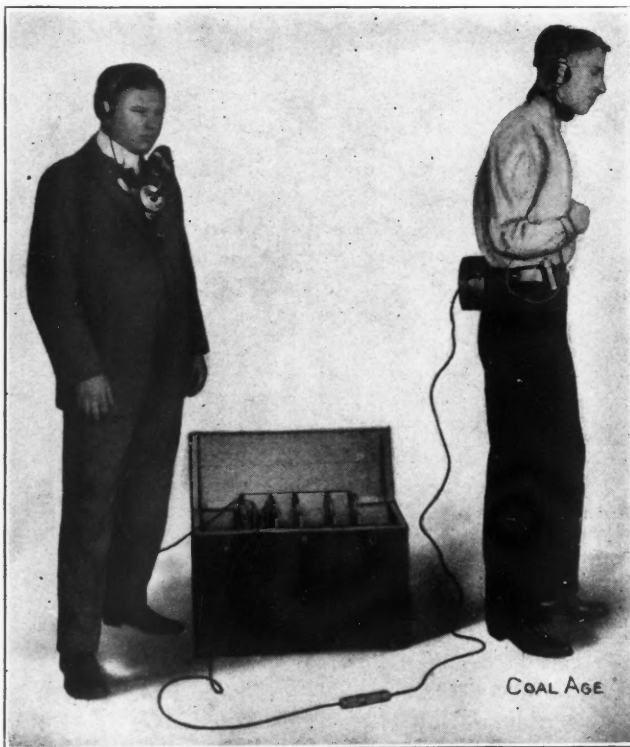
offer an excellent opportunity for cheap sorting. The ore is low in phosphorus and sulphur, as can be seen by the analyses in the accompanying table. It is expected to add a sintering or nodulizing plant eventually.

Operations have not been extensive enough as yet to permit giving any figures of costs, tonnage, etc. The cost of hauling fuel is \$0.50 per ton at present. So far as the concentrate is shipped as return freight it will cost little, but the amount that must be handled by itself

Portable Mine Rescue Telephone

Attention has been directed in mine-rescue work to the urgent need for some means of instant and continuous communication between an advance party equipped with its oxygen apparatus and a rear party outside the mine, by the fact that in the past loss of life could have been prevented by a quick and reliable means for summoning aid. The accompanying illustration shows a portable telephone set devised to meet this demand.

A man wearing an oxygen helmet, which covers his mouth, cannot use the ordinary type of telephone transmitter, so that a special type, known as the "throat" transmitter has been developed. This is light and compact and is provided with a soft rubber cup to adapt itself to the curves of the throat. It has been found by actual test to transmit practically as well as standard



APPARATUS IN POSITION

instruments. The telephone equipment used by the outside party is a standard switchboard operator's set.

Connection between the parties is had by a small wire cable consisting of two copper conductors insulated with black enamel and two servings of silk, all of which is covered with a stout linen braid impregnated with moisture-resisting compound. This wire is in 500-ft. coils and is carried in a leather case fastened to the helmet-man's belt, paying out as he advances. The coils weigh less than three pounds apiece; several of them can easily be carried and as one is run out, another can be connected by means of a plug and jack combination. The wire is so wound that it cannot tangle and will pay out from any position. The total weight of the telephone equipment and one coil is a little over five pounds. The battery is in a box at the outside point. By means of a key its condition can be determined. This is a necessary feature, since it would be a serious matter for the rescue

party to enter the mine with batteries too weak for service.

It may be found desirable to use cable for carrying the talking circuit up to the edge of the danger zone. For this purpose a specially constructed large box is furnished, holding 1300 ft. of strong and flexible twisted-pair cable, having a 30% pure Para rubber insulation. The outfit is made by the Western Electric Company.

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Tariff Discussions

WASHINGTON CORRESPONDENCE

Senator Smoot in his general attack on the new tariff bill during the past week has taken strong exception to the provisions of the new bill relating to lead, giving an elaborate analysis of the supposed effect of the new rates. In this connection he said "on dross lead in pigs, etc., there is a duty of 25% *ad valorem* imposed as compared with an equivalent specific duty now of 94.26%. There is a wide variety in value per pound of lead at neighboring ports, as shown by the Treasury figures. In 1911 the average at New York was 1.88c., at Perth Amboy 2.10c. and at Paso Del Norte 2.12c. This served to show the importance of the specific rates. Utah produces 15% of the country's total of lead, and 5% of the world's total, but no lead mine in the state could produce at a profit except for other metals. It costs 4c. per lb., he claimed, to produce and deliver that lead in New York, and, except for the value of the other metals obtained at the same time, the cost would be 8c. per lb. Without the lead-silver mines the production of precious metals in this country would fall away rapidly.

"In the Cœur d'Alene district of Idaho 117,000 tons of lead are produced annually, or more than 30% of the United States production. The mines in that state are carried on at a small profit and any reduction in the tariff on lead will lead to the vanishing point in many cases and to the point in others below the equitable return, causing distress and paralysis to business. Crediting the silver, the cost of production and marketing was 3.413c. per lb. (1909-1911) and the average selling price was 4.401c. Deducting amortization payments left less than 5% return on the investment. After investigation, W. R. Ingalls, a recognized expert, says that the cost of producing lead in the Idaho district is in the neighborhood of 4c. per lb. when silver is worth only 50c. per oz. The *ad valorem* 25% proposed in this bill would have admitted at all times during the past 10 years foreign pig lead so that it could have been sold below the price of the domestic lead. The effect of the proposed reduced rate would be to close many mines under development and decrease the production of gold and silver.

"The present duty on the zinc is a revenue duty, averaging \$250,000 annually and the imports have increased under the present law. From 66 to 70% of the cost of manufacturing zinc is expended in mining and concentrating. It costs \$39.61 to produce and deliver to the smelters a ton of average Joplin zinc ore. In Mexico the cost is \$20.96 to produce and deliver 1½ tons containing the same quantity of zinc, the difference being principally in wages."

There is no apparent disposition to alter the rates of the present bill on lead and zinc and there is no reason to expect that they will be changed.

Recent Cottrell Electric Precipitation Results

SYNOPSIS—At the Raritan Copper Works in Perth Amboy, N. J., a plant to treat the gases arising from smelting slimes is about completed. Appreciable amounts of precious metals are thus recovered. Experiments on the gases of one converter of the American Smelters Securities, Garfield plant, have led to arrangements to install the process for all the converters. The Ohio & Colorado company has arranged to permit installations on either the roaster or the blast-furnace flue, at its Salida plant, Colo. Experiments at this plant showed the necessity of certain precautions in testing.

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Shortly after the organization of the Research Corporation, last February¹, investigations were undertaken for the Raritan Copper Works, Perth Amboy, N. J., on the gases arising from the smelting of the slimes obtained in electrolytic copper refining and the results were so definite that a large plant for treating the entire volume of gases is now nearing completion. The copper, as received at the electrolytic refinery, generally contains some gold, silver and other precious metals, as well as arsenic, selenium, tellurium and many other elements, in small quantities. During the purification of the copper by electrolysis, most of these impurities settle out from the electrolyte. This sediment, called electrolytic slime, is then treated in another department, primarily for the recovery of the gold and silver. It is common practice in some refineries to dry this slime and then give it a furnace treatment. The volatile elements are driven off in the gaseous state and subsequently condensed in the flue. During the furnace treatment considerable silver is vaporized, some of which condenses quite near the furnace exit. At this point in the flue, dust may be found assaying very high in silver. Considerable gold may also be found at this point, probably having been carried over mechanically. Further along the flue, arsenic, antimony, selenium and other elements or their compounds, condense, thus forming a thick chemical fume. It is interesting to note the tendencies of the various compounds to deposit. For instance, some of the silver compounds, or metallic particles, are light and finely divided, and it is extremely difficult to effect a satisfactory recovery of settling chambers, centrifugal dust apparatus or by water sprays and scrubbers. Gold has been found a long distance from the furnace, but as a rule it is the first to deposit.

CHARACTER OF SILVER REFINERY FLUE DUST

The influence of one, or several, volatile metals upon the volatility of other metals, especially at various temperatures, has not been studied extensively, but most authorities state that the loss of silver is increased in the presence of lead or zinc. Probably arsenic or antimony also exert an influence upon the loss of silver. It would be interesting and of considerable value to be able to consult curves of the vapor tensions of these various elements under the varying conditions of these refinery gases. Samples of this kind of dust from various refineries show it to have a range of at least from 100 to 2000 oz. of silver per ton. The gold content is not apt to vary so

greatly. Fume has been collected after passing through water scrubbers (so arranged that the gas was saturated and carried water particles in suspension) and found to still contain large amounts of precious metals.

The character of the fume will depend, of course, upon the composition of the copper received at the refinery, as well as upon the operations of the refining furnaces. It is almost impossible to filter this gas, because of its corrosive action upon the filtering medium, and its tendency to clog it. Results obtained upon these gases have convinced us that practically all of the values now going to waste in these gases can be readily recovered by the electrical precipitation processes, thereby insuring a greater net profit in these departments. The problem of recovering the values from the dust collected is receiving considerable attention. If all the collected dust is fed back into the furnace, the highly volatile elements will again be driven off, subsequently condensed and, in turn, collected. This will permit the impurities to concentrate and increase to such a point as to be objectionable. Experiments have been conducted with a view to facilitating the recovery of the precious metals in a pure state from this precipitated fume. The proposed method may open up an opportunity for valuable improvements in the present practice of treating these electrolytic slimes.

RECENT COTTRELL INSTALLATIONS

Arrangements have also been made to install the process upon the gases from all the copper converters at the Garfield (Utah) smelting plant of the American Smelters Securities Co. The fume contains considerable lead, and small amounts of silver and other elements. Apparatus has been installed to treat all the gases from one converter, and it has been operated successfully for a fairly long period of time without cleaning; the officials' operating results showed a normal clearance of about 98%. A large amount of valuable fume has already been collected. The volume of gas treated is about 100,000 cu.ft. per min. coming from one converter. The gases are treated while moving between the electrodes at a velocity of from 10 to 15 ft. per sec. The same company has also recently conducted some large-scale tests upon gases from the roasters, reverberatories and blast furnaces at this plant, and these were quite as successful as those obtained at the converter. A report of one of the employees of the works stated that some of the officials from New York had witnessed the operations and, to quote, "we had to prove it to them that we were pumping smoke into it." They were using a No. 80 Sturtevant fan to withdraw gases from the flues to deliver them to the Cottrell treater.

The Ohio & Colorado Smelting & Refining Co., which operated a lead smelter at Salida, Colo., has made arrangements permitting them to install the processes for precipitating the fume in either their roaster flue or blast-furnace flue. Godfrey machines and Dwight-Lloyd sintering machines are employed and deliver their gases to a common flue. This flue has a cross-section of such size that the average velocity of the gases is about 500 ft. per min. Some extensive testing has been conducted upon these gases, and interesting results obtained. It was endeavored to draw from the main flue, large average

Note—An excerpt from a paper by Linn Bradley, published in "Proceedings of the Engineers' Society of Western Pennsylvania," April, 1913.

¹"Eng. and Min. Journ.," Oct. 19, 1912, p. 677.

samples of the gases for treatment, and from the results of the operations calculate the probable recovery of values which would be obtained when all these gases were being treated.

Fairly elaborate plans were made for ascertaining volumes of gases handled in the treater (averaging about 10% of the total in the roaster flue), volume of gases contained in the main flue, temperatures, drafts, resistance of flues and chambers, density of solids in the gases, total weight of dust and of the metals contained, and such other data as would enable one to draw reasonably accurate conclusions regarding the probable value of metals escaping into the atmosphere. Upon checking the work, it was found that we were not obtaining a fair sample of the gases from the main flue with the arrangement whereby the gases were withdrawn at right angles, through a hole in one of the walls of the flue, and even though we were drawing the gases through the opening at practically the same velocity as that of the gases in the main flue; the main reason being that the relative inertia of the suspended particles is much greater than that of the surrounding gases, and therefore a greater proportion of gases than solids was withdrawn, and the result was a gaseous body containing too small a percentage of suspended particles; hence when figures were calculated to the entire volume of gases in the main flue, the indicated weight of total suspended particles was lower than actually was the case.

Furthermore, in our methods for ascertaining the percentage clearances, we had a filtering scheme for determining the amounts of suspended particles in the entrance and also in the exit gases. It so happened that we were aspirating from the entrance gases at a velocity higher than that of the main body of entrance gases, thus giving figures upon fume density which were too low, while upon the exit gases our apparatus worked in such a manner that the aspiration was too slow and the results were too high; thus these two errors indicated a percentage of clearance by the treater operation which was lower than the truth. Even under such conditions the percentage clearances generally indicated high.

Tending to prove the statement that by aspirating at too high a velocity the results show a fume density which is too low, is the observation that even though we were not getting a 100% precipitation in the treater, nevertheless the actual amount of fume collected was greater than the total indicated fume content of the gases being treated as calculated from the volume aspirated through the filter and the solids collected therefrom, and compared to the total volume of gases being treated by the processes. With the arrangement of the filtering equipment on hand at the time, it was impossible to obtain checks. At the present time, other arrangements are being considered so that a more accurate calculation can be made of the values in the main flue after which it can be decided whether it will be commercially profitable to collect them. The expense of a bag house would be prohibitive there.

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Fatal Mining Accidents in Australia for the first quarter of 1913 numbered 37, out of a total of 52 in all industrial groups. The number of accidents incapacitating the victim for more than 14 days was 849 in the mining industry and 1087 in all groups. ("Aust. Labor Bull.," May, 1913). Figures of the number of men employed are not furnished, but it is evident that the mining industry makes a poor showing in comparison with the other industries considered, and this in spite of the fact that Australia stands exceedingly well relative to other countries in respect to its mining death rate.

Manufacture of Barium Compounds in Germany

Until recently heavy spar, barium sulphate, served almost exclusively in Germany as raw material for the manufacture of barium oxide, barium hydrate, barium peroxide, and the various salts of barium, according to *Daily Consular and Trade Reports*, June 7, 1913. The sulphate was reduced by heating in kilns with coal to the form of sulphide. From the solution of the latter, barium carbonate was precipitated by the action of carbon dioxide, this carbonate serving as a starting point for the preparation of the chloride, the nitrate and the oxide.

By the recent process of W. Feld, German pat. No. 149,803, of 1901, it is possible to reduce directly natural barium carbonate (witherite), to the form of oxide by heating in retorts in the presence of a fuel free from hydrogen. Several other methods have been patented in Germany, but it is not known to what extent they have been introduced as technical operations. A. Frank, in 1901, took out German patent No. 135,330, a process obtained is of a high degree of technical purity and barium carbonate when mixed and heated. The reaction is:



After evolution of gas ceases, the reaction is complete.

H. Schulze, of Bernburg, under German patent No. 240,267, of 1907, finds it possible to secure a porous form of barium oxide by the direct reduction of the carbonate, if the retort employed for the purpose is lined with carbon and if a narrow space is left free between the walls of the retort and the mixture of carbonate and coal. Otherwise compact crusts are formed adjacent to the walls and particles of the coal are inclosed in them. In a patent of a later date, this inventor described an additional method of effecting the reduction of the carbonate with coal. Use is made of an electric furnace and the mixture of mineral and coal is exposed to combined electrothermal and electrolytic action, forming itself a part of a circuit. The reaction mass is an excellent conductor of the electric current at high temperature. The barium oxide thus obtained is of a high degree of technical purity and possesses a uniformly porous structure.

A wet electrolytic process has been developed by the Siemens & Halske Co., of Berlin, under German patent No. 241,043 of 1910, which makes use of the facts that chloric and perchloric acids are only slightly affected by either the nascent oxygen liberated on an anode or the nascent hydrogen at the cathode. Solutions of barium chlorate or perchlorate serve as electrolytes. Barium carbonate is suspended in the anode cell so that the acid liberated is immediately neutralized, while the equivalent amount of barium oxide is formed in the cathode cell. M. Herzberg proposes in his patent of 1907 (German No. 195,278), to facilitate the decomposition of barium carbonate at a white heat, by introducing substances that react with carbonic oxide, and thus remove it. He accomplishes this by mixing barium peroxide with the carbonate. Siemens & Co., German patents Nos. 158,950 and 200,987, claim to secure good results by heating a mixture of barium carbonate, barium nitrate and coal, in an electric furnace to a white heat.

Decomposition of the carbonate begins as soon as nitrous vapors are evolved. Explosions are avoided by mix-

ing the components with tar, and forming the mass into sticks.

Bradley and Jacobs claim to secure fair results by the reduction of barium sulphate with coal in an electric furnace. In practice, this operation uses a mixture of 60% BaO and 40% BaS. Brochet and Ranson secure the hydrate by submitting aqueous solutions of barium sulphide to electrolysis. H. Nordlinger has devised a method for decolorizing the solutions of barium sulphide obtained by the lixiviation of the crude product resulting from the reduction of heavy spar with coal. He adds 1 to 2% of a solution of caustic soda of 36° Baumé. All color vanishes and there is a marked increase in the readiness to crystallize, the crystals being perfectly colorless. Similar effects are produced by the addition of ammonia water. The introduction of a slight amount of formaldehyde overcomes all danger of oxidation.

W. Mostowitsch has investigated the reduction of barium sulphate by heating with coal. He finds that the reaction begins at 600° C., and is completed at 800° C. Barium sulphide remains unchanged at a temperature of 1000° C.

In producing barium hydrate from crude solutions of barium sulphide, D. Schreiber recommends the following method: The liquid is saturated with hydrogen sulphide and the resultant solution of barium sulph-hydrate is concentrated in a vacuum apparatus. This is treated with cold, concentrated solutions of the alkaline nitrates or of calcium nitrate, and barium nitrate is precipitated. The crystalline product is purified in a centrifugal. An important advance in this field has been achieved by K. Puls, K. Krug, and coworkers, who also make use of the cheap and relatively pure calcium nitrate, now supplied in increasing quantities by the Norwegian works. Witherite, BaCO₃, is finely ground and introduced into an aqueous solution of the nitrate. The mixture is then heated in a digester, provided with an agitator, under a pressure of 1 to 2 atmospheres for 4 hours. After removal from the digester, water is added and the mass is boiled. The precipitate of calcium carbonate is removed by means of a filter press and the residual solution of barium nitrate is evaporated to the point of crystallization.

Traine and Hellmers propose a variation to this method by using, instead of witherite, barium oxalate or barium phosphate, which has been precipitated from solution of barium sulphide. An important process for the reduction of barium sulphate that promises to simplify materially the manufacture of soluble barium compounds is due to C. A. Beringer, of Charlottenburg. He keeps a mixture of heavy spar, 7 parts, and clay, 3 parts, for some time at a bright-red heat and brings about the formation of a double silicate of barium and aluminum. This is readily decomposed by hydrochloric or nitric acid.



Cement Rates

WASHINGTON CORRESPONDENCE

The Interstate Commerce Commission has handed down a decision in the case of the Allentown Portland Cement Co. versus the Philadelphia & Reading Co. in which it holds that the defendant's rates on cement in carloads to Baltimore, Philadelphia, New York and elsewhere, now the same from Evansville, Penn., as from the other cement-producing points in that district, subject the city

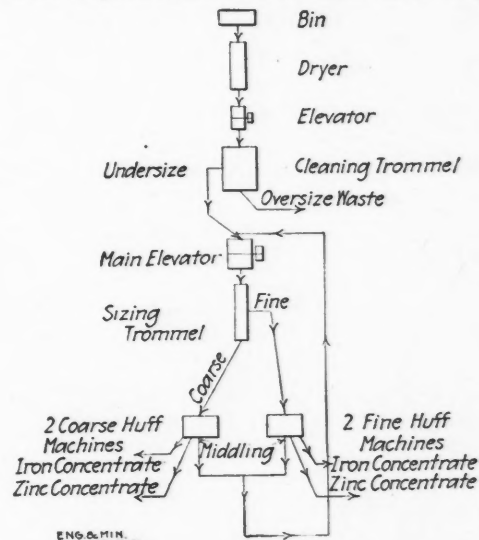
of Jersey City to undue prejudice and disadvantage and it is directed that the defendants shall on or before Sept. 15 next establish fair and equitable rates.



Electrostatic Separation of Barstow Concentrate

BY C. R. WILFLEY*

The Barstow mine, in the Red Mountain mining district, 11 miles from Ouray, Colo., produces a gold-silver ore containing lead, zinc, copper, and iron sulphide, the ratio of concentration being 7.25:1. Prior to the tests herein described, the ore was milled by crushing through breaker and stamps, and concentrating on Wilfley tables and Wilfley multiple-deck duplex slime tables. From the first tables, a 20% lead concentrate was taken, assaying about 6% zinc and less than 1.5% copper, and constituting about 63% of the total product. From the second tables, treating tailing from the first, an iron-zinc product was taken, assaying about 17% zinc. The slime tables made a good mixed concentrate, and all products



OURAY ELECTROSTATIC-SEPARATION PLANT

were sold direct to the American Smelting & Refining Co., at Durango, Colorado.

Shortly before closing the mill in November, for lack of water, two trial runs were made to determine the profit obtainable by separating the zinc and iron at the Huff electrostatic custom plant recently erected and operated by David Foerster, at Ouray. In this separator, concentrate is separated into iron and zinc products, middling returned to the system, and no tailing made.

The first run, herein called lot 1, was made on the regular zinc-iron product. For the second run, the mill scheme was changed, with the purpose of taking out some of the iron from the regular zinc-iron product, which should be under penalty limit in zinc, and of enriching the remainder as a zinc product. Further, it was intended to get additional table treatment of the final middling, to help the saving of gold and silver, and at the same time reduce the amount of these metals going into the zinc product. This was done by simply taking from the second tables an upper or iron streak, amount-

*Ouray, Colo.

ing to 40% of the original zinc-iron product, then sending the remainder, with a wide middling streak, to hydraulic classification and a third set of tables. This

SEPARATION OF BARSTOW CONCENTRATE

Lot No. 1	Au Oz. p.t.	Ag Oz. p.t.	Zn %	Cu %	Pb %	SiO ₂ %	Fe %
Crude concentrate.....	0.948	13.14	17.22	2.62	4.04	6.50	23.65
Iron product.....	1.117	15.48	5.48	3.51	5.00	4.42	35.33
Zinc product.....	0.566	7.83	43.75	0.48	1.77	11.89	6.00
Lot No. 2	Au Oz. p.t.	Ag Oz. p.t.	Zn %	Cu %	Pb %	SiO ₂ %	Fe %
Crude concentrate.....	0.53	8.03	26.18	3.65	1.52	10.54	20.62
Iron product.....	0.69	10.93	7.00	6.14	1.94	7.38	33.47
Zinc product.....	0.32	4.37	46.38	0.51	0.98	14.57	4.35

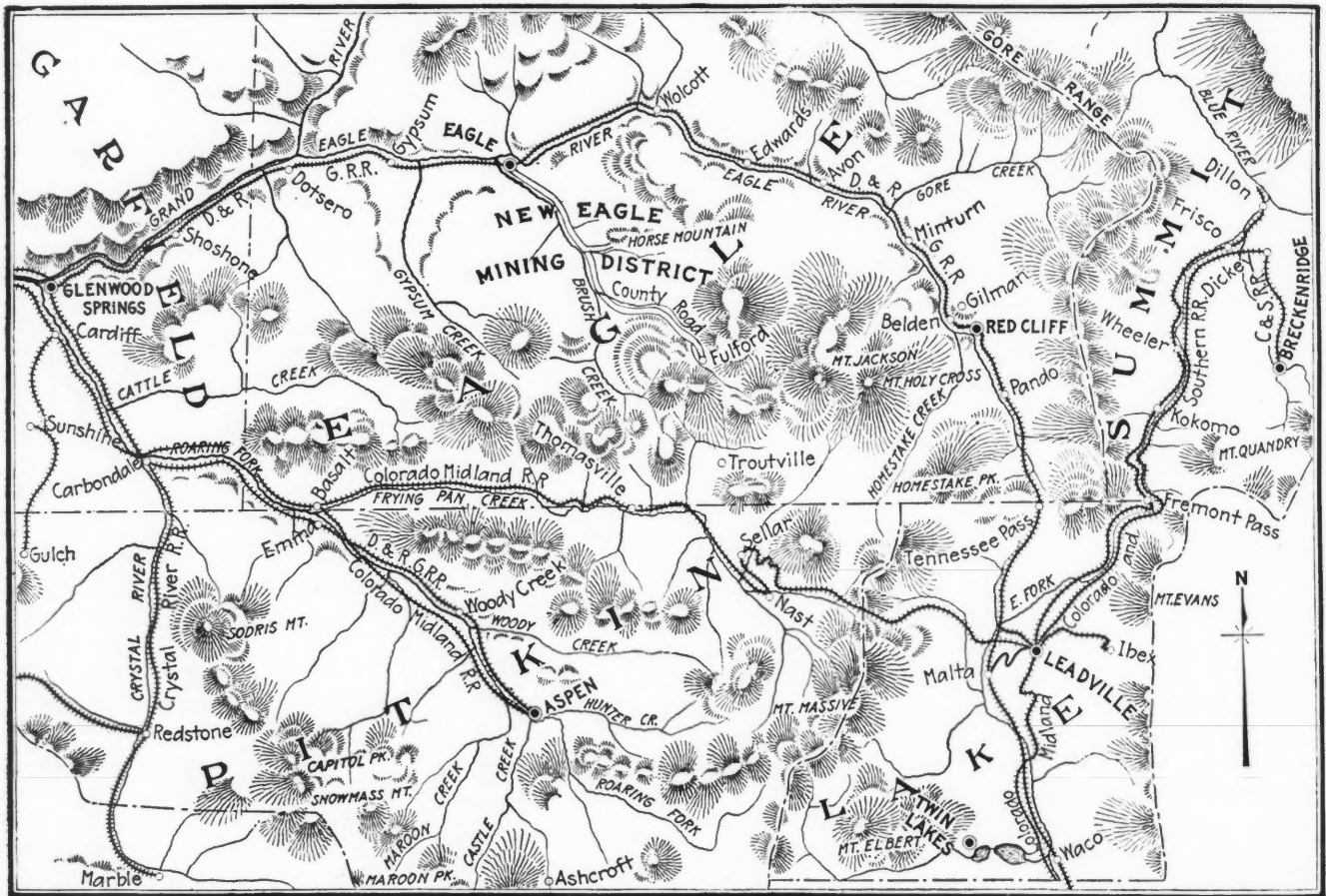
made a zinc product of about 26% zinc, while the iron product took a large part of the gold and silver.

The table shows the results. It indicates that a better separating product was made by the milling change, in spite of the fact that the amount "thrown" to the iron in separating was less for lot 2 than for lot 1.

had to stand the longer haul. The mill scheme has been further modified, as a result of these tests, for the purpose of saving still more of the gold and silver in the lead and iron products, and of "crowding" copper and zinc into a third product; a more thorough scheme is expected to bring still better results. This will be done by classification of the original pulp to first tables, second-table retreatment of tailings, and classification and table treatment of the second-table middlings.

Eagle Mining District

In the accompanying cut is shown a map of the new Eagle mining district of Colorado, furnished by the Denver & Rio Grande R.R. The Lady Belle, the first loca-



EAGLE MINING DISTRICT, COLORADO

In estimating the profits, net value at the railroad loading point is taken, using the same schedule, prices, and freight rate, to afford just comparison. As a matter

RECOVERIES IN SEPARATED PRODUCTS

Iron Products	Au	Ag	Cu	Pb	Zinc Products	Zn	SiO ₂	Fe
Lot 1.....	81.7	81.2	93.0	86.6	Los 1.....	77.9	54.3	6.9
Lot 2.....	73.1	76.3	93.8	71.3	Lot 2.....	85.1	60.9	9.3

PROFIT ON SEPARATION

	Lot 1	Lot 2
Net at R.R., separated.....	\$29.27	\$24.92
Net at R.R., crude.....	21.14	10.08
Profit.....	\$8.13	\$14.38
Profit per ton crude ore.....	\$0.412	\$0.451

of fact, in this particular case, the actual profit was less than that shown, because the original material was hauled a shorter distance to market, while the separated products

tion, was made in November, 1912, on Horse Mountain, which is an almost round elevation, about 1000 ft. high, standing out from the range. The mining properties are only about seven miles from the old farming town of Eagle.

Blasting Down a 20,000-ton Pillar of ore, in the Morris mine of the Giroux company, at Kimberley, Nev., was effected by a single round of 257 shots. The blast was the outcome of months of preparation and is the first really tangible evidence to be given in this district of the cheapness of the much-lauded caving system. No further expense is attached to the handling of the ore except shoveling into cars and hoisting to the bins for shipment to the works at McGill. Following the big blast about half of the working force of the Giroux, about 160 men, were laid off. The Bunker Hill mine has been closed down for the present. With this big "stock pile" to draw from, 150 men can easily keep up shipments to the smelter from the Morris at the rate of from 800 to 1000 tons per day.

The Cost of Copper

BY HEATH STEELE*

SYNOPSIS—An inquiry into the cost of the output of copper of the great American producers, and what is the cost to the ultimate consumer of the world's supply.

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The actual cost of copper and the cost that has a bearing on the price of the metal are very different figures. It is probable that no one will ever be able to give the actual cost of copper or in fact the true cost of any commodity used in the world. If we are asked to give the cost of producing copper by a particular mining concern we must include all expenditures. Its cost at the end will be the total of expenditures for: Location, explorations, regardless of whether ore was found or not; development, equipment and operating. If we were to give the actual cost of copper produced by the State of Arizona, we would have to include expenditures of over 500 companies, yet there are only about 20 that amount to anything as producers. Out of a few thousand copper properties or companies that have existed at one time or another in North America, there are today less than 50 that stand out prominently as producers and almost 50% of the world's supply of copper is produced by about 25 of them.

TRUE COST WOULD CONSIDER BOTH FAILURES AND SUCCESSES

Practically all the failures have been separate from the successful operations. If the industry had been carried on under one head, we would probably have to reckon with this cost as we do with explorations undertaken by the producers. However, like all other unsuccessful enterprises, the unprofitable copper mine is charged to the account of failures and forgotten. It is doubtful if this class adds anything to the cost of production that has any bearing upon the selling price, as practically all our mined and manufactured products come from profitable enterprises. It is, therefore, their cost of production we must consider as having a relation to the market price of the product. This cost will necessarily carry with it a proportionate amount of new equipment, experimental work or unsuccessful explorations.

As representative copper mines, I have selected the following, divided into three groups: The Lake Superior group, the porphyry group, and miscellaneous. The mines selected in the Lake Superior district are: Calumet & Hecla, Copper Range Consolidated, Mohawk, Osceola, Allouez, Isle Royale, Quincy, Ahmeek, Tamarack, Centennial, and Wolverine. The Copper Range Consolidated includes the operations of the Tri-Mountain, Baltic and Champion mines. The porphyries consist of Utah Copper, Nevada Consolidated, Ray Consolidated, Miami and Chino. Miscellaneous comprises Anaconda, North Butte, Tennessee, Shannon, Granby Consolidated, British Columbia Copper, Calumet & Arizona, Mason Valley and Old Dominion. The Lake Superior group of 11 mines produced 205,636,620 lb. of refined copper in 1912. From the five porphyry mines, the production amounted to 249,712,570 lb., and the miscellaneous group of nine

mines produced 473,044,379 lb., a total of 928,393,569 lb. for the 25 mines in 1912, or about 42% of the world's production for the year. The Phelps-Dodge properties have not been included in the groups mentioned for the reason that the reports of the company do not contain sufficient data to obtain its exact cost. However, as a rough guess from the figures given I should say its cost was about 8.5 or 9c. per lb., after crediting all earnings from smelting outside ores, etc. The production of the Phelps-Dodge company from its own ores was 140,628,798 lb. of copper in 1912. This added to the production of the 25 companies mentioned, accounts for 1,069,022,367 lb., or about 48% of the world's production for 1912.

The cost of producing copper at these mines, representing as they do about one-half of the world's output, should give a fair representative average of the cost of copper. There is quite a difference of opinion evidenced in the reports of mining companies as to just what constitutes the cost of production. Some state operating costs only and charge "capital expenditures" off profit and loss or surplus accounts, while others write practically all such expenditures to property accounts. It would not be fair to take the statements of one company charging all expenditures to operating and compare them with costs made up from partial expenditures without calling attention to the fact. For this reason the accounts given in the annual reports have been gone over and their actual expenditures worked out. In some cases it was necessary to do this by working back from the balance of quick assets shown in the balance sheet. It is not my purpose to discuss cost details so expenditures have been brought under as few heads as possible to still allow some analysis. The main fact to be brought out is that a certain amount of money has actually been spent and so much copper has been produced within a certain period.

ANALYSIS OF LAKE SUPERIOR COSTS

Starting with the Lake Superior group; the smelter production statistics credit this district with an output of 231,628,486 lb. of copper for 1912, or a little over 10% of the world's output. The mines selected from this district represent a mine output of 205,636,620 lb. of copper during the same period, or 89% of the output of the district and about 9% of the world's output.

LAKE SUPERIOR 1912 COPPER PRODUCTION AND COSTS

	Copper, Lb.	Net Cost per Lb. Cents
Calumet & Hecla.....	67,856,429	9.86
Quincy.....	20,634,800	11.6
Osceola.....	18,413,387	9.95
Champion*.....	17,225,508	8.88
Ahmeek.....	16,455,769	7.69
Baltic*.....	13,373,961	10.94
Mohawk.....	11,995,598	10.61
Wolverine.....	9,408,960	7.59
Isle Royale.....	8,186,957	11.4
Tamarack.....	7,908,745	13.05
Tri Mountain*.....	6,908,713	11.73
Allouez.....	5,525,455	13.4
Centennial.....	1,742,338	13.4
Total.....	205,636,620	10.58

*Copper Range Consolidated property.

The net cost is obtained after crediting earnings from rents, etc., to the cost of production. The total expenditures of this group for 1912 amounted to 10.58c. per lb.

*52 William St., New York.

of refined copper. During the last five years Calumet & Hecla has produced 376,693,925 lb. of copper from 13,998,914 tons of ore, having an average yield of 26.9 lb. per ton at a cost of 8.92c. per lb. The productions and costs by year have been:

CALUMET & HECLA COSTS OF PRODUCTION

Year	Tons Ore	Yield per Ton, Lb.	Total Lb. Copper	Cost per Lb., Cents
1908.....	2,643,938	31.22	82,549,979	9.00
1909.....	2,842,880	28.18	80,096,995	8.28
1910.....	2,795,514	25.77	72,059,545	8.96
1911.....	2,909,972	25.47	74,130,977	8.52
1912.....	2,806,610	24.18	67,856,429	9.86
Total.....	13,998,914	26.90	376,693,925	8.92

The annual reports of the Calumet & Hecla do not contain statements of operating expenditures, however, a table of costs obtained from the tax reports giving the total cost of copper at 8.97c. per lb. for 1906-1910 shows the cost to be made up as follows: Mining, transportation and stamping, 6.54c.; smelting, 1.17c.; construction, 0.72c.; and general expenses, 0.54c. per lb. of copper.

The Quincy ore yields approximately 16 lb. per ton and during the last seven years the mine has produced 144,507,998 lb. of copper for a total expenditure of \$16,927,257, or 11.7c. per lb. Miscellaneous earnings amounted to \$170,642, leaving a net expenditure of about 11.58c. per lb. However, \$693,050 of these expenditures were for mining lands, which, if deducted from the operating cost, gives a net cost of 11.1c. per lb. The following table gives the record from 1906 to 1912. Mining, transportation and stamping have averaged about 9.5c. per lb.; smelting and general expenses, 0.9c., and construction, 0.7c. per lb.

QUINCY MINING CO. COSTS

Year	Total lb. copper	Total exp. per lb., c.	Land purchases per lb., c.	Miscellaneous receipts, c.	Net Cost per lb., c.
1906.....	16,194,838	12.5	0.434	0.17	11.9
1907.....	19,796,058	12.4	...	0.2	12.2
1908.....	20,600,361	11.4	0.24	0.07	11.1
1909.....	22,511,984	11.0	0.54	0.06	10.4
1910.....	22,517,014	11.2	0.67	0.13	10.4
1911.....	22,252,943	11.3	0.72	0.08	10.5
1912.....	20,634,800	12.5	0.70	0.2	11.6
Total.....	144,507,998	11.7	0.48	0.12	11.1

From 1905 to the end of 1912 the Osceola Consolidated has produced 8,274,961 tons of ore, yielding an average of 16.4 lb. of copper per ton, or a total of 135,481,801 lb. at a net cost of 9.82c., after deducting 0.38c. for miscellaneous credits. Construction has averaged 0.6c. and total expenditures 10.2c. per lb. The record by year is given herewith:

OSCEOLA CONSOLIDATED

Year	Tons of ore	Yield per ton, lb.	Total lb. copper	Total exp. per lb., c.	Misc'l. credits c.	Net cost per lb., c.
1906.....	1,016,240	18.4	18,588,451	10.9	0.6	10.3
1907.....	811,603	16.4	14,134,753	12.4	0.5	11.9
1908.....	1,241,400	17.1	21,250,794	10.53	0.24	10.29
1909.....	1,494,845	16.9	25,296,657	9.47	0.39	9.08
1910.....	1,217,720	15.9	19,346,566	9.37	0.29	9.08
1911.....	1,246,596	14.8	18,388,193	9.28	0.11	9.17
1912.....	1,246,557	14.8	18,413,387	10.36	0.41	9.95
Total.....	8,274,961	16.4	135,418,801	10.2	0.38	9.82

As stated, the Copper Range Consolidated consists of the Champion, Baltic and Tri-Mountain mines. These mines from 1906 to 1912, inclusive, have produced 282,176,555 lb. of refined copper from 12,912,108 tons of ore, yielding an average of 21.8 lb. per ton at a cost of 9.76c. per lb. Of this amount, the Champion produced 121,325,314 lb., at a cost of 9.27c.; the Baltic, 112,939,287 lb., at 9.2c., and the Tri-Mountain, 47,911,954 lb., at 12.5c. per lb. The average yield of the ore was 23.5 lb.,

22 lb., and 18.1 lb., respectively. A table of yearly production and costs follow for each mine. Expenditures of the Copper Range Consolidated Co., not included in these costs, bring the total cost of copper produced by the three mines to 10.1c. per lb.

COPPER RANGE CONSOLIDATED

Year	Champion Mine		Total lb. of copper	Cost per lb., cents
	Tons of ore	Yield per ton, lb.		
1906.....	671,785	25.2	16,954,986	9.3
1907.....	708,685	23.2	16,489,436	11.8
1908.....	794,703	22.3	17,786,763	9.01
1909.....	753,908	23.9	18,005,071	8.45
1910.....	722,051	26.6	19,224,124	7.85
1911.....	734,392	21.3	15,639,426	9.06
1912.....	765,306	22.5	17,255,508	8.88
Total.....	5,150,830	23.5	121,325,314	9.27
Baltic Mine				
1906.....	649,932	22.3	14,397,557	9.6
1907.....	761,288	22.	16,704,868	10.3
1908.....	764,117	23.2	17,724,854	8.3
1909.....	814,260	21.9	17,817,836	7.99
1910.....	781,419	22.4	17,849,762	8.35
1911.....	696,795	22.06	15,370,449	9.13
1912.....	652,433	20.50	13,373,961	10.94
Total.....	5,120,244	22.00	112,939,287	9.20
Tri-Mountain Mine				
1906.....	506,492	18.8	9,607,933	12.2
1907.....	444,358	18.4	8,190,711	13.3
1908.....	334,929	18.	6,034,908	12.6
1909.....	323,408	16.4	5,282,404	13.9
1910.....	317,299	17.9	5,694,868	12.4
1911.....	347,885	17.59	6,120,417	11.55
1912.....	366,663	19.04	6,980,713	11.73
Total.....	2,641,034	18.1	47,911,954	12.5
3 mines.....	12,912,108	21.8	282,176,555	9.76
Including copper range expenditures.....				10.10

The Ahmeek, during the last seven years, has produced 67,563,693 lb. of copper from 2,973,090 tons, averaging 22.7 lb., at a cost of 10.8c. for total expenditures with a credit of about 0.1c. for miscellaneous receipts, making a net cost of 10.7c. per lb. This cost includes 2.33c. for construction, made up largely of expenditures for a new mill.

AHMEEK

Year	Tons of ore	Yield per ton, lb.	Total lb. copper	Cost per lb., cents
1906.....	166,960	18.5	3,077,507	18.
1907.....	320,733	17.4	5,510,985	12.5
1908.....	298,178	21.1	6,280,241	13.8
1909.....	406,045	22.6	9,198,110	15.5
1910.....	530,365	22.3	11,844,954	11.05
1911.....	598,549	25.4	15,196,127	7.17
1912.....	652,260	25.2	16,455,769	7.69
Total.....	2,973,090	22.7	67,563,693	10.7

The Mohawk Mining Co., during the last seven years, has produced 76,502,593 lb. of copper, at a cost of about 11.08c. per lb. This copper came from 5,157,188 tons of ore, yielding 14.8 lb. per ton. The latest available figures show a cost of \$1.34 per ton of ore hoisted, of which a little over 9% is sorted out, resulting in a cost of \$1.47 per ton treated. The cost of smelting, freight, marketing and office expenses amount to about 0.87c. per lb. of refined copper. Construction during 1912 was 0.07c. per lb. The costs and production by year are given:

MOHAWK MINING CO.

Year	Tons of ore	Yield per ton, lb.	Total lb. copper	Cost per lb., cents
1906.....	618,543	15.12	9,352,252	11.4
1907.....	640,777	15.77	10,107,266	11.6
1908.....	685,823	15.01	10,295,881	10.8
1909.....	819,019	13.73	11,248,474	11.2
1910.....	802,537	14.22	11,412,066	11.4
1911.....	802,548	15.07	12,091,056	10.4
1912.....	787,941	15.22	11,995,598	10.61
Total.....	5,157,188	14.8	76,502,593	11.08

The Wolverine is one of the lowest-cost copper producers. During the period 1906-1912, it has produced 67,189,788 lb. of copper at a cost of about 7.33c. per lb., after allowing miscellaneous credits of approximately 0.07c. To produce this copper, 2,589,093 tons of ore

were treated, yielding 25.9 lb. of copper per ton. The reports of this company are issued for the fiscal years ended June 30, therefore, all figures stated are for years ending on that date. During the year ended June 30, 1912, the cost per ton of rock hoisted was \$1.53, and after discarding about 3% by sorting, the cost was raised to \$1.58 per ton stamped. The Wolverine vein is about 15 ft. wide and dips 37°. No timber is required and favorable working conditions, good grade of ore and good management are responsible for the low cost it obtains.

WOLVERINE				
Year	Tons of ore	Yield per ton, lb.	Total lb. copper	Cost per lb. c.
1906.....	341,820	28.2	9,681,706	6.76
1907.....	344,062	27.2	9,372,982	7.45
1908.....	348,860	26.8	9,356,123	7.2
1909.....	373,694	26.8	9,995,748	7.28
1910.....	401,873	25.	9,757,101	7.39
1911.....	388,476	24.75	9,617,168	7.55
1912.....	401,308	23.45	9,408,960	7.59
Total.....	2,589,093	25.9	67,189,788	7.33

There are still four mines of the Lake Superior group included in this calculation to be considered: The Isle Royale, Tamarack, Allouez and Centennial. The Tamarack costs have been increased on account of depth, and while profitable only during high-metal prices, it is still producing at the rate of over 7,000,000 lb. per annum. The other properties have some promise of being steady producers for several years. Isle Royale, since the end 1905, has produced 37,579,893 lb. of copper from 2,497,-

ISLE ROYALE				
Year	Tons of ore	Yield per ton, lb.	Total lb. copper	Net cost per lb., c.
1906.....	192,210	15.3	2,937,098	13.5
1907.....	175,450	15.2	2,667,608	27.5
1908.....	218,940	13.8	3,011,660	28.3
1909.....	401,280	14.3	5,719,056	15.85
1910.....	520,860	14.5	7,567,394	11.3
1911.....	457,440	16.4	7,490,120	10.55
1912.....	531,105	15.4	8,186,957	11.4
Total.....	2,497,285	15.1	37,579,893	14.6

TAMARACK				
Year	Tons of ore	Yield per ton, lb.	Total lb. copper	Net cost per lb., c.
1906.....	389,680	25.3	9,832,644	14.7
1907.....	533,600	20.8	11,078,604	16.5
1908.....	654,897	19.6	12,806,127	15.2
1909.....	689,099	19.6	13,533,207	14.1
1910.....	525,554	21.1	11,063,606	14.4
1911.....	392,338	19.1	7,494,077	15.4
1912.....	421,385	18.8	7,908,745	13.05
Total.....	3,606,553	20.5	73,717,010	14.8

ALLOUEZ				
Year	Tons of ore	Yield per ton, lb.	Total lb. copper	Net cost per lb., c.
1906.....	178,292	19.5	3,486,900	13.7
1907.....	214,720	9.85	2,134,116	40.8
1908.....	220,905	13.80	3,047,051	16.9
1909.....	253,049	15.93	4,031,532	13.3
1910.....	247,119	18.84	4,655,702	11.1
1911.....	288,610	16.56	4,780,494	13.1
1912.....	333,618	16.56	5,525,455	13.4
Total.....	736,313	15.9	27,661,250	15.4

CENTENNIAL				
Year	Tons of ore	Yield per ton, lb.	Total lb. copper	Net cost per lb., c.
1906.....	166,000	13.58	2,253,015	19.6
1907.....	200,040	11.85	2,373,572	27.4
1908.....	169,693	12.94	2,196,377	21.2
1909.....	196,525	13.15	2,583,793	15.5
1910.....	102,133	15.40	1,572,566	14.3
1911.....	86,543	17.26	1,493,834	12.7
1912.....	106,517	16.36	1,742,338	13.4
Total.....	1,027,451	13.9	14,215,495	18.3

285 tons of ore, yielding 15.1 lb. per ton, at a net cost of 14.6c. per lb. Of this cost, about 2.68c. was for construction, lands, etc.; total expenditures amounted to 15.2c., from which a credit of 0.6c. was deducted for receipts from miscellaneous sources. Tamarack during the same period stamped 3,606,553 tons of ore, yielding 20.5 lb. of copper per ton, producing 73,717,010 lb. of refined copper. The total expenditures equalled 15c. per lb., of which 0.65c. was for construction, etc. Other receipts deducted from expenditures leave a net cost of 14.8c. per lb. The Allouez Mining Co. produced 27,661,250 lb. of copper at a net cost of about 15.4c. per

lb., from the end of 1905 to Dec. 31, 1912. Receipts from miscellaneous sources deducted from total expenditures amounted to 0.2c. per lb. The average yield of the ore was 15.9 lb. and construction, etc., approximately 3c. per lb. Centennial stamped 1,027,451 tons of ore, yielding 14,215,495 lb. of copper, or 13.9 lb. per ton during 1906-1912. The net cost of this copper was 18.3c. per lb. Construction and land purchases included in this cost are equal to about 4.5c. A credit of 1.7c. per lb. was made for sale of mill interest and other receipts.

SUMMARY OF LAKE SUPERIOR GROUP

The production of this group for the last seven years has amounted to 1,303,227,001 lb. of refined copper from ore having an average yield of 20.4 lb. per ton. The net cost of this copper has averaged a little over 10.3c. per lb., which is less than the average obtained for 1912 by about 0.28c. per lb. Approximately 56% of the present output of the district is produced at or below this cost while the remaining 44% costs anywhere from 10.5c. up, as will be seen by referring to the table of costs and production for 1912, which accounts for about 89% of the entire output.

THE PORPHYRY GROUP

Practically speaking, all the properties of the porphyry group are new mines, as not one of them has yet reached its maximum production, with the exception of the Nevada Consolidated. They have all expended large sums for development and equipment, as will be shown by figures given. The greater part of these expenditures are chargeable to future production and are being carried in deferred operating accounts or capital accounts that are given, but in figuring the cost of producing copper, the operating costs as reported by the companies are used. During 1912, the production from these mines was as follows:

PRODUCTION, PORPHYRY GROUP, 1912

Mine	Tons of ore	Yield per ton lb.	Total lb. copper
Utah Copper Co.....	5,315,321	17.2	91,366,337
Nevada Consolidated.....	2,887,731	21.9	63,063,261
Ray Consolidated.....	1,565,875	22.2	34,674,275
Miami Copper.....	1,040,744	31.5	32,832,609
Chino Copper.....	1,122,666	24.7	27,776,088
Total 1912.....	11,932,337	20.93	249,712,570

It will be noted that the total production of this group was 249,712,570 lb. of refined copper from 11,932,337 tons of ore, yielding 20.93 lb. per ton during 1912. This copper was produced at a net operating cost of 8.83c. per lb., after crediting 0.83c. for miscellaneous receipts and 0.57c. for receipts from sale of gold and silver contents. The Nevada Consolidated dividends received by the Utah Copper Co. are not included in the credits against operations. The operating cost as reported by these concerns is claimed to carry a proportionate amount of stripping of overburden from ore mined from openpits, underground development and depreciation on plants and equipment. The total amount expended by the group during 1912 amounted to \$32,071,810, made up of: \$25,531,221 for operations, \$3,452,869 for deferred stripping and development, and \$3,057,720 for construction and equipment. Miscellaneous receipts totaled \$2,060,002, and sales of gold and silver, \$1,446,208. In addition to the expenditures given, there were spent \$1,039,797 for investments in subsidiary companies and \$1,042,637 for additional property.

For details of costs for this group, reference is made to the table given for 1912.

1912 COSTS PER LB. COPPER FOR PORPHYRY GROUP

Mine	Operating cost, c.	Misc'l. earnings credit, c.	Gold and silver credit, c.	Net cost, cents	Deferred charges
Utah Copper.....	9.98	0.054	0.956	8.97	2.80
Nev. Cons.....	11.63	2.46	0.820	8.34	0.99
Ray Cons.....	10.53	0.827	0.023	9.83	5.14
Miami.....	10.15	0.02	0.13	10.00	0.98
Chino.....	7.09	0.45	....	7.24	4.75
Total.....	10.23	0.83	-0.57	8.83	2.61

The Utah Copper Co., Bingham, Utah, in 1912 mined 78.81% of its tonnage by steam shovels and 22.19% from underground. The capacity of its Magna mill is 12,000 tons per day and the Arthur plant can treat 8000 tons, a total capacity of 21,000 tons per day. Allowing for delays in operation, this should give about 7,000,000 tons annual capacity and an output of something over 100,000,000 lb. of copper per year. Since June 30, 1907, this company has produced 375,183,676 lb. of refined copper from ore yielding from 17.2 lb. to 20 lb. per ton. This copper has been secured for an operating cost of 9.5c. per lb., with credits of 1.03c. for gold and silver, and 0.05c. for miscellaneous earnings, making a net operating cost of 8.42c., as reported. During this period there has been spent \$4,571,714 for stripping and development and \$5,587,316 for construction and equipment not charged to operations but carried in deferred charges. These charges to date equal about 2.79c. per lb. of copper produced, of which 1.22c. is deferred development and stripping and 1.59c. is for construction and equipment. The ore reserves are estimated to contain 316,500,000 tons of ore, averaging about 30 lb. of copper per ton, which, according to past records, should yield something like 18 lb. of refined copper. The present deferred charges amount to only about 0.177c. per lb. of recoverable copper in reserves. It is understood, however, that this charge is likely to increase before all development and stripping is completed. The actual construction necessary to keep the plant and equipment in repairs should be reckoned at not less than 0.7c. per lb. of copper. This figure is obtained from expenditures of numerous copper producers whose operations extend back for several years and may be applied to any operations which include milling.

In the table giving the record of this company by year, the first period is for 18 months, from June 30, 1907, to Dec. 31, 1908. The value of the gold and silver contents per pound of copper was: 0.91c., 1c., 1.18c., 1.07c. and 0.956c. in the order given in the table:

UTAH COPPER CO.

Year	Tons of ore	Yield per ton, lb.	Total lb. of copper	Costs per lb. copper	Less credits, c.	Net Cost, c.
1908.....	not given	.....	54,051,212	9.80	0.96	8.84
1909.....	not given	.....	51,749,233	9.80	1.05	8.75
1910.....	4,340,245	19.46	84,502,475	9.25	1.24	8.01
1911.....	4,680,801	19.95	93,514,419	8.89	1.11	7.78
1912.....	5,315,321	17.20	91,366,337	9.98	1.01	8.97
Total.....	.....	.....	375,183,676	9.5	1.08	8.42

The Nevada Consolidated Copper Co., Ely, Nev., to date has mined all its ore from openpits, but is planning to extract some of its present ore reserves by underground mining. The cost of production will naturally increase when this method is adopted, the present cost is about 30.4c. per ton, underground mining will probably average \$1 for all expenses. The company makes a large profit from its investments, which are nothing more than ownerships of subsidiaries operating its railroad and reduc-

tion works. The profits derived from this source are a part of the business, therefore are rightly a credit against operating expenditures. The income from these concerns amounts to approximately \$1,500,000 per year, or a little over 2c. per lb. of copper. During 1910, 1911 and 1912, this company has produced 8,463,001 tons of ore, yielding 24.2 lb. of copper per ton, or 204,376,873 lb. of refined copper. Gold and silver contents have averaged 0.78c. per lb. of copper, and miscellaneous receipts from investments, 2.17c. Operating expenditures have equaled 10.35c. per lb.; deducting credits, the net cost of this copper as reported was 7.4c. per lb. Deferred stripping charges during this period are equal to 0.98c. per lb. of copper produced, and construction, 1.01c. per lb. The ore reserves are estimated to contain 38,853,551 tons of 33.4-lb. ore. The present deferred charges amount to something over 0.45c. per lb. of recoverable copper yet to be mined. The record for three years given herewith is for periods ended Sept. 30, 1910, and Dec. 31, 1911 and 1912. In 1912 the production was below normal on account of labor troubles.

NEVADA CONSOLIDATED

Year	Tons ore	Yield per ton	Total lb. copper	Operating cost, c.	Less credits, c.	Net cost c.
1910.....	2,237,028	28.1	62,772,342	9.8	2.8	7.00
1911.....	3,338,242	23.6	78,541,270	9.8	2.81	6.99
1912.....	2,887,731	21.9	63,063,261	11.6	3.25	8.35
Total.....	8,463,001	24.2	204,376,873	10.35	2.95	7.40

The remaining three mines of the porphyry group—Ray Consolidated, Miami and the Chino—are just entering their production period. In 1911 Ray Consolidated, Kelvin, Ariz., produced 14,935,047 lb. of copper from 681,519 tons of ore, yielding 21.9 lb. per ton at a net cost of 11c. per lb., after deducting 1.5c. for miscellaneous credits. For 1911 and 1912, the production was 2,247,394 tons, yielding 22.1 lb. of copper per ton, or a total of 49,609,322 lb. The average cost of this copper was 11.15c. per lb. for operating expenditures as charged, less credits, amounting to 1.05c. per lb., making a net cost of 10.1c. Present deferred development amounts to about 0.15c. per lb. of recoverable copper estimated to be in the ore reserves, and 0.28c. will about cover construction and equipment charges as carried in capital accounts.

The Miami Copper Co., Miami, Ariz., in 1911 produced 15,385,783 lb. of refined copper, making a total of 48,218,392 lb. for two years ended 1912. The cost reported was 9.8c. per lb. less 0.17c. for credits, or a net cost of 9.63c. per lb. The deferred charges of the Miami, as they stand at present, are equal to about 0.65c. per lb. of recoverable copper, estimated to be in reserve. Of this, 0.22c. is for development, and 0.434c. is for construction and equipment.

In 1911 the production of Chino was less than 1,000,000 lb. and as actual operations were not well underway until 1912, the production for 1912 is all that is considered in this calculation. At present the deferred charges for stripping and development at Chino amount to approximately 0.288c. per lb. of recoverable copper in ore reserves, made up of 0.244c. for construction and equipment and 0.044c. for development and stripping.

SUMMARY OF PORPHYRY GROUP

The five companies mentioned are the only producers of any consequence of the so called porphyry group. The

Inspiration Copper Co., situated near the Miami and Ray Consolidated, will produce something over 50,000,000 lb. per year when operations are well under way. Its mill is now being constructed and it will be at least three years before its output reaches this amount. The Inspiration costs should compare with those of Ray Consolidated. The Braden Copper Co., of Chile, is just entering the productive stage and will, in all probability, reach an output of 70,000,000 lb. of copper per annum, though the present plant can turn out only about half this much. There is no reason why this copper should not be produced as cheaply as copper from the western porphyries, as the class of labor secured there is much above the average of other South American countries and other conditions are favorable for reasonable costs.

From the figures given, it will be seen that we have accounted for a total production of 705,164,351 of copper from the porphyry mines. The average cost of this copper, as computed from figures, given in the annual reports, is 9.8c. per lb. for operating, with credits of 1.53c., making a net cost of 8.27c. per lb. As the deferred charges of the group stood at the end of 1912, they amounted to approximately 4.74c. per lb. of copper produced, made up of 1.72c. for stripping and development and 3.02c. for construction and equipment. However, based upon the amount of copper expected to be recovered from the ores in reserve, these charges amount to only about 0.106c. and 0.188c., respectively, or a total of 0.294c. per lb. yet to be recovered from reserves. It will be noticed that the average cost for 1912 is higher than the average to date, due in part to labor troubles at the Utah and Nevada Consolidated, yet the costs of 1912 are by no means high, and if maintained as an average through the life of the mines, a new record in copper costs will be confirmed.

MISCELLANEOUS GROUP

We now take up a group of companies which obtains its copper from ores yielding approximately 57 lb. per ton. The exact yield cannot be obtained as two of them do not give the tonnage treated. This estimate includes the Phelps-Dodge ores, which average over 70 lb. per ton from all mines operated by it. The other companies in 1912 obtained a yield of between 52 to 54 lb. per ton. The Calumet & Arizona and the Superior & Pittsburgh are practically one operating company, as is the case of the Old Dominion and the United Globe, but as their operating statements are made separately, they are so treated in the tables. The miscellaneous group's output for 1912 is given for each mine.

PRODUCTION OF THE MISCELLANEOUS GROUP, 1912

	Tons of ore	Yield per ton, lb.	Total lb. copper
Anaconda.....	5,069,242	58	294,474,161
North Butte.....	425,297	62	26,480,123
Tennessee.....	444,289	29.8	13,352,634
Shannon.....			16,406,336
Granby.....	739,519	17.9	13,231,121
British Columbia.....	740,589	15	11,146,811
Calumet and Arizona.....	159,513	92.1	16,490,229
Superior and Pittsburgh.....	288,429	127	36,618,399
Mason Valley.....	241,822	66.5	16,058,493
Old Dominion.....			16,533,999
United Globe.....	188,254	65	12,252,073
			473,044,379
Phelps-Dodge output.....			140,628,798
Total.....			613,673,177

The average cost of this copper was 9.6c. per lb., after allowing credits of 2.38c. for gold and silver contents and

0.18c. for miscellaneous receipts reported. The operating expenditures, as reported, amounted to 12.16c. per lb. and construction and other expenditures not charged to operations did not exceed 0.4c. per lb. Including the Phelps-Dodge production, it is safe to say that the copper produced during 1912 from the sources mentioned did not exceed a net cost of 9.5c., after allowing credits. The Tennessee Copper Co. is now deriving some profit from the production of sulphuric acid from its fumes, but from figures published, there is no way to estimate what its income from this source is.

The statement of the United Globe expenditures do not contain smelting charges, which are evidently deducted by the Old Dominion before making settlements for its ore. For this reason, the costs of the two companies are figured together. The Mason Valley began operations in 1912, and its costs will be lower when operations are on the basis contemplated.

1912 COSTS—MISCELLANEOUS GROUP, PER LB. COPPER

	Operating, c. per lb.	Gold and silver, c.	Misc'l. receipts, c.	Net cost, c.	Construction, etc., not charged, c.
Anaconda.....	12.3	2.66	0.24	9.40	0.01
North Butte.....	13.1	3.37	.....	9.73	.....
Tennessee.....	.....	.....	.....	11.00	0.04
Shannon.....	12.6	1.05	.....	11.55	.....
Granby.....	17.3	6.06	.....	11.24	.....
British Columbia.....	18.5	5.3	.....	13.2	3.1
Calumet and Arizona.....	10.66	1.96	.....	8.70	0.2
Superior and Pittsburgh.....	7.67	1.36	0.05	6.26	0.2
Mason Valley.....	14.8	0.23	.....	14.57	0.003
Old Dom.—United Globe.....	9.0	0.51	0.44	8.05	0.59
Total.....	12.16	2.38	0.18	9.6	0.4

The Anaconda Copper Co., Butte, Mont., in 1910, took over the Boston & Montana, Red Metal, Butte & Boston and several other important producers, so that now it produces practically all the copper from the Butte district. As stated, the output from the Lake Superior district in 1912 was 231,628,486 lb. The magnitude of the Anaconda and its importance in the copper industry may easily be realized by comparing its production with that of the Lake district, which is exceeded by nearly 63,000,000 lb., or by almost as much as the Calumet & Hecla output. Its present annual output is over 2½ times the maximum expected from the Utah Copper and about twice the present yearly output of the Phelps-Dodge properties. The Anaconda ores in 1912 yielded about 0.415c. gold and 0.0375 oz. silver per ton. The gold content has doubled since taking over the other properties mentioned, but the silver content has remained practically the same. Apparently the Anaconda has charged more depreciation on plants, etc., than it has actually spent in the past seven years. To get the actual expenditures the statements have been checked carefully. Since Jan. 1, 1906, to Dec. 31, 1912, the production of this company has been 1,076,913,905 lb. of refined copper. This came from ores yielding from 56.4 to 61 lb. per ton. In 1912, the yield was 58 lb. The actual expenditures to produce this copper have amounted to approximately 13.3c. per lb. Gold and silver credits were about 2.45c. per lb. The company has various incomes from investments and subsidiaries, which are a part of the business and should be credited to its expenditures. Income from this source has averaged about 0.45c. per lb., making a total credit of 2.9c., and a net cost of 10.4c. per lb. of copper produced in the past seven years.

Next to the Anaconda the North Butte is the most important copper producer in the Butte district. Its ore has yielded about 77 lb. per ton in the last six years, in

1911 and 1912 the yield has been 60.5 and 62.1 lb., respectively. Gold and silver have averaged 2.26c. per lb., and during the last three years of the period this credit has amounted to 2.22c., 2.55c. and 3.37c. per lb. The production of copper from Jan. 1, 1907, to Dec. 31, 1912, was 163,115,127 lb., at a total cost of 10.75c. per lb., including all expenditures except investments and payments on mining lands. After deducting the precious-metal contents, the net cost of this copper has averaged 8.49c. per pound.

Beginning with 1909, the Tennessee Copper Co., Copperhill, Tenn., has not issued a statement of operating expenditures in a form that will permit working out its average cost, as is the case with most of the other concerns mentioned. However, I am confident that its actual net receipts from operations have been:

1907.....	\$808,523
1908.....	406,317
1909.....	337,621
1910.....	282,193
1911.....	356,507
1912.....	1,224,159
Total.....	\$3,415,321

These figures were obtained by working back from changes made in quick assets, after allowing for receipts from bond issues. For example, in 1912 the balance of quick assets was increased \$230,640. No money was received from loans, so that all disbursements were evidently earned. Adding dividends paid, \$500,000; bonds redeemed, \$300,000; and interest paid on bonds, \$80,250, we have an actual net gain of \$1,110,890 for the year above all expenditures. The company has been compelled to control the fumes from its smelting plant, and has spent a considerable sum for several years in changes and the erection of a sulphuric-acid plant. These expenditures are properly chargeable to deferred or capital accounts. In 1912, this construction amounted to \$113,269, which, added to the net gain of \$1,110,890, gives actual receipts over operating expenditures and current construction of \$1,224,159 for 1912, as shown. By these figures it is possible to get a good check on the cost, as reported by the company. During this 6-year period, the price of copper has averaged about 14.6c. per lb. The production was 80,613,141 lb. of refined copper, indicating a profit of 4.23c. per lb. for the period, or an average cost of about 10.4c. per lb. The actual price received by one company does not agree with the quoted average market price for the year, however, by this method the company's reported cost is checked to 0.3c. per lb., the average by its own figures being about 10.7c. per lb. Therefore, the reported costs should be accepted with confidence. We then have 80,613,141 lb. of copper produced by this company from 1907-1912 at a net cost of 10.7c. per lb., exclusive of smelting and acid-plant construction. Gold and silver produced were about 0.03c. per lb. in 1912, but it is not plain that all this comes from the company's own ores. The ore has yielded about 33 lb. of copper per ton.

The Shannon Copper Co., Metcalf, Ariz., for seven years ended Dec. 31, 1912, has produced and sold 108,287,586 lb. of copper from ore which yields from 40 to 50 lb. per ton; an exact figure cannot be obtained from the reports as no tonnage figures are given. The total expenditures of the company were apparently 14.5c. per lb., or 13.8c. net, after allowing for 0.7c. gold and silver contents. The yield in silver is almost double the gold

produced. These expenditures consisted of 0.43c. for construction, etc., and 0.27c. for development of outside properties, the remainder being direct operating cost.

At the Granby Consolidated Mining, Smelting & Power Co., Phoenix, B. C., during seven years ended June 30, 1912, there were treated 6,286,847 tons of ore yielding 21.2 lb. of copper, 0.34 oz. of silver, and 0.047 oz. of gold per ton. The total production of copper amounted to 133,218,126 lb. The company during this period has received about 57c. per oz. for its silver, with gold at \$20 it should have a credit of about 5.35c. per lb. of copper produced for these metals. The company has spent, exclusive of new property purchased, 16.8c. per lb. of copper, crediting gold and silver, the net cost of this copper was about 11.45c. per lb. The yield of the ore smelted has been falling for the past four years; in 1908 it was 24 lb.; 1909, 22.3 lb.; 1910, 19 lb.; 1911, 18.1 lb.; and in 1912 it was 17 lb. per ton.

The British Columbia Copper Co., Greenwood, B. C., during four years ended Dec. 31, 1913, has smelted 2,164,542 tons of ore yielding 34,560,255 lb. of copper, or 16 lb. per ton. This includes custom ore smelted. The yield of the company's ore has been: 17.7 lb., 18, 16.4 and 13.6 lb. for 1909-1912, in the order named. Precious metals produced amounted to 100,212 oz. gold and 424,705 oz. silver. The total operating charges, including 2.6c. per lb. of copper for purchased ores and miscellaneous expenses, were 17.8c. per lb. of copper produced. Deducting precious metals the operating cost was 11.3c. per lb. In addition to this charge, construction and mining land purchases amounted to 2.24c. per lb., but there is no way to segregate these charges from the figures given in the reports.

The Calumet & Arizona, Warren, Ariz., during the period 1908-1912, has produced 121,677,650 lb. from ore yielding 99 lb. of copper and 1.1c. of gold and silver per lb. of copper. The net cost of this copper was 9.46c. per lb. after deducting 1.1c. for other metals and 0.61c. for miscellaneous earnings from an expenditure amounting to 11.17c. per lb. The dividends received from the Superior & Pittsburgh are not credited in this cost. All expenditures are included in this figure except those for investments and construction of a new smelting works, which has just been erected. Current construction included is about 0.036c. per lb. In addition to this all exploration charges on outside properties are included. At the end of 1912 the new smelting plant had cost \$1,174,987. As its subsidiary, the Superior & Pittsburgh during the same period the production of copper was 137,635,480 lb., at a net cost of 8.46c. per lb. from ore yielding 119 lb. per ton. This cost is obtained after deducting 0.97c. for gold and silver contents and a small credit for other income. Stock investments and property purchases are not included. The ore has shown an increase in yield for the past two years.

The Mason Valley Mines Co., Thompson, Nev., began producing in 1912. Its cost of production was given in the table for 1912 costs, which in this case represented total expenditures for the year. The last of the miscellaneous group, the Old Dominion Co., operates the Old Dominion Copper Mining & Smelting Co. and the United Globe Mines, Globe, Ariz. During five years ended Dec. 31, 1912, the two companies have produced 139,219,259 lb. of copper at a net cost of 9.8c. for all expenditures.

This cost is obtained by including all operating and construction expenditures at the mines, expenditures apparent from an analysis of reports, and Boston expenses of the Old Dominion Co.; these amount to 10.5c. per lb. Besides the gold and silver contents of the ore (0.34c. per lb.) there are credits of 0.36c. for interest receipts of the Old Dominion Co., smelting profits and miscellaneous income. These deducted from the total expenditure make the cost 9.8c. for five years as stated.

In the miscellaneous group, 2,011,299,022 lb. of the last seven years' production has been accounted for. It will be seen in the table or summary of this group that this copper has been produced and marketed for 10.3c. per lb., after deducting 2.4c. for credits, from expenditures amounting to 12.7c. per pound.

SUMMARY OF MISCELLANEOUS GROUP FOR PERIODS ENDED 1912

Years	Yield per ton, lb.	Total production, lb.	Cents per lb. copper			Net cost	
			Expenditures	Ag Au	Misc'l. Credits		
Anaconda.....	7	56 to 61	1,076,913,905	13.30	2.45	0.45	10.4
North Butte.....	6	about 77	163,115,127	10.75	2.26	.....	8.49
Tennessee.....	6	33	80,613,141	.....	.....	.....	10.7
Shannon.....	7	40 to 50	108,287,586	14.5	0.70	.....	13.8
Granby.....	7	21.2	133,218,126	16.8	5.35	.....	11.45
British Columbia.....	4	16	34,560,255	17.8	6.5	.....	11.3
Calumet and Ariz.....	5	99	121,677,650	11.17	1.1	0.61	9.46
Superior and Pitts.....	5	119	137,635,480	9.43	0.97	.....	8.46
Mason Valley.....	1	66.5	16,058,493	14.8	0.24	.....	14.57
Old Dominion	5	.....	139,219,259	10.5	0.34	0.36	9.8
United Globe							
Total or average.....			2,011,299,022	12.7	2.1	0.3	10.3

CONCLUSION

We have now a record of 4,019,690,374 lb. of copper covering several years for each mine except the new producers included. The cost of this copper was just a fraction over 10c. per lb., after deducting all credits. This output and cost has been accounted for in the following manner:

Lake Superior group.....	1,303,227,001 lb. at 10.3 cents
Porphyry group.....	705,164,351 lb. at 8.27 cents
Miscellaneous group.....	2,011,299,022 lb. at 10.3 cents
Total and average.....	4,019,690,374 lb. at 10.0 cents

It has been only within the last three years that the porphyry mines production has exceeded much over 100,000,000 lb. per annum. Their production has only affected the cost of copper a fraction of a cent per pound in the last seven years. In 1912 the Lake group produced 22.1% of the copper accounted for, not including the Phelps-Dodge output; the porphyries, 27%, and the miscellaneous group, 50.9%. Including the Phelps-Dodge Co., the porphyry group produced 22.3% of the output accounted for. The output and costs for 1912 are summarized:

Lake group.....	205,636,620 lb. at 10.58 cents
Porphyry group ¹	249,712,570 lb. at 8.83 cents
Miscellaneous group.....	473,044,379 lb. at 9.6 cents
Total and average.....	928,393,569 lb. at 9.6 cents
Phelps Dodge Co. ²	140,628,798 lb. at 8.5 to 9c.
Total and average.....	1,069,022,367 lb. at 9.55 cents

¹ Deferred and construction charges not included, 0.261c.
² Cost estimated.

The smelters' production from North American ores, including United States, Mexico, Canada and Cuba, for 1912, by the latest estimate was 1,489,168,562 lb. of copper. While the figures used in this calculation were reported mine productions, nevertheless they represent the actual amount of copper sold to the refineries, probably including a small balance on hand at the mines. Taking this output as a basis the cost has obtained on about 72% of the copper produced in 1912 from North American ores and, as stated in the beginning, about

half of the world's output. The effect of the porphyry production during the past year is more evident. Yet again it is plain to see, although they are now producing almost 60% of their expected annual output, that they will lower the cost of the world's copper only a fraction of a cent per pound.

In the summary of all the groups for 1912 the average cost is shown to be about 9.6c. for 72% of the North American production against a general average of 10c. covering several years. The remaining copper produced from these ores and not accounted for undoubtedly costs more than 9.6c. or 10c. per lb. But if we include all expenditures during 1912 for deferred stripping, development, and new construction, which amounted to several million dollars, and should more than cover the additional cost of the remaining 28%, the cost is only raised to about 10.5c. per lb. The principal foreign producers obtain similar costs, so it seems reasonable to infer that if one-half the world's output can be produced at a cost of not over 10.5c., the remaining half should be produced at about the same cost.

FUTURE COSTS

There is little prospect of the North American copper costing any less than it does today. The Lake district is not expected to increase its output; the district as a whole has reached its zenith and is now on the decline. Great improvement has been made in the operating costs of this district, but this will only serve to offset the decreasing grade of the ore and increasing depths of the workings. The same may be said of the mines of the miscellaneous group as a whole. The Anaconda, individually the most important factor in the copper industry, has recently completed improvements that will lower its costs, but it also faces the problem of securing its ore from greater depths than heretofore. There are some mines of this group that are expected to better their costs; on the other hand, some are now passing through the most favorable stage of operating conditions.

The orebodies of the porphyries are by no means delimited, yet the maximum production to be expected from these deposits as they are known today is not much over 11,500,000,000 lb. of copper. Economic conditions will necessarily limit the annual output from these mines. It is doubtful if it is materially increased beyond the capacity of their present plants. The minimum average cost of copper from this group will be about 9c. per lb. As a group they will rank among the low-cost producers, but their effect upon the cost of the world's copper will be insignificant.

COST TO CONSUMER

With the record of increasing copper consumption so evident there is no reason to believe the world could do with less than it is getting today. Statistical evidence points strongly to the need of new sources of supply. Any marked curtailment in the output would only serve to increase the price of metal. If the less important producers do add a fraction of a cent a pound to the cost it is necessary because there is a demand for their product. The price of commodities is subject, first, to the law of demand; second, to the supply, and again the supply is regulated by the cost of production. In all business enterprises there must be sufficient return to induce people to furnish capital to carry on the business. If the price

of copper should fall to a point where no profit remained for the producer, production would soon cease unless this condition changed. Not only the producer of the raw material must have his profit, but everyone through whose hands it passes must have his profit. Any operation involving the investment of capital is expected to return this profit. The consumer must not only pay the farmer his profit for producing his food, but the railroads for handling it, the warehouse that stores it, or the manufacturer who preserves it. There is also the merchant's profit to pay. This cost or profit forms no small part of the price the consumer has to pay.

In organizing a mining company there are usually large blocks of stock issued for promotion profits, this stock circulates on the market and is as much a liability as the stock sold for cash to start the business. The people who buy it demand their share of the profits. Besides stock issued for certain promotion services a large bonus of stock is sometimes given for the property. In the costs given certain profits for transportation, smelting, refining and selling have been included, as well as depreciation for plant and equipment. But the greater part of the cost of mine property is carried on the books as an asset. This charge must be returned to the investor out of the profits by the time the mine is exhausted. Some maintain that the profits from mining should be greater than from other enterprises. Regardless of whatever rate of interest return is sufficient, the consumer must pay this charge also. All these claims must be satisfied out of the margin between the cost of production as given and the selling price of the metal. To meet all these demands it is probably necessary that 40 to 50% should be added to the cost stated to get the cost to the consumer.

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A Visitor's Estimate of Platoro

BY S. EARL BENNETT*

The chief problem now in the Platoro district in southern Colorado is transportation. On a recent visit to that old gold district, rejuvenated by Gilmore's discovery last autumn, as has been chronicled in the *JOURNAL*¹, I found that the autos and roads for the people going and coming are all that could be desired, but that the distances to a railroad, 42 miles from Platoro and the 34 miles from Jasper, prevent regular shipping, even of sorted ore. The chief hope is that the Denver & Rio Grande R.R., which has already shown so much interest in the region and which has made some preliminary surveys, will construct a broad-gage line from Monte Vista, up Rock Creek to the Alamosa River, through Jasper and Stunner over the range into the valley of the San Juan River to connect with their line at Pagosa Springs. Until the advent of a railroad, heavy hauling will probably be done by teams and auto trucks.

The area, called the Gilmore district immediately after Gilmore's discovery of last year, but now usually referred to by the older name, Platoro, comprises the four districts of Platoro, Stunner, Gilmore and Jasper, the center of the region being from 40 to 45 miles south-

west of the towns of Alamosa and Monte Vista, in the San Luis Valley. There are excellent roads from these two towns to the four mining camps. They are being made better by the cooperation of the county and state departments, appropriations having been made by both. Worthy of special mention is the state highway through Jasper and Stunner to Pagosa Springs.

No mining district could be better situated in regard to such natural advantages as timber and water power. The mountain sides are covered by spruce, all in the forest reserve, but the forest supervisor concurs with the miners and his department will exert itself in the interests of the mineral development of the region. The townsite of Platoro has been released from the forest reserve so that deeds may be obtained by grant of the Department of the Interior, according to its rules; providing the claims which have been staked across the present townsite are set aside. The abundance of water, both in the Alamosa and Conejos Rivers, affords opportunities for hydro-electric developments. The patenting of many claims upon which work has been done off and on for many years, keeps the deputy mineral surveyors quite busy.

The impression abroad is that the ore is generally low grade. Most of the assays of surface run under \$5. There are a few exceptional properties, such as the Valley Queen and Mammoth, at Platoro. The Valley Queen is under lease to John A. Traylor, of the Traylor Engineering Co., of Denver. The Mammoth is owned by Gerald Hughes and associates. Mr. Hughes is the son of the former United States Senator. The Asiatic, at Summitville, is another one of the better known mines. The Gilmore property, at Gilmore, and the Miser and Guadalupe tunnels, at Jasper, yield at present mostly specimen ore. Sampling of the 200-ft. level of the Mammoth, samples taken at 20-ft. intervals for 1200 ft., indicated an average of \$11 per ton in gold and silver. The average of 20 assays from one property in the district was \$581 in gold and silver, some choice pieces of ore were exceedingly rich.

Cyanide tests are being made and it has already been shown that with the exception of ore containing arsenic and antimony, satisfactory recoveries can be obtained. The geology of the district has not been extensively studied. Professor Patton, of the State School of Mines, and 13 students, are making a geological map, a state appropriation having been made for that purpose. I found one vein with andesite hanging wall and syenite or granite foot wall. The quartz vein between was 12 ft. wide.

On the whole, the district makes a favorable impression. It is not a poor man's camp. Experienced millmen will be needed to solve the problems of ore treatment and no small sum of money will finance the prospecting of the large veins found in this widely mineralized district.

Some financially strong companies have been formed within the last month, and are preparing to prospect their properties at once. There is no boom on now and the floating population has drifted out, leaving Platoro and neighboring towns peopled with several hundred determined mining men of high average character.

The geology is the San Juan complex with considerable brecciation. Rhyolite predominates around Summitville, andesite south of Stunner, and syenite-granite at Jasper.

*1732 Welton St., Denver, Colo.

¹"Eng. and Min. Journ.," of Mar. 29, p. 679; Apr. 5, p. 730; Apr. 12, p. 775; May 24, p. 1069; May 31, p. 1122; June 7, p. 1167; June 14, p. 1217; map, May 17, p. 996.

DETAILS OF PRACTICAL MINING

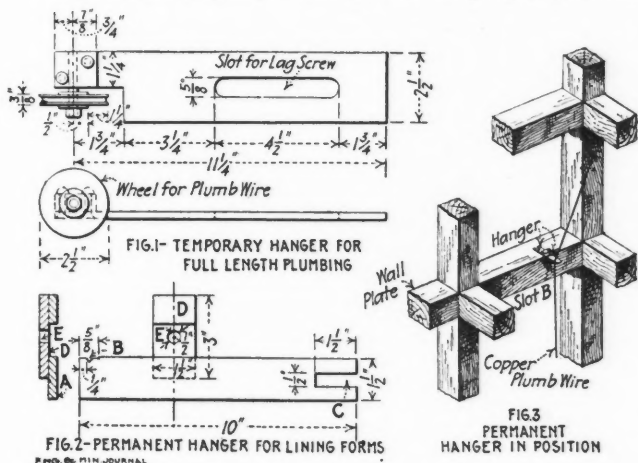
Aligning Concrete Forms in Shaft

By ROBERT H. DICKSON*

The Calumet & Arizona Mining Co., of Bisbee, is concreting its Junction shaft by starting at the bottom and replacing the timbers with concrete. Since most of the shaft sets have been in place for 10 years, and in that time have moved more or less from their original position, permanent points had to be established at regular intervals in the shaft, for lining in the concrete forms.

A preliminary plumbing was done in order to ascertain the relative positions of the sets, and thus determine the best position for the permanent points. This plumbing was done by hanging two wires in opposite corners of the shaft, and measuring the distances from them to the wall plates and end plates.

The permanent points were placed in proper position



HANGERS FOR SHAFT PLUMB WIRES

by hanging two plumb lines the full length of the shaft. The lines were manipulated over hangers, shown in Fig. 1. These hangers were first set by hanging a short plumb line over them, and adjusting this into proper position by transit and tape. They were held by a 5-in. lag screw and washer to a 10x10-in. stringer, projecting a little beyond the edge of the shaft. The 5/8-in. slot, through which the lag screw passed, allowed the hanger to be moved transversely or longitudinally, and thus adjusted to exact position. The long plumb lines of piano wire were then hung over the hangers. Each line was 1500 ft. long and carried a 60-lb. weight partly immersed in crude oil.

There was a strong upward draft in the shaft, due to the hot steam pipes supplying the pumps, which caused troublesome vibration of the wires. An ingenious scheme was devised by E. E. Whitely, chief engineer of the company, to minimize this vibration. It consisted of finding the center of swing of the wire at intervals of 300 ft. and then fastening it in this position. A strip of

wood about 1/4x1x12 in., with a 3/8-in. hole near one end, slotted to insert the wire, was placed so the wire vibrated in the hole without touching the sides. When the center of vibration was at the center of the hole, the strip was nailed to the wall plate, and two halves of a pencil about 2 in. long, with the lead removed, were placed in the hole so that the wire passed through the groove left by the lead, thus holding the wire fast in place.

The next step consisted in placing permanent points or hangers at 35-ft. intervals. Their construction is shown in Fig. 2. They were made of 1/4-in. iron plate sheared into strips A, 1 1/2x10 in. One end of one edge of the strip was milled for a distance of 5/8 in. back and in this a file cut B was made so as to be vertical when the hanger was in place. The other end of the strip was slotted at C. Two of these were placed at each 35-ft. interval in opposite ends of the shaft but near the same wall plate. They were fastened to the wall plate by lag screws through slot C so that the wire passed through the little slot B. By means of the washer D with a screw through the 1/2-in. hole E, the hanger was held firmly to the timber so as not to rotate about the screw through C. For actually lining in the concrete forms, a copper wire with a 10-lb. plumb bob is fastened to a post or other timber, as shown in Fig. 3, and then let down through the slot B. As the work proceeds upward, the hangers are taken out with the timbers and the next set above is used.

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Safety Rules—Blasting*

(1) No explosive should be used unless there is plainly printed or marked in the English language, on every original package, the name and place of business of the manufacturer, together with the date of its manufacture and its strength.

(2) Use no frozen or chilled dynamite. Frozen dynamite, though not sensitive to blows, is peculiarly sensitive to friction, such as that produced by cutting or boring holes in it.

(3) The removal of a detonator from a frozen cartridge should be prohibited.

(4) Fuse should not be less than 2 ft. long for pops, block holes and shaking holes. When blasting holes the fuse should be at least 5 ft. long and always long enough to insure perfect safety, depending on the depth of the hole.

(5) Whenever practicable, after a raise has reached a height of 50 ft., blasting should be done by battery.

(6) In shaft sinking the manner of blasting shall be by battery or electric current, and the man who does the blasting should be the only one to connect the wires to the battery or switch.

(7) After shaking a hole, allow time enough for cooling before the charge is put in.

*Mining engineer, Calumet & Arizona Mining Co., Bisbee, Ariz.

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

(8) In tamping drill holes only wooden rammers should be used, never iron or steel. Tamping by strokes is forbidden and only direct application of pressure is permitted.

(9) One man should not fire more than five holes or fuses at one time, except with authority of the mine captain. In case more than five are to be fired, get assistance.

(10) Before blasting have a definite understanding with your partner as to which one is to return and light the fuse, after giving warning.

(11) When two gangs of miners are drifting toward each other, one gang should always notify the other before blasting.

(12) Miners about to fire should give warning in every direction and all entrances to the place where charges are to be fired should be guarded while such firing is going on.

(13) The number of shots exploding, except in case of electric firing, shall be counted by the miner firing them.

(14) If the miner is not certain that all shots have exploded, no one shall be permitted to enter the places where such charges were placed, for a period of 30 min. after the fuses were lighted.

(15) Do not go back to your place of work while the smoke is thick; there are poisonous gases present and you cannot see whether the roof and timbering are safe.

(16) It is strongly recommended that miners do not extract or attempt to extract explosives from a hole which has missed fire, but in every case insert a fresh charge above the missed hole and then explode; and that miners do not deepen holes or any part of holes left standing or abandoned and theretofore charged with explosives. If for any reason a hole is missed and the miners consider it necessary to remove the charge, this shall be done with picket, scraper and swab stick only, and no drill or metal tool shall be used in attempting such removal. Men are warned that there is great danger in attempting such removal, and are urged not to do so. Notify the shift boss and shift partners of missed holes so that they may be aware of the dangerous condition.

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Difficulties with Flumes at Nome

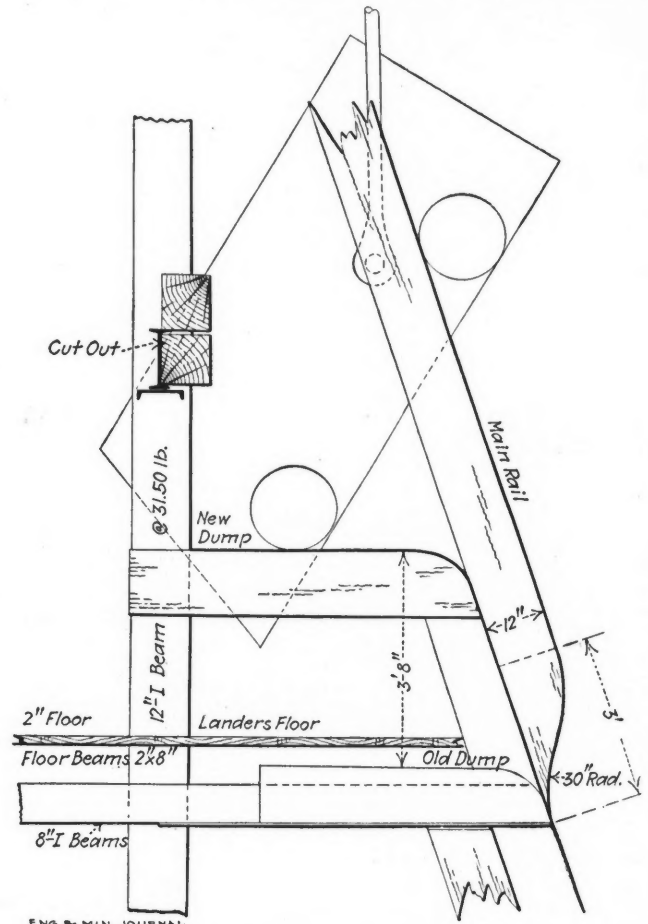
For three reasons, wooden flumes in connection with the water-ditch systems of the Seward Peninsula are unsatisfactory. In the first place, the imported lumber is expensive, the landing cost is high, and the cost of freighting to the interior is even higher (Water Supply Paper No. 314, U. S. Geological Survey). On the Paragon ditch in the Council country the cost of flume lumber is said to have been nearly \$200 per M., b.m. In the eastern part of the peninsula native lumber can be used for trestles and collars, but is too poor for the flume itself. A second objection to flume construction is its lack of permanency. For eight or nine months of the year it is out of commission and exposed to the elements. Snow slides may wreck portions of it; snow drifts may pile on it and in settling break the trestles, crush the bottoms and spread the sides. The worst difficulty is that of obtaining proper foundations in the frozen ground. Where a ditch settles a few inches no

great harm results, but in the case of a flume, joints are opened and not only does leakage result, but the section may even fall to pieces.

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Raising Inclined Skip Dump

The drawing shows a device applied to a skip dump, raised to a new position, which enabled the skip to dump in the same vertical plane. The construction of the dump is as outlined. The main rails are bent over for the front wheels to follow in the usual fashion, but the rear wheels are also raised somewhat as in the Angove dump,



RAISING SKIP DUMP WITHOUT LATERALLY DISPLACING DUMPING POINT

so that the dumping point is not moved forward, as it would be otherwise, an amount corresponding to the cosine of the dip.

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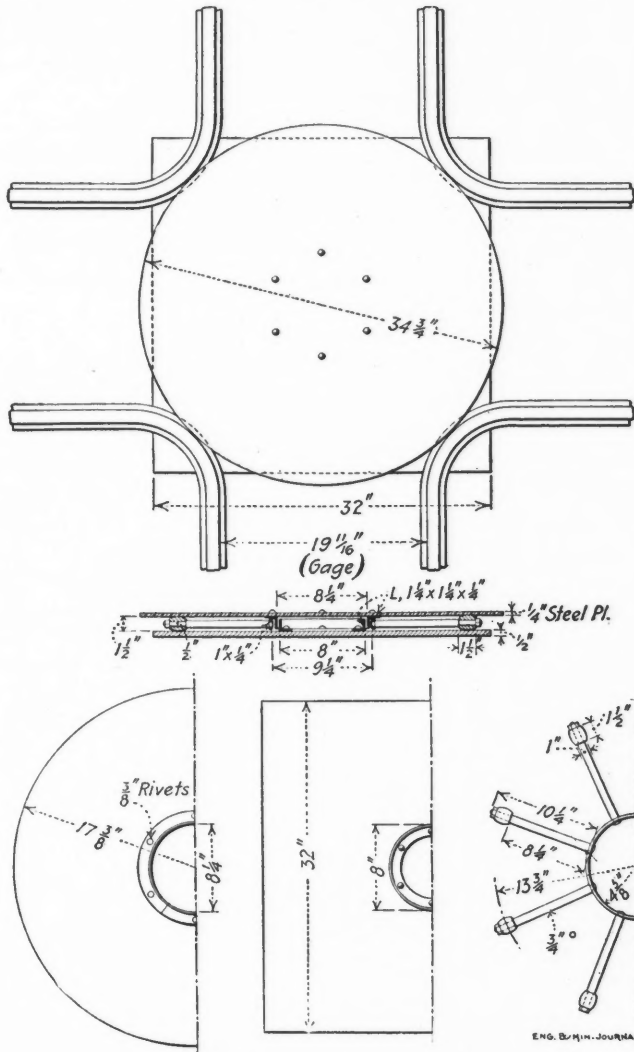
Ore Sorting by Artificial Light

At the mines of Rammelsburg it was found impossible to separate iron pyrites from copper pyrites by the light from oil lamps, from incandescent lights, either with clear or colored globes, from either plain or enclosed arc lights, or Nernst lamps, says *Echo des Mines*. However, with Cooper Hewitt lights this separation proved easy. These lights were fitted with fluorescent reflectors, in order to overcome partially the excess of green rays. Each lamp consumed 3.6 amp. at 110 volts.

Cheap and Satisfactory Turntable

By L. O. KELLOGG

For transferring mine cars from track to track, underground or on the surface, either a system of switches or a large well leveled and well backed slick sheet generally proves most satisfactory. In certain cases, however, the use of a turntable is advisable. This is especially the case where lack of room renders it necessary to make a sharp turn in direction. If a turntable is to be used, there is none better than that herewith illustrated. It is a design suggested at a Mexican mine by a mechanic engaged on a temporary erecting job. It



SIMPLE HOME-MADE TURNTABLE FOR MINE TRACKS

proved an excellent device in practice and so far as known, has never been described in print.

It consists of a fixed bottom-plate, a movable upper-plate and an intermediate spider carrying rollers. The relation of the three pieces is maintained by means of three collars which nest together. As shown, the table is applied to a track of 0.5 meter gage with 16-lb. rails; the dimensions are given in English units.

The bottom plate is here shown as made of a 1/2-in. iron casting taken from the scrap heap. Other types of plates would answer, such as wooden backing covered with an iron sheet fastened with countersunk screws.

The top plate is of 1/4-in. steel. The spider has eight arms of 3/4-in. soft steel turned down at each end. One end enters a hole in the 1/4x1-in. collar and is riveted over. The other end carried a roller free to revolve on the turned portion and held in by a nut. The roller is of the shape shown, a prolate spheroid with truncated ends, to be exact. If the threads are bradded down a little, there is no trouble experienced from the nut's working off. The spider collar is welded so as to be continuous. The plate collars are of bent angles, riveted to the plates, no attempt being made to weld the ends.

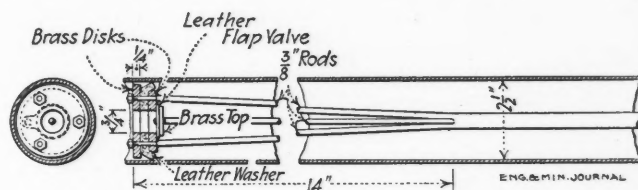
The diameter of the collars is such that the one on the upper plate fits loosely between that of the spider outside and that of the lower plate inside. Their height is such that the edges do not touch above or below in any case, the only contacts being those of the rollers. The car wheels come close enough to the line of the rollers so that for a 2400-lb. load with a 1/4-in. steel plate, there was no dishing toward the center, so far as could be seen, which would make the collars bind. The tracks are laid as bends over the corners of the bottom plate and the thickness of the rollers is determined by the height of the rails, the top of the movable plate being at such a height as to take the bottom of the wheel flange as the tread leaves the rail. The edge of the revolving plate is made to come just below the inside edge of the rail head at the bend.

The table is cheap to put up; it can be made at any mine shop that has a lathe. It is reliable and durable; it can never wobble, as often happens with tables revolving on a central axis; and it is much simpler and less expensive than the rather elaborate tables offered by manufacturers.



Home-Made Hand Pump

A convenient hand pump for incidental work around a mine can be made at slight expense. The illustration represents such a pump, using a 2 1/2-in. pipe. The pump in its simplest form will not suck, but the plunger must work in the water. By the attachment of a check valve



SIMPLE HAND PUMP FOR 2 1/2-IN. PIPE

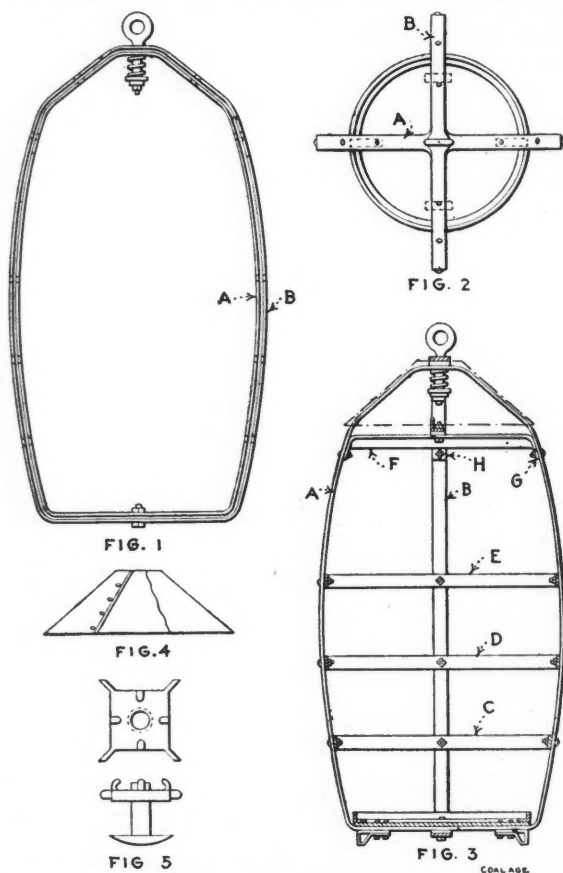
at the bottom of the pipe, however, a suction lift could be had.

For its construction, three 3/8-in. rods are welded to the end of a 1/2-in. rod, the latter of the same length as the pipe through which the pumping is to be done. The three rods are turned or swaged to 3/16 in. at the lower ends to pass through the plunger and are threaded. The plunger consists of two brass disks 1/4 in. thick with a piece of leather between. The lower disk fits loose in the pipe. The upper disk is slightly smaller. Thus the leather will have a slight upward turn on its edges and will be tight in the pipe when the plunger rises and loose enough when it descends, to permit easy working. A 3/4-in. hole through the plunger is covered with a leather

flap riveted to the plunger on one side and weighted down with a brass cap. This forms the working valve. The plunger pieces are held against the $\frac{3}{2}$ -in. collars on the rods by nuts.

Collapsible Skeleton Emergency Bucket

A recent invention of George S. Rice, chief mining engineer of the U. S. Bureau of Mines, has been dedicated to public use for rescue work around mines. It consists of a bucket or cage, built in the main of strap iron, and so constructed as to be collapsible for transportation but readily assembled for use in emergency cases. As can be seen by the illustration, it consists essentially of two vertical elliptical hoops of strap iron *A* and *B*, with three



DETAILS OF COLLAPSIBLE HOISTING BUCKET

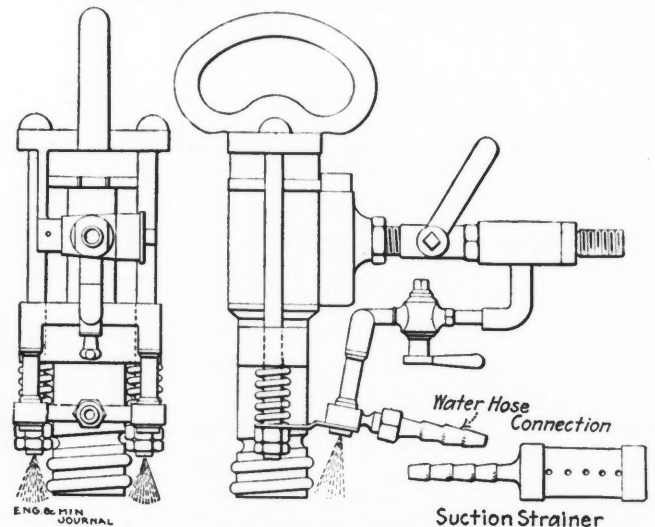
horizontal hoops *C*, *D* and *E*, and with top and bottom pieces, making what is in effect the skeleton of a bucket. Of the two vertical hoops *A* and *B*, one is smaller than the other, so as to fold inside of it when the device is knocked down. *A* and *B* revolve on a bolt at the bottom and on a draw-pin at the top, through which connection to the rope is made. This latter may work against a spring to give a cushioning effect. A cross-brace *F* of two angle bars, stiffens the top of the frame, and the bottom is reinforced with a bent angle. The construction of the hood, Fig. 4, is evident. To hold the members together, a special bolt and nut, Fig. 5, is employed, the bolt having a flat head, which will not catch on obstructions in a shaft, and the nut being furnished with projections, so that it may be screwed up by hand like a butterfly nut,

or by a tool acting as a lever between the projections. The size of the bucket depends upon the local use to which it is to be applied; for large buckets it may be desirable to use more than two of the vertical frame members.

The shape of the device is such that it can guide itself past possible obstructions in the shaft. One was used in a disaster in the South with great advantage, and perhaps prevented the loss of some men who had been overcome underground and might have fallen from an ordinary tub. As many as three or four men with breathing apparatus can be lowered at one time, well protected from projections which would be liable to upset another improvised conveyance. The idea occurred to Mr. Rice at the Cherry mine, where the tub used was so small that the men had to be strapped in and were unable to get off at the landing, so that a delay of half a day was experienced in building a special cage.

Water Spray for Drills

An increasing amount of legislation looking to the abatement of the dangers of dust from machine drilling lends interest to the water spray herewith illustrated (*Iron and Coal Trades Rev.*, May 30, 1913). It consists of a pair of jets working on the injector principle. Air is supplied from the main air connection, water is sucked up from any convenient sump or receptacle, which may be as far as 25 ft. away. The strainer renders it possible to use dirty water. The object of the spray is to



ATTACHMENT FOR SPRAYING MACHINE-DRILL HOLES

kill the dust issuing from the collar of the hole. The attachment weighs less than 2 lb., and is stated to be fool-proof. The air consumption is given at 3 cu.ft. of free air per min. as a maximum. The water does not enter the hole and its consumption is small, about a bucketful for 12 ft. of hole. Thus the workman is not splattered with mud. Water can be drawn from any place which gives a depth of $1\frac{1}{2}$ in. The spray is made by the Bristol Engineering Co., Ltd., Fishponds, Bristol, England.

An Unusually Good Grade of Adobe is being made by the Miami company for building houses. The ferruginous schist of the mountain side northwest of the Miami general-office building is screened through $1\frac{1}{2}$ -in. grizzlies and tamped into forms like those used for concrete buildings. The resultant wall is far more durable and even in structure than is the ordinary adobe, even approaching concrete in firmness.

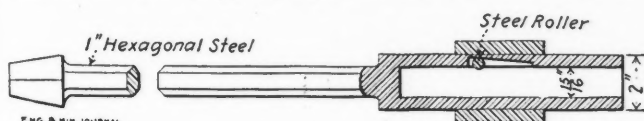
DETAILS OF METALLURGICAL PRACTICE

Withdrawing Stuck Bars

It frequently happens that when the forehearth is full of matte, and requires tapping in a hurry, a bar will have the head knocked off, says A. A. Summerhayes (*Min. and Eng. Rev.*, Australia, June 5, 1913). The accompanying illustration shows a useful tool for drawing the bars, and the following description should make the construction and operation of the apparatus clear.

The tool consists of a steel bar, generally made out of 1-in. hexagon steel, with a collar welded solidly on the end and bored about $\frac{1}{8}$ in. larger than the bars in use. A slot is then cut $1\frac{1}{2}$ in. long, $\frac{3}{8}$ in. wide, and a steel wedge fitted in it flush with the outside of the collar so that a space is left in the inside of the slot of $\frac{3}{8}$ in. on the front end of the slot and $\frac{5}{8}$ in. on the back end. In this slot is dropped an ordinary piece of $\frac{1}{2}$ in. round file or steel roller $\frac{5}{8}$ in. long, the ends slightly conical, to prevent the roller dropping through into the bore on the tool. After putting in the roller, a steel collar is shrunk over the slot.

The operation of drawing the bar in the event of the head having broken is as follows: The tool is slipped over the bar, the roller riding on the bar until checked by coming to the end of the bore. The tool is then pulled in the direction it is desired to draw the bar. The roller immediately rides up the wedge and so grips the bar. The harder the bar is driven the tighter it naturally grips. This machine has pulled a $\frac{7}{8}$ -in. steel bar in halves, the tool gripping tight all the time. The advan-



APPARATUS TO DRAW STUCK BARS

tage of the tool is that a tap with a hammer in the opposite direction will immediately release the implement, which is free to be used again.

Sampling Waste Dumps

In a suggestive series of articles on mine sampling, now appearing in the *South African Mining Journal*, Arthur S. Lejeune remarks that the question of mental bias—tempting a man to take the best and leave the worst, or *vice versa*—is of greater importance in selecting samples from a waste dump than in almost any other case, for the reason that the original sorting is never theoretically perfect, and, therefore, a considerable quantity of reef may find its way to the waste dump. This being the case, there is a tendency to include more reef in the sample than there should be. Probably the best time to sample a waste dump is on a moonlight night, when there is just sufficient light to work by but not enough to be able to distinguish reef from waste. Pieces large and small

are thrown off the dump until about a ton is collected. This then represents the sample, which has to be broken down and quartered to a convenient size.

Mexican Method of Retorting Amalgam

BY A. M. MERTON*

I have never seen described the remarkably simple but effective Mexican method of retorting amalgam obtained from the operation of *arrastres* or *tahonas*, as they are almost universally called in Mexico and Central America. The method of retorting used by the small operators in Mexico requires no iron retort. Everything is home-made, but the results are fully as efficient as those obtained from the use of the small retorts obtained from supply houses. These little wrought-iron retorts warp



PRIMITIVE MEXICAN RETORT

out of shape after being used once or twice and the top fits wretchedly. The Mexican appliance, which of course never fits, even at first, is always the same and will last several burnings before breaking. It can then be replaced at a maximum cost of fifty *centavos*. Possibly an account of this method will be interesting to engineers, as it has been useful to me a number of times.

Several years ago I had a group of claims in southern Mexico in which a small body of rich ore was discovered. I decided to test this ground by treating the ore in *arrastres*. Incidentally I hoped to get a little revenue. I had in my scrapbooks a number of articles on the *arrastre*, but face to face with the problem of building one

*Colorado City, Colo.

I decided that most of the accounts had been written by amateurs who had never actually built and run such a machine. I, therefore, engaged a native who had a local reputation as a *tahonista* (not *tahonero*, that term being applied to the mules that dragged the stones) to build and run a pair of 12-ft. *tahonas*. The construction of two really good appliances was completed in a week by the *tahonista* and a helper. The only tools used were an axe and an auger. Not a particle of iron entered the mechanism and the two completed machines cost something less than 25 pesos.

I conceived great respect for the skill and ingenuity with which the native Mexican treated gold and silver ores in very simple appliances. To run a *tahona* correctly requires as much ability as we formerly saw displayed in running silver-amalgamation pans. In the elemental metallurgy of gold and silver the Spanish-American cannot be excelled.

After about ten days' operation of the *tahonas*, two handsome balls of gold amalgam were obtained. The *tahonista* suggested that he should "burn" the amalgam and recover the quicksilver. We had no retort but that did not worry José María. His wife, he explained, was a *lozera* of ability, that is, she could make good *ollas* and such pottery. Being curious to see the native method of retorting, as well as desirous of having the gold in pure form, I consented.

The *tahonista's* wife made two *ollas*, one somewhat smaller so that it could fit into the mouth of the other. The smaller of the *ollas* was used as the retort proper, the ball of amalgam being placed within it and wedged tight against the bottom of the vessel with several pieces of old pottery. The larger *olla* was about half filled with water and was used as a condenser. A hole was dug in the ground deep enough so that when the large *olla* was buried the mouth was a few inches below the ground level. The small *olla* was placed mouth downward in the larger, the water being about an inch below the mouth of the retort. The sketch appended shows the general arrangement. Earth was filled in the hole and when buried, the bottom of the small *olla* projected a few inches above the ground. A dab of stiff clay was stuck on the bottom of the retort, to protect the fragile unglazed earthenware against a chance blow, and a fire was built over the hole. It was kept going briskly all day. In the evening the fire was raked away and the *ollas* taken up. In the small *olla* was as fine a retort of gold as ever I saw and absolutely free from mercury. In the large *olla* was the quicksilver.

Out of 124½ oz. of amalgam there was obtained 35¼ oz. of spongy gold and 76 oz. of quicksilver, indicating a recovery of about 84% of the latter. Certainly not a bad result for such a simple and apparently crude arrangement. The balls of sponge gold were melted down in a blacksmith's forge and gave a pretty bar which realized about 1100 pesos. The thought was thrust upon me that few indeed of our gold miners could have accomplished the result with only the tools nature had supplied them with as effectively as the illiterate Mexican *tahonista*.

It is the fashion in some circles to deery the honesty of the Mexican. It is but simple justice to say that this *tahonista* was an honest and reliable man. He proved it during the months he worked with me. Of course, he might have "nibbled" at the amalgam but there was not

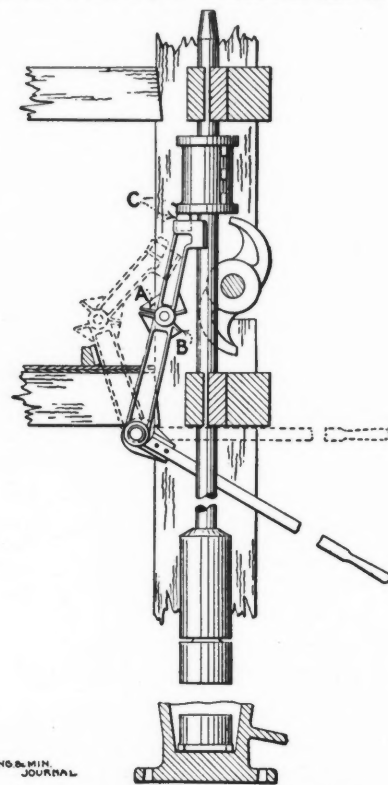
the slightest ground for suspicion. He was as honestly proud of his work as any man I ever saw.

An odd little trick of retorting amalgam was shown me by an old Guatemalan placer miner. We had tested some placer ground with the *batea* using mercury. To show up the pure gold the placer miner took a large potato, cut it in two, and in one of the halves gouged out a small hole which would comfortably accommodate one of the balls of amalgam. The two halves were wired together and the potato was placed in the ashes of a fire and slowly baked overnight. In the morning the potato, on being taken out of the ashes, was found to have absorbed the mercury, leaving the spongy gold in the cavity. The spongy placer gold made pretty and queer looking beads.

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A New Finger for Gravity Stamps

The ordinary method of hanging up stamps, with a cam-stiek, has been generally considered a rather annoying one and often a little dangerous. Broken arms and crushed fingers have not infrequently resulted from its careless use. In this connection it is interesting to note the device shown in the accompanying drawing, by means of which the stamp can be hung up instantly by one standing on the lower floor in front of the mortar.



FINGER FOR GRAVITY STAMPS

The principle and operation is clearly shown in the drawing and is readily understood. The faces *A* and *B* are finished with a piece of leather or rubber packing, to prevent crumbling of the iron through vibration. At the point *C*, a wooden block is placed for the same purpose.

The advantages are obvious. It was invented by E. H. Moyle, of Los Angeles, Calif., and patented under U. S. No. 1,040,235. Some experiences of its practical operation would be of interest.

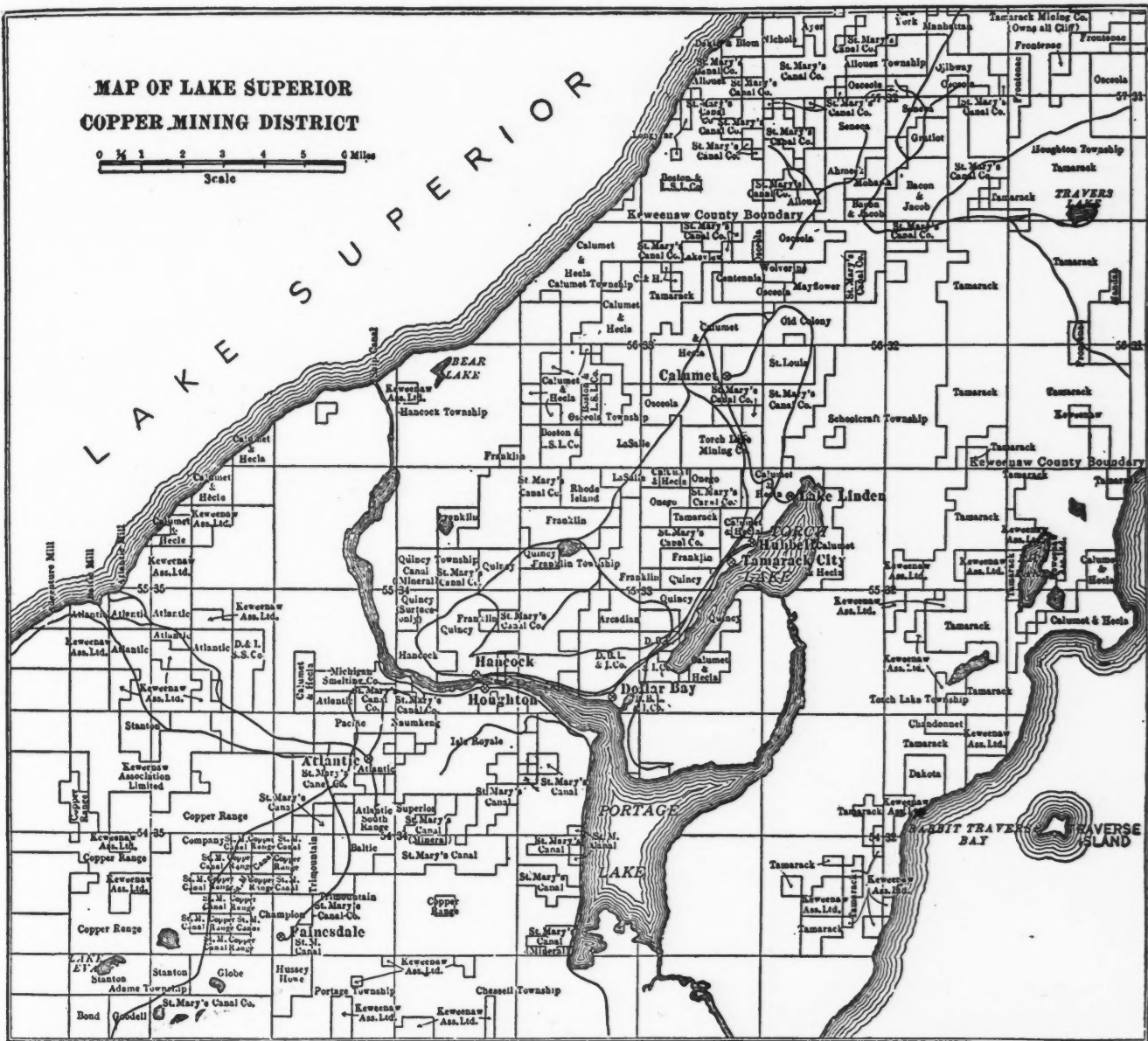
The Strike in Michigan

For the benefit of the JOURNAL readers, who are following the course of the strike in Michigan, we herewith give a map of the copper district. The late news will be found under editorial correspondence, while illustrations of this section will be found in "Photographs from the Field."

July 17—Forty men were killed in a fire in a sulphur mine near Castel Termini, Sicily.—Five miners, entombed in the Spruce mine at Eveleth, Minn., as a result of a cloudburst, rescued.

July 23—General strike of miners in the Lake Superior copper country.

July 24—Militia called out to maintain order in Michigan copper country.



Eng. & Min. Journal

MICHIGAN COPPER-MINING REGION

Chronology of Mining for July, 1913

July 3—General strike in the Rand gold field, South Africa.

July 5—Two men killed by cave-in at the Morris mine of the Giroux group at Ely, Nevada.

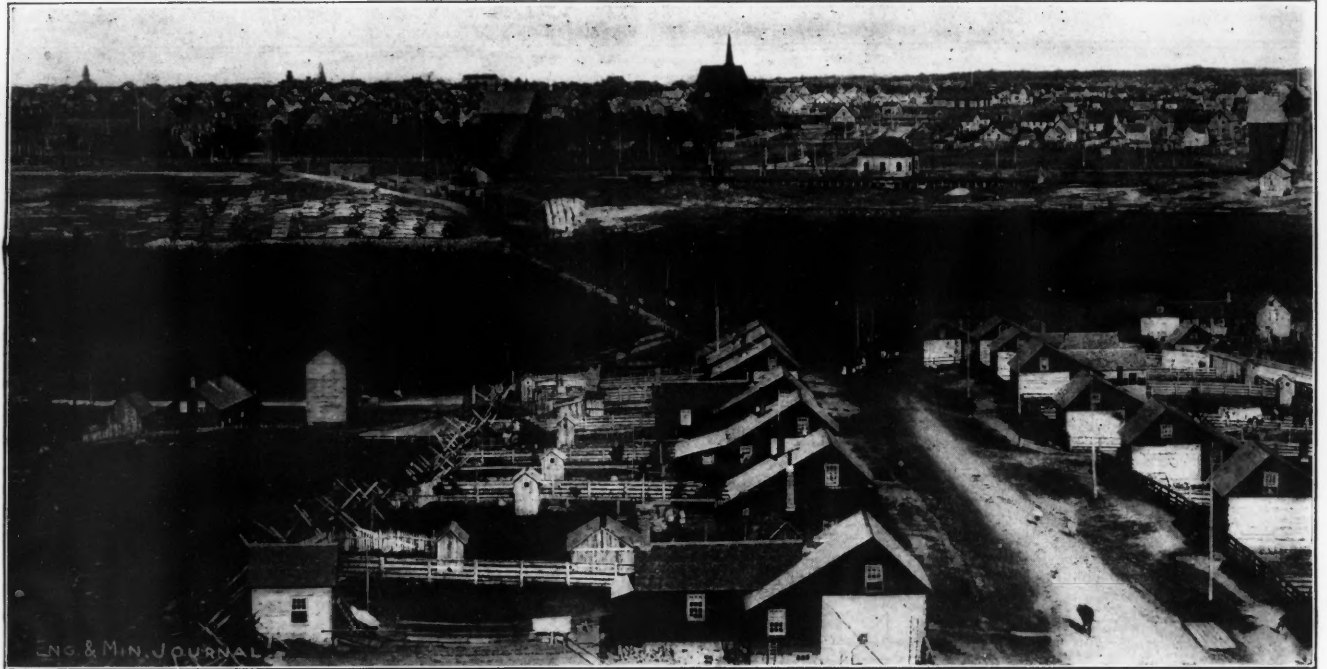
July 7—Rand strike ended, most of the gold miners returning to work.

July 8—Suit filed for \$3,000,000, by the Christmas Gold Mining Co., against the Golden Cycle Mining & Milling Co. to recover property.

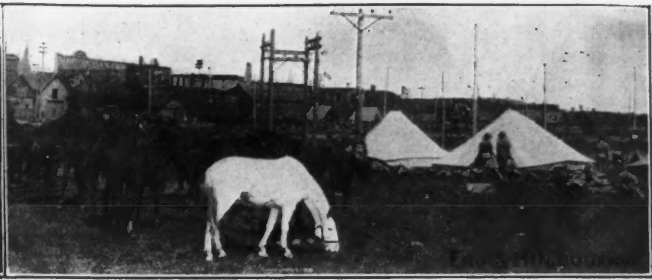
July 27—Hearings in the Government's suit against the Southern Pacific R.R. to recover oil lands in Kern County, Calif., estimated to be worth \$18,000,000, begun in the federal court at Houston, Texas.—Two men were killed in the wreck of the hoisting engine at the Green Hill mine, Mace, Idaho.

July 30—Miners of the Cabin Creek coal district of West Virginia settled the differences with the coal operators, and agreed to ratify an agreement between the operators and the local officers of the United Mine Workers of America.

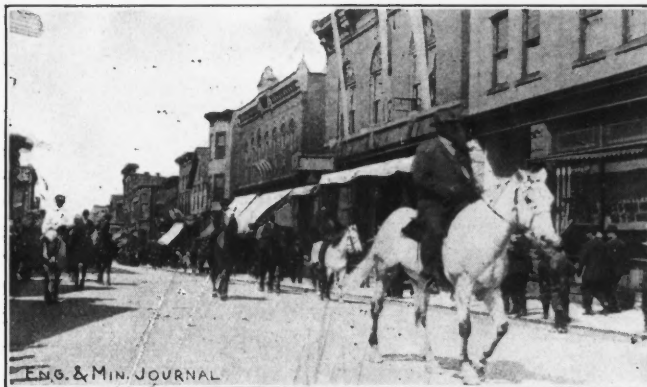
PHOTOGRAPHS FROM THE FIELD



VIEWS OF THE MICHIGAN COPPER COUNTRY SHOWING TYPES OF HOUSES PROVIDED FOR MINERS



MILITIA ENCAMPED IN THE COPPER COUNTRY TO MAINTAIN ORDER



FEDERATION OFFICIALS AND MINERS MARCHING IN CALUMET



A MINER'S FAMILY

JULY 30 IN CALUMET

The Guggenheims

The recent testimony of Daniel Guggenheim, president of the American Smelting & Refining Co. and the Guggenheim Exploration Co., in the Ross-Burrage litigation brought out some interesting facts regarding the house of Guggenheim and the methods pursued in acquiring new properties, says the *Boston News Bureau*. The exact number of properties in which the Guggenheims are interested cannot be stated; in fact, Daniel Guggenheim says he himself does not know the number. When it was suggested to him that he was in somewhat the same position as a New England millionaire who testified he did not know how many automobiles he owned, he said he could easily answer that, as he owned four.

Daniel Guggenheim is a faultless dresser and, of course, appeared in a different suit of clothes on each of the four days he was in Boston. He is a great believer in vichy water and milk as a cure for indigestion, and while under the questioning of Sherman L. Whipple in the Ross-Burrage hearing, he frequently sipped his vichy and milk, consuming about a quart of the latter during the six hours he was daily on the stand.

The firm of M. Guggenheim was formed in 1879 and comprises the Guggenheim brothers exclusively. The senior partner is Murry Guggenheim, Daniel being the second brother and more active in the firm than the older brother. The executive work is in charge of S. R., Murry and Daniel. Murry is more particularly interested in the financial end of the business. In the next few months ex-Senator Guggenheim will again become active in the firm and, as his brother Daniel puts it, "he will come back to take up the white man's burden."

The business of the firm is concentrated at the New York office at 165 Broadway. Its main business is the development of mines as an industry, the firm rarely being identified with their flotation.

When the firm is invited to inspect properties to determine their worth the usual course of procedure is to turn the papers over to Chief Engineer Pope Yeatman, who has held that position since 1907, and he, with his assistants, Berry and Marsh, report on the same. Tests of the ore are usually made by experts Guiterman, Smith and Guess, the last being in Missouri. Franklin Guiterman has been identified with the smelting business for upward of 30 years, and is regarded as an eminent metallurgical expert. The Guggenheims have very great confidence in him. E. A. C. Smith is given as high an indorsement by the Guggenheims as Mr. Guiterman, his special business at the present time being the perfection of a leaching process at Perth Amboy to handle Chile ores particularly. Mr. Yeatman, the mining engineer, is highly esteemed by everybody, including the Guggenheims, with whom his word is law.

Daniel Guggenheim, in his recent testimony, stated that he first heard of the Chuquicamata mines in Chile about a decade ago, when Mr. Duval, of Beechey, Duval & Co., "a good friend of the firm and a gentleman with whom it had business in South America," called their attention to the property. He told Mr. Guggenheim about the grade of the ore, the distance from the railroad, etc. The firm did not take much stock in treating ores in those days, except by direct smelting, and as the ore is atacamite and low grade the Guggenheims turned the proposition down.

Later, however, in June, 1911, through correspondence with A. C. Burrage, the firm became interested in the Chuquicamata mines, as it was believed the ore, running about 2% copper, could be profitably treated by the new so called Bradley process or by some other similar leaching process. In purchasing the property the Guggenheims were influenced to a great extent by the reports made by Fritz Mella.

In offering the property to M. Guggenheim Sons, Mr. Burrage stated to Daniel Guggenheim: "I don't want you to put in any money to pay me, or to take my interest over, but I would like to join you and I am willing to take for what I get for the property, a certain percentage of the stock in the new company."

A. C. Burrage did not own all the stock of the various companies purchased, the Lyon Co. and the Duncan Fox Co. being minority owners. As it is the policy of the firm to control all of a property, if possible, Daniel Guggenheim told Mr. Burrage that "it was absolutely necessary we should control the whole business because we didn't like to go into business of this kind and be compelled to do all the work and put up all the money and have a lot of stockholders on the outside, who would probably be dissatisfied with things we wanted to do and who were not reasonable and pliable; but we always respected the minority shareholders' interest; in fact, we were very sensitive about it. Our experience is that the small stockholder on the outside can be very pestiferous and very annoying, and usually is."

Mr. Guggenheim told Mr. Burrage that "if the Chile property was going to be a big thing it was for his interest to get it and keep it, as much for his interest as it was for our interest, until we had reached a position where the property was in such a state of development that we could say to our friends: 'This business is all right; you run no risk now in coming in.' Human nature is very peculiar. People who have a minority interest always imagine all sorts of things and they are very difficult to handle, and so we rarely put a large amount of money in any business where we don't—I don't mean dominate it—but where in the early stages, it is not our business."

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American Institute of Mining Engineers

The local committee, of which C. W. Goodale, of the Anaconda Mining Co., is chairman, has completed the following program for the meeting of the American Institute of Mining Engineers, which will be held in Butte August 16 to 21, inclusive:

Saturday, Aug. 16, at Great Falls, with visits to Rainbow Falls, Giant Springs and Boston & Montana smelters; in the evening, technical session.

Monday, Aug. 18, at Butte, 9:30 a.m., technical session, morning and evening, with visits to mines in the afternoon.

Tuesday, Aug. 19, visit to Anaconda works, with a session at Anaconda and a social in Butte.

Wednesday, Aug. 20, visits to mines and two technical sessions; 12.30 p.m. luncheon at Silver Bow club.

Thursday, Aug. 21, visits to mines, and annual dinner in the evening.

CORRESPONDENCE AND DISCUSSION

Extremely Difficult Underground Connections

In the JOURNAL of July 26, 1913, p. 161, I notice a short article describing an underground connection at the Brakpan mine, South Africa. It is stated that both line and level holed through to about $\frac{1}{8}$ in. The article comments upon this as a remarkably accurate job, but hardly does the matter justice. Such precision as this is rarely met with, even in mining practice and certainly reflects credit on the engineers responsible. It is difficult for the inexperienced to realize what it means to swing plumb bobs (I presume that this was the method used) at a depth of 3000 or 3500 ft. and prolong underground the line thus obtained. The achievement shows particularly beside a similar occurrence which is reported in the *Engineering Record* of July 26. The Astoria tunnel, driven under the East River from Long Island to the mainland by the Consolidated Gas Co., holed through to $\frac{3}{4}$ in. in line and $\frac{3}{8}$ in. in level. This tunnel is of approximately the same length as the Brakpan incline, but the shafts at the ends were only between 200 and 300 ft. There is thus no comparison whatever between the two jobs in point of difficulty, the advantage being all with the Astoria tunnel, and yet, note that the error in the connection was three times as great in one direction and six times in another.

It is hardly realized, I believe, by the public at large what accurate surveying is demanded and obtained in the mining industry. I submit these two jobs as an excellent example of what the highly specialized mining engineer can do in comparison with his brother in the ordinary branches of civil engineering.

ROBERT OLDS.

New York, July 29, 1913.

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Salted Drill Samples of Elliptic Mine

In the JOURNAL of July 26, in the mining news, p. 189, under South Dakota, there is an item to the effect that a crew of men under the management of F. S. Stratton had unwatered the 700-ft. shaft on the Elliptic property and installed a diamond drill in the bottom, the object being to confirm the statement that former drilling had cut a body of remarkably rich free-gold ore at a depth of 600 ft. below the shaft bottom. The item concludes by saying that a great deal of interest attaches to the work, it being in a section outside of the recognized productive district, and that success will mean the stimulation of prospecting over a wide territory.

Believing that certain details in relation to this undertaking should be made public, I am writing you from my experience with the matter. As I understand it, the former drilling referred to was performed in the early part of 1909 by J. G. Leming, as superintendent for a Nebraska company known as the Elliptic Mining Co.

Mr. Leming appears to have ceased work on the property in the fall of that year, and in the following year to have thrown away all of his drill cores. However, he appears to have retained the drill cuttings from around the cores, and some time after he had stopped the drilling referred to, had assays made of the cuttings obtained from near the bottom of the drill-hole. The depth of the shaft is given as 603 ft., and the depth of the drill hole 775 $\frac{1}{2}$ ft. additional. At a vertical depth of slightly over 1300 ft. from the surface, the drill appears to have entered Archean schists, and when Mr. Leming had the cuttings of this material assayed the results ran from \$300 to over \$5000 in gold per ton.

The company owning the Elliptic property not being in financial position to undertake the work of continuing sinking the shaft, the proposition was brought to my attention by Mr. Leming's attorneys in the spring of 1911. These attorneys had also had assays made of the material submitted to them by Mr. Leming, the results ranging from \$200 to over \$4000 gold per ton. I requested that some of the drill cuttings be sent to me, and upon receiving these I sent about half of each of the four quantities received to Von Schulz & Low, of Denver. The assays they obtained ran from \$240 to over \$4500 per ton, but microscopic examination of particles of the gold secured by vanning the richest sample showed some of them to be spirals of flat ribbon that exactly resembled minute turnings, while striations, resembling tool-marks, could be observed on most of the flat particles. No gold could be found imbedded in rock particles or adhering to them, all the gold being loose and detached.

I communicated this result to Mr. Leming's attorneys, telling them frankly that everything pointed to the samples having been salted. At my suggestion, they then sent portions of the material to both the Henry E. Wood Ore Testing Co., of Denver, and Ricketts & Banks, of New York, for careful testing to determine whether the samples were regular or had been tampered with. The report returned by the Wood Co. showed that the material tested by them assayed over \$1500 per ton, but their most careful tests failed to show the presence of metallic gold in the sample. While their conclusion given was that the sample was not a natural one, they were unable to positively establish the method of salting. The principal basis for their conclusion was that delicate vanning tests and a powerful microscope failed to show a single piece of sulphide mineral, and they considered it unlikely that at such depth from which the sample had presumably come material carrying iron should be so thoroughly oxidized and altered. Furthermore, they obtained a distinct reaction in testing for tellurium, indicating the possible method used in salting the sample. The sample tested by Von Schulz & Low was marked 770, indicating the depth of the drill-hole from the bottom of the shaft at the time the sample was secured, and was the richest sample in the lot; while the sample tested by the Wood Co. was marked 775, and was the

next richest sample in the four lots of drillings submitted by Mr. Leming to his attorneys. The inference would be that different methods had been employed in salting the different lots of cuttings.

The test made by Ricketts & Banks was of material from the same lot as tested by Von Schulz & Low, and like Von Schulz & Low they had no difficulty in separating the gold by panning. Most of the metallics so secured exhibited distinct marks of abrasion under the microscope.

Furthermore, an assay of clean metallics showed the gold to be alloyed with copper, the proportion of gold being slightly higher than used in coin alloys, and in fact higher than the proportion of gold in any native gold they had ever met with in their experience. Their conclusion was that the sample was unusual and suspicious.

These three results were communicated to Mr. Leming by his attorneys, who believed Mr. Leming to be entirely sincere and to have no doubts of the genuineness of his samples. It appears that Mr. Leming, while superintendent for the company, had complete charge of the work of drilling, and that the drill cuttings had been boxed up and kept by him in a private place, and that he did not think it possible for anyone to have salted the samples. Mr. Leming's attorneys furthermore assured me that Mr. Leming's proposition to secure funds for opening up the supposed discovery was of such a nature that it would not bring him any profit of consequence unless the mine should prove valuable.

At first I thought these samples might have been salted as a hoax by someone who used filings from gold coins, but, as it afterward appeared, two distinct methods of salting were employed for the two richest of the four samples, and the matter took on a new aspect. I have never met Mr. Leming, and have no reason to doubt, in my experience, the sincerity of anyone concerned. Mr. Leming's attorneys were certainly trying to get at the truth of the matter. However, there must be a "nigger in the woodpile" somewhere, and while everyone concerned in the present experiment may know that the supposed rich ore has been tested by three of the best assayers and ore-testing firms in the country with the above results, I think, in view of the general interest which attaches to the matter, that I should write you fully.

L. H. TAYLOR, JR.

Land Title Building, Philadelphia,
July 31, 1913.

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Counter-Current Decantation of Slime

I note that H. A. Megraw, in his description of the Gold Road Mill in the *JOURNAL* of July 5, speaking of continuous counter-current decantation without filters, says: "It is applicable in its present form only where solutions carrying low cyanide percentages can be used and where the amount of metal in solution is comparatively small."

The last part of this statement I consider incorrect because in continuous counter-current decantation if the value of the pregnant solution precipitated is kept con-

stant by increasing the amount precipitated with the increase in values dissolved, it will be found theoretically that not only does the percentage of recovery of dissolved values increase but the actual loss in tailing will decrease. A moment's thought will show that this must be the case, as the pulp will leave the first thickener with the same total amount of dissolved values and receive each time a greater dilution with low-grade and finally barren solution.

It may be objected that the necessity for such increased precipitation is a definite handicap to the use of this process on rich ore, but an examination of most plants using filters will show that the same practice prevails because most operators realize the necessity of complete precipitation and are not willing to take chances with too high-grade solution.

The mechanical loss of cyanide where comparatively strong solutions are used has always been recognized as one of the principal factors limiting the use of continuous decantation without filters. The use of a double circulation-precipitation system, which we have suggested and which the Gold Road company is now installing, allows this loss to be reduced about one-third. By supplying an extremely low-grade solution to be precipitated for weak barren solution it also gives insurance against losses from bad precipitation in the high-grade solution circuit.

In his discussion of the field for continuous decantation, Mr. Megraw has neglected to mention the influence of the physical nature of the pulp, which is most important. The mechanical loss of cyanide per ton of ore, when solutions of a given strength are used, depends, of course, on the ratio of solution and solids in the final discharge. With a product carrying much colloid, which can only be settled to 60% moisture, 1½ tons of solution are lost per ton of ore. A reground quartzite, which should be discharged at less than 40% moisture, would lose only ¾ ton of solution at that figure. When considering the mechanical loss of cyanide in continuous decantation without the use of a filter, the loss met in filtration should be borne in mind. In two recent instances where I have had an opportunity to determine this loss in different types of vacuum filters, it has been found much higher than I expected and poor displacement was indicated. The determination of this loss in plants operating regularly will surprise many operators.

When thickening a mixture of fine sand with some colloid, it will be found that the thickener can be run for some time, perhaps several days, with a thick discharge, which in some cases has been low as 30% moisture. At this density, however, there is a tendency for the slime to hold back in the tank and gradually accumulate until it overflows. Reduction in the feed to the thickener will not help this condition, but a slight increase in the dilution of the discharge will cause the slime to pass out with the sandier portion. The density beyond which it is difficult to discharge the whole product delivered to the thickener will vary with each ore. The deeper the tank the greater will be the density at this point of separation. The increased use of continuous decantation in this country and abroad will undoubtedly give us more information on it within a short time, and determine how wide its field of usefulness will be.

JOHN V. N. DORR.

Denver, Colo., July 21, 1913.

EDITORIALS

The Tariff on Zinc and Lead Ore

It may be accepted as a foregone conclusion that Congress will within a short time enact a law making the duty on lead in ore $\frac{1}{2}$ to $\frac{3}{4}$ c. per lb.; and on zinc ore 10 to $12\frac{1}{2}\%$ *ad valorem*, these being material reductions from the present rates in each case. As to the effects upon the industries we shall offer no argument now, but it is our duty to call the attention of Congress to certain inequitable and troublesome things that are going to happen if the proposed law be enacted in its present form.

Section 154 reads "Lead-bearing ores of all kinds containing more than 3 per centum of lead $\frac{1}{2}$ ($\frac{3}{4}$) cent per pound on the lead contained therein."

Section 164 reads "Zinc-bearing ores of all kinds, including calamine, 10 ($12\frac{1}{2}$) per centum *ad valorem*."

Section 570 puts ores of gold and silver on the free list.

There is manifestly going to be a complication in the assessment of duties on zinc-bearing ores, which conceivably may amount to the prohibition of importation. Instead of assessing a specific duty on zinc contents in zinc-bearing ores, the bill as it passed the House contemplates a duty of 10% *ad valorem*. To this is to be added a specific duty on the lead contents. Assuming that an imported zinc-bearing ore contains lead in quantity sufficient to give the ore an added value for its lead contents, the ore is virtually to be assessed twice for the same element of value, viz.: First, 10% or $12\frac{1}{2}\%$ *ad valorem* on the total value of the ore; second, $\frac{1}{2}$ c. or $\frac{3}{4}$ c. per lb. on the lead contained therein. Furthermore, it is usual that foreign zinc-bearing ores contain valuable quantities of silver and gold. Ores of silver and gold are, and for many years have been, free of duty. In the pending tariff bill they are on the free list. Nevertheless, as the bill is now worded, zinc-bearing ore which possesses an added value on account of the presence of gold and silver will be assessable at 10% or $12\frac{1}{2}\%$ *ad valorem*, so that the importation of such ore, even though it contained no lead, might conceivably be prohibited.

We imagine that the wording of sections 154 and 164 of the pending bill were designed in part to avoid the absurdity of the Payne-Aldrich Act, which causes the lead smelters to pay duty on zinc which they can not extract, do not want, and for which they penalize the shipper of the ore. If there were any well defined line between lead ore and zinc ore, and between ores used for making pig lead and spelter and those used for making oxides, there would be no great difficulty in framing simple and equitable tariff provisions, but existing conditions are so complex as to make this a problem that is well-nigh baffling. The introduction of arbitrary distinctions at certain percentages of the respective metals would naturally excite suspicion of being in the special interest of somebody, no matter how sincerely they might be offered.

However, complicated as the case may be, it is manifest that the lead and zinc sections must be altered if the obvious intention of Congress is to be fulfilled and if in-

justices, inequities and lawsuits are to be avoided. The phraseology of the pending bill, as it now stands, exempts from duty the gold and silver content of the lead ore imported by the lead smelters, but causes the zinc smelter to pay on what his zinc ore contains. It is even possible that gold and silver ores imported by anybody might have to pay an *ad valorem* duty which might be prohibitive, inasmuch as although such ores are specifically on the free list in section 570, they frequently contain zinc, which would bring them under section 164 and cause them to be subject to an *ad valorem* duty on all their valuable contents. Even the lead-bearing ore provided for in section 154 might be construed as coming under section 164 if it contained zinc. Thus the copper smelters, lead smelters and zinc smelters may all be embarrassed in a way that clearly is not intended.

It has been suggested that things could be made straight by discarding the proposed *ad valorem* rate on zinc ore and substituting a specific rate per pound of zinc contents, but this would simply continue the present Payne-Aldrich troubles. Although there are serious objections to an *ad valorem* rate on zinc ore for technical reasons other than those which we have mentioned in this article, we think that those objections may be overlooked for the sake of simplicity if the pending section be amended so as to avoid double duties.

The latter can be partially corrected by letting section 154 stand as at present, and adding to section 164 the proviso that zinc-bearing ores upon which duty has been paid *ad valorem* shall be exempt from the specific duty on lead stipulated in section 154. Assuming that it be the intention of Congress to collect duties on lead and zinc only, it should be further provided that a rebate be allowed on the gold, silver, cadmium, copper and all other substances specifically mentioned on the free list that may be recovered from zinc-bearing ores which have paid duty *ad valorem*. Such a proviso would probably eliminate also the danger with respect to gold and silver ores, now on the free list, but it would be wise to make the position of the latter even more clear.

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Iron Production in 1913

While in Wall Street and some other places there has been talk of dull business for some months past, the blast furnaces of the United States have been active and have been turning out more iron than ever before. The Bureau of Statistics of the American Iron & Steel Institute reports that in the first half of 1913 the pig-iron production reached a total of 16,488,602 long tons, which was an increase of 5.3% over the make for the second half of 1912, and 17.1% over the first half. It was by far the largest quantity ever reported for a similar period. Moreover, this production, added to that for the second half of 1912, makes a total of 32,143,265 tons, which exceeds by 2,391,402 tons the heaviest make ever recorded in 12 consecutive months. To go back to the most recent year

of iron-trade depression, the half-year's production was greater than that of the entire year 1908 by 552,584 tons.

This great production appears to have been pretty well absorbed, since there have been no complaints anywhere of the existence of large surplus stocks, such as were accumulated in 1909 and 1910. Early in the year, in fact, there was a scarcity of some kinds of iron, so great as to occasion an abnormal movement in prices, so that for two months or more No. 2 foundry sold at higher quotations than bessemer iron. This was an unusual condition, but quickly corrected itself. It is true that prices fell during the half-year and closed at a low point, from which there has since been a slight recovery. Thus bessemer pig at Pittsburgh declined from \$18.15 in January to \$17.11 in June, and basic iron from \$17.31 to \$15.40; No. 2 foundry at Philadelphia fell from \$18.50 to \$16.19, and No. 2 Southern from \$13.70 to \$10.80, at Birmingham. These are serious declines, but were not sufficient to check the output to any considerable extent.

While all the important classes of iron showed an increase during the year, the most notable point was the large gain in basic pig, which constituted 39.5% of the total make, considerably exceeding the bessemer output. It is not generally understood, perhaps, that more than half the pig iron—55% exactly—made in 1913 was not cast in any form, but was delivered in molten condition to mixers, converters and openhearth furnaces. Less than half, therefore, was remelted.

The great production of pig iron points to an equally large output of steel. The total make of ingots must have been nearer 17,000,000 than 16,000,000 tons for the half year—a production which certainly does not indicate a period of depression.

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Head Room

Important factors of most milling machinery are the floor-space and head-room that they require. Of these two, head-room is often the more important consideration, because while more floor-space may increase the first cost of the building, more head-room may not only increase the first cost of the building by swelling the cubic contents, but also may add to direct operating expense so long as the mill continues to be run.

The ideal mill is one like the simple stamp mill wherein the ore is fed at the upper side and descends uninterruptedly by gravity, the exhausted material—the tailings—being discharged at the lower side. The several parts of the stamp-mill require but relatively little head-room and the arrangement herein outlined is commonly feasible.

In flat terrains, however, such an arrangement is infeasible and in such cases it is necessary to elevate the ore at least once. If after such elevation the flow is uninterruptedly downward we have the next simplest arrangement.

However, in modern practice the flow of ore is never uninterruptedly downward, but is rather up and down, according as middlings and other between products have to be retreated. So much is this inevitably the case, that it is uncertain whether there be any advantage in a sloping location over a flat one. The old controversy respecting the side-hill vs. the flat mill-site has not yet been thoroughly analyzed in spite of reams of discussion.

Nevertheless, there is no doubt that in either case unnecessary elevation ought to be avoided and types of machine have a good deal to do with that. Thus, one of the early forms of mechanical sampler—the old pipe sampler—required a high elevation just to permit the ore to be dropped through it. One of the excellent points of the Vezin sampler later introduced was that it required but relatively little head-room. So it is with crushers, especially those of the gyratory type. In a recent article on milling in southeastern Missouri a writer in the JOURNAL referred to a certain crusher being selected just because of its economy in head-room. This is a point that is borne in mind by several manufacturers of such crushers, besides the one mentioned by our contributor, among whose products there is excellence in this respect.

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The Administration's Mexican Policy

During the last week the affairs of Mexico have figured more extensively in our newspapers than at any time since the fighting in the Mexican capital. Ambassador Wilson has been retired and the President has intimated the nature of his own policy.

This seems to be to try to persuade the Mexican factions to hold a prompt and fair election, and to promise to abide by the result, thus creating a government which the United States will recognize. If the Mexicans will not do this, the United States may let all parties have arms and fight things to a finish among themselves.

These proposals do not impress us as being effective. The idea of a fair election in Mexico is in itself rather a joke. The idea of letting the Mexicans fight things out has a certain merit. By the time they have done so they will have learned a lesson that may last a century, but the prospect of what might in the meantime happen to foreigners in the country is not pleasing.

❖

Meetings of Societies

Mining engineers and metallurgists who are interested in attending the meetings of technical societies are often offered an embarrassment of riches. Thus, during this month, there are the meetings of the American Institute of Mining Engineers, at Butte, Mont.; of the Lake Superior Mining Institute, at Duluth, Minn.; and the International Congress of Applied Geology, in Canada. Many persons who would like to attend all three of these meetings are unable to do so. There ought to be a clearing house for society meetings, some central organization which might be consulted in the arrangement of dates, with the idea of avoiding coincidences.

❖

One of the great questions in American affairs of the day is the enactment of a new banking and currency system to take the place of the present inelastic machinery which has repeatedly failed to work in times of crisis. Many persons in Congress think that the proper persons to frame a new banking law are a cowboy from Texas, a backwoodsman from Arkansas, and a cotton-grower from one of the Carolinas. The bankers should have nothing to do with the matter, in the opinion of Messrs. Henry, Ragsdale and Wingo. On the same theory, if a navigator of a ship be needed, get a "Cousin Jack" miner.

BY THE WAY

Concerning the rather widely published report that James MacNaughton, general manager of the Calumet & Hecla Mining Co., receives a yearly salary of \$120,000. The *Boston News Bureau* makes the positive statement that from all of the companies under his charge, including the Calumet & Hecla and all its subsidiaries, numbering at least 12, Mr. MacNaughton receives but slightly over \$40,000.

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The use of mine tailings—chats they are called locally—from the zinc and lead mines of Missouri for railroad ballast, for road making and in concrete structures, is increasing. The Geological Survey reports the sales of tailings for the year as follows, in tons:

	Railroad	Commercial	Total
Southeast Missouri.....	463,498	258,623	722,121
Southwest Missouri.....	1,449,207	553,075	2,002,282
Total.....	1,912,705	811,698	2,724,403
Total, 1911.....	865,011	638,592	1,503,603

The increase last year over 1911 was 1,220,800 tons, or 81.1%. The material is sold at the mines at a low price, generally about \$1 per carload, so that the chief cost to the consumer is the transportation.

❖

A correspondent of the *American Machinist* asks why is it that advice or information received from a person with a trade and from another with a profession should be viewed so differently, and relates this curious experience:

I am reminded of a man, who at the time was considered a friend. He was a doctor; in other words, a member of a profession. He was interested in buying a car, but as his knowledge of cars was meager, he wanted outside assistance. I, at that time, dabbled a little in automobiles, and he asked me to call around and have a chat about them. I called and, after the doctor had inquired about the condition of a member of the family whom he had been treating, for two hours I advised him gratis in connection with the design, operation and repair of automobiles. Imagine my surprise when a month later I got a bill from him for \$2 marked "professional services," which covered the visit I had made at his request and wholly in his own interests.

A good many mining engineers have asked why should they be expected to give their services, advice and information for nothing. This is an old complaint. Of course they shouldn't. If they do, the fault is their own. It is simple to say to any inquirer, "Mr. A., my fee for advising you in this matter will be \$5," or \$10, or whatever may be conceived proper. Why doesn't he say that? We fancy the deterring influences are something like these: (1) The idea that Mr. A. will say, "Oh, if that be the case, I will withdraw my inquiry." (2) The conception that an answer to the inquiry, which is a small matter, scarcely worth charging for, may lead to some business that will be worth while. (3) The possibility that Mr. Engineer having answered the inquiry may want to say, "Mr. A., do you think that Amalgamated is a good purchase around present prices?" The great point of difference is that legal and medical men have organized a business on the basis of small fees. Engineers have not.

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An engineer in Colombia writes from Istmina of a re-

cent trip to the platinum country. He says: "It is an 8-day 'steamer' trip from Cartagena to Quibdo, which in former days was the center for the buying of gold and platinum. At present more gold than platinum is handled there and business is almost entirely in the hands of Syrians or 'Turks,' as they are called, who keep general merchandise stores and trade with the natives (negroes). Quibdo is on the Atlantic side of the continental divide, while the rich platinum country is on the Pacific side, or in the region tributary to the Rio San Juan. Istmina is the center of this district and is reached from Quibdo by means of a 3-day canoe trip to the headwaters of the Atrato system and a 2-hour or 6-mile muleback ride over the low divide into Istmina. Istmina is on the San Juan and is accessible by launch or canoe from Buenaventura, the Pacific port of Colombia, in two or three days. By far the greater part of the Colombian platinum is obtained in this vicinity. In the early days the value of the platinum was not recognized and it appears that when the natives brought in their gold, which was more or less mixed with the white metal, the storekeepers would sort out the platinum and throw it on the floor before weighing the gold. A few months ago, a firm of 'Turks' in Quibdo began remodeling their old store and began washing the dirt under the floors. I saw several pounds of platinum which they had recovered so far and the washing is still going on."

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Due to the continued idleness of the United States Steel Corporation's Champion mine, practically the sole support of the once prosperous town of Champion on the Marquette range, the village is gradually becoming deserted. The mine has been closed for many months, and previous to its entire suspension, it had been operated on only a small scale for several years. Where formerly hundreds of men were employed, the crews had dwindled to one of a few score of members. The miners have sought work elsewhere, and while for a time the families remained behind, these are now joining the husbands and fathers, and the population is steadily waning. Already more than 50% of the dwelling houses have been vacated, and their doors and windows have been boarded up. Many of these buildings are owned by men who were employed at the mine in the palmy days of the town and who invested their savings in these little properties. Business is well nigh stagnant. The Steel Corporation has no present need for Champion ore. It is concentrating its mining activity on the Mesabi range, and it is hardly expected that the Marquette range property will be restored to the producing list until the lease to the Hill lands in Minnesota has expired and these holdings have reverted to the Great Northern interests. The Champion is owned in fee by the Steel Corporation. There is no lease binding the company to a production of any amount and, under the circumstances, it is not surprising the mine should be idle. A big tonnage of ore is in stock. Some of this was taken out as much as 15 or 20 years ago. The mine has shipped to date a total of 4,415,000 tons of ore, and there are fully 3,000,000 tons remaining in the deposit, with a possibility of new discoveries augmenting the extent of the reserves, so that it is generally credited with an assured future life of 25 years. It is about the deepest mine in the Marquette district, the bottom level being down 2000 ft.

Zinc Discovery at Embreeville, Tenn.

Zinc ore in large quantities has been reported discovered on an old iron property near Embreeville, Tenn. The Embreeville Iron Co. owns the land, 1700 acres of which is included. This company was formed in the early '90s, when there was a general boom in iron making in this district, and has changed hands several times without ever making any financial success. It is now in the hands of a receiver, and the property was about to be sold, when the discovery of zinc changed the situation. The stock of the Embreeville Iron Co. is held by Pickands, Brown & Co., Chicago, 54%, and the Perin interests, New York, 46%. The Perin stock is said to be under option to the American Zinc, Lead & Smelting Co. until some time in August.

This newly discovered zinc land is in Unicoi County, only a few hundred yards from Washington County, in which Embreeville is situated. It is about 19 miles southwest of Johnson City in the valley of the Nolichucky River, just where that stream passes through the Cherokee mountains. The zinc discovery is in a cove about $4\frac{1}{2} \times 1$ miles, and the formation a dark, dolomitic limestone. The rim of the cove on both sides is quartzite. Ore is said to occur in residual earth surrounding limestone pinnacles, conditions similar to those obtaining in the zinc deposits of Bertha, Va. The ore is in the form of zinc carbonate and silicate. Large amounts are said to have been washed into the Nolichucky River when iron development was attempted by hydraulic means. At the same time a large amount of zinc ore was developed.

Discovery was made by C. A. Morris, formerly of Bertha, Va., who was acquainted with the nature of zinc deposits and recognized the indications at Embreeville. He was in charge of the property for the receivers. Finding it impossible to convince them of the value of the property, Morris managed to collect and ship a car of ore, which is said to have brought \$960 at the mine.

Two diamond drills are at work on the property and are said to have cut a large area of ore, 17 ft. thick. Ore shipped contains about 40% zinc and has a market value of about \$20 per ton. The discovery has aroused intense interest in the district and surrounding property is in great demand. Local investigators speak of the discovery in superlatives and believe that an important zinc district will be developed.

Pig-Iron Production in 1913

A special bulletin of the American Iron & Steel Institute gives the production of pig iron in the United States for the first half of 1913 as below, comparison being made with three previous years. The figures are in long tons:

	1910	1911	1912	1913
First half.....	14,978,738	11,666,996	14,072,274	16,488,602
Second half.....	12,324,829	11,982,551	15,654,663	.....
Total.....	27,303,567	23,649,547	29,726,937	.....

The production of iron in the first half of the current year is the largest on record for a half-year. If we add the second half of 1912 to the first half of 1913, the total is 32,143,265 tons, by far the largest make recorded in any consecutive 12 months.

The production, according to fuels used, was as follows, compared with the first half of 1912:

	1912	1913	Changes
Coke.....	13,840,251	16,075,264	I. 2,235,013
Anthracite.....	65,657	237,156	I. 171,499
Charcoal.....	166,366	176,182	I. 9,816
Total.....	14,072,274	16,488,602	I. 2,416,328

Coke is the chief fuel used in our furnaces. Only a very few use raw bituminous coal, while many anthracite stacks use some proportion of coke. This year, only 11,491 tons were made with anthracite alone, 225,665 tons being made with mixed coke and anthracite.

An interesting point given in the present statement is the disposition of the iron as taken from the furnace, as follows: Delivered in molten condition to mixers, openhearth furnaces, etc., 9,069,845 tons, or 55%; sand cast, 3,685,512 tons, or 22.4%; machine cast, 3,246,964 tons, or 19.7%; chill cast, 480,503 tons, or 2.9%; direct castings, 5578 tons, or 0.03%. These details for 1912 are not available.

DIVISION OF IRON BY USES

The report gives a full statement of the uses for which the iron was intended, as follows:

	Tons	Per cent.
Foundry.....	2,808,364	17.0
Forge.....	221,776	1.4
Malleable.....	482,902	2.9
Low phosphorus.....	158,918	1.0
Bessemer.....	6,127,048	37.1
Basic.....	6,497,563	39.5
Ferrosilicon.....	46,181	0.3
Ferro-alloys, etc.....	34,607	0.2
Spiegeleisen.....	54,387	0.3
Ferromanganese.....	56,856	0.3
Total.....	16,488,602	100.0

Comparisons cannot be made with previous years, as the data are in different form. The largest increase over the first half of 1912 was in basic iron, 1,092,187 tons. The gain in bessemer pig was 688,855 tons.

There were 304 furnaces in blast on June 30, 1913, as compared with 313 at the beginning of the year. The total number of stacks in blast during the half year was 348, and the average time worked was 163.3 days. On June 30, 1913, there were seven new stacks in course of erection, the aggregate capacity being 1,051,150 tons. One new furnace, Oriskany, at Lynchburg, Va., went into blast; its capacity is 50,000 tons yearly. Three furnaces, with a total capacity of 163,000 tons, were abandoned.

PRODUCTION BY STATES

The total production in 1912 and 1913, by states, is as follows:

	1912		1913
	First half	Second half	First half
Massachusetts and Connecticut.....	8,793	8,573	8,581
New York.....	880,581	1,058,650	1,138,671
New Jersey.....	2,773	34,103	54,779
Pennsylvania.....	6,035,773	6,516,358	6,885,058
Maryland.....	105,027	112,519	152,002
Virginia.....	120,127	136,040	192,530
Alabama.....	887,512	975,169	1,078,173
West Virginia.....	129,155	145,205	131,097
Kentucky.....	24,017	44,743	33,903
Tennessee.....	145,076	193,162	189,019
Ohio.....	3,285,752	3,516,741	3,660,473
Illinois.....	1,304,227	1,583,132	1,653,017
Indiana and Michigan.....	788,252	982,376	894,743
Wisconsin and Minnesota.....	153,420	149,950	222,167
West of Mississippi.....	199,789	197,942	194,389
Total.....	14,072,274	15,654,663	16,488,602

A table appended to the report gives the production of pig iron for 60 years. In 1854 the total was 657,337 tons, and it did not reach a million tons until 1864. It is of interest to note that the quantity of iron made with anthracite as fuel was greater in 1854 than in 1912, while the charcoal iron has increased only a few thousand tons. The growth has been in coke iron, which expanded from 48,647 to 29,132,733 tons in the 60 years.

International Geological Congress

Two hundred delegates to the Congress, representing nearly every civilized country in the world, were entertained at luncheon on Aug. 1 by the Canadian Government at the Experimental Farm, Ottawa. An official welcome on behalf of the government was extended by Hon. R. L. Borden, Canadian Premier, and Controller Parent, of Ottawa, delivered an address of welcome from the city. An appropriate reply was made by Dr. Frank D. Adams, of McGill University, President of the Congress. A memorial tablet to Sir William Logan, first director of the Geological Survey of Canada, erected on a concrete pedestal in front of the Victoria Museum, was unveiled by Hon. T. W. Crottiars, Minister of Labor, who accepted the memorial on behalf of the Government. The delegates left for Montreal in the evening.

A special party of 18 of the geologists and engineers from the Sudbury-Cobalt excursion of the International Geological Congress on July 22, made a side trip into the new Kirkland Lake gold camp and were given an opportunity to inspect the geological conditions in the neighborhood of the most important developments, and to examine the vein conditions on the Tough-Oakes (Foster) and on the Burnside properties. A. G. Burrows, of the Ontario Bureau of Mines, who is engaged on the investigation of the geology of the district, was with the party and explained the geology of the area as far as determined. C. A. Foster, who is developing the Tough-Oakes property, conducted the visitors over the surface workings, and all of the party were taken to the 100-ft. level of the main shaft, where an opportunity to note the conditions of the veins in depth was afforded by the work of cutting a station at that level. After a supper served the visitors, at the mining camp boarding house, Mr. Bedford McNeill, of London, made a speech of acknowledgment of the courtesies offered and expressed his great interest in the possibilities of the new camp. The party were given a special permit to "high-grade" and many of them returned with a fine assortment of ores with visible gold taken from the stockpile and from the veins in the mine. The foreign visitors were much interested in the conditions involved in the opening of a new district in Ontario, and they made comparison with the beginnings of other gold camps now well established. The efforts the provincial government is making to provide a good road to the camp was favorably commented on; also the vigor with which the development operations, under way only since January, are being conducted.

The president and board of directors of the American Institute of Mining Engineers have issued a circular letter offering the hospitality and courtesies of the institute headquarters in New York to all members of the International Geological Congress, who may visit New York. A committee of welcome, of which Dr. George F. Kunz is chairman, has been appointed. Visitors are also invited to attend the meeting of the Institute at Butte.

The party visiting the Sudbury district arrived at Sudbury July 24, and spent nearly four days there. Visits were made to Creighton mine, Copper Cliff, Murray mine and two Frood mines, to the Coniston plant of the Mond Nickel Co. and the iron deposits of Moose Mountain at Sellwood. The outcrops at Windy Lake and Ramsay Lake were also visited. On July 25 the party was entertained at a banquet by the Sudbury Board of Trade.

July Mining Dividends

Dividends paid for the month of July by United States mining companies making public reports, amounted to \$7,234,529; those of iron-smelting, industrial and holding companies amounted to \$4,433,193; and those of Canadian and Mexican mining companies to \$3,107,528. There were a few unpleasant surprises, Ahmeek reduced its dividend from \$10 to \$5, American Zinc, Lead & Smelting passed its declaration, and United Verde is understood to have done the same.

United States Mining Companies			
	Situation	Per Share	Total
Ahmeek, c.	Mich.	5.00	250,000
Anaconda, c.	Mont.	0.75	3,249,375
Arizona, c.	Ariz.	0.36	554,002
Bunker Hill Con., g.	Calif.	0.02½	5,000
Bunker Hill & Sull., l.s.	Ida.	0.20	65,400
Center Creek, z.	Mo.	0.00½	5,000
Copper Range Consol., c.	Mich.	0.75	295,269
Colo. Gold Dredging, g.	Colo.	0.25	25,000
Continental Zinc, z.	Mo.	0.50	11,000
Eagle & Blue Bell, g.s.l.	Utah	0.05	44,657
Federal M. & S., com., l.s.	Ida.	0.75	45,000
Fremont, g.	Calif.	0.02	4,000
Frontier, z.	Wis.	2.00	2,500
Golden Cycle, g.	Colo.	0.02	30,000
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.65	163,254
Iron Blossom, s.l.g.	Utah	0.10	100,000
Mammoth, g.s.c.	Utah	0.05	20,000
Mary McKinney, g.	Colo.	0.02	26,185
North Butte, c.	Mont.	0.50	205,000
Old Dominion, M. & S., c.	Ariz.	1.25	202,500
Oscola, c.	Mich.	2.50	240,375
Shattuck-Arizona, c.	Ariz.	0.50	175,000
Snowstorm, c.	Ida.	0.01½	22,492
Stewart, g.	Ida.	0.10	123,862
Tom Reed, g.	Ariz.	0.06	54,573
Tonopah Belmont, g.s.	Nev.	0.25	375,000
Tonopah Extension, g.s.	Nev.	0.05	23,585
Tonopah Mining, g.s.	Nev.	0.40	400,000
United, c.	Wash.	0.01	10,000
United Globe, c.	Ariz.	7.50	172,500
Utah Consolidated, c.	Utah	0.50	150,000
Vindicator, g.	Colo.	0.03	45,000
Wasp No. 2, g.	S. D.	0.01	5,000
Wellington, g.	Colo.	0.05	50,000
Yak, g.	Colo.	0.40	40,000
Yellow Aster, g.	Calif.	0.05	5,000
Yellow Pine, z. l.s.	Utah	0.02	19,000
Iron, Industrial and Holding Companies			
	Situation	Per Share	Total
Am. Ag. Chem., pfd.	U. S.	1.50	275,730
Am. Ag. Chem., com.	U. S.	1.00	171,141
Am. Sm. Sec., pfd. A.	U. S., Mex.	1.50	255,000
Am. Sm. Sec., pfd. B.	U. S., Mex.	1.25	375,000
Bethlehem Steel, pfd.	Penn.	1.25	186,350
Colo. Fuel & Iron, pfd.	Colo.	4.00	80,000
General Chemical, pfd.	U. S.	1.50	150,000
Guggenheim Exploration.	U. S., Mex.	0.75	623,799
Harbison-Walker, pfd.	U. S.	1.50	144,000
La Belle Iron.	Ohio	0.50	49,577
National Carbon, com.	U. S.	1.50	82,500
Old Dominion of Maine, c.	Ariz.	1.25	366,691
Penn. Salt.	Penn.	3.00	150,000
Republic Iron & Steel.	U. S.	1.75	357,296
Sloss-Sheffield S. & I.	Ala.	1.75	117,250
U. S. Smelting, Refining & Min., pfd.	U. S., Mex.	0.87½	425,530
U. S. Smelting, Refining & Min., com.	U. S., Mex.	0.75	263,329
Virginia-Carolina, pfd.	U. S.	1.50	360,000
Canadian, Mexican and Central American Companies			
	Situation	Per Share	Total
Blanca y Anexas, g.s.	Mex.	0.90	63,000
Buffalo, s.	Ont.	0.10	100,000
Canadian Goldfields, g.	B. C.	0.001½	60,000
Consol. Min. & Smelt.	B. C.	2.00	106,104
Crown Reserve, s.	Ont.	0.05	88,441
Chontalpan, g.s.l.z.	Mex.	0.50	3,500
Dominion Steel, com.	Can.	1.00	345,896
El Favor, s.g.	Mex.	0.01	35,000
El Oro Min. & Ry., g.s.	Mex.	0.24	278,843
Esperanza, g.s.	Mex.	0.24	165,847
Hollinger, g.	Ont.	0.15	90,000
La Rose, s.	Ont.	0.25	374,656
Lucky Tiger, g.	Mex.	0.05	35,767
McKinley-Darragh-Savage, s.	Ont.	0.10	224,769
Mines Co. of America, s.g.	Mex.	0.12½	112,500
Nipissing, c.	Ont.	0.37½	450,000
Nova Scotia Steel & Coal, pfd.	N. S.	2.00	20,600
Nova Scotia Steel & Coal, com.	N. S.	1.50	90,000
Santa Gertrudis, s.	Mex.	0.24	332,431
San Toy, g.s.	Mex.	0.01	60,000
Standard, s.l.	B. C.	0.02½	50,000
Tilt Cove.	N. F.	0.42	18,924
Victoria, l.s.g.	Mex.	0.50	1,250

Dividends paid for the first seven months of the year by United States mining companies amount to \$45,450,722; iron smelting, industrial and holding companies to \$64,083,425; and by Canadian, Mexican and Central American companies, to \$13,879,295. The month's figures compare very favorably with those of 1912, which were: \$6,888,977, \$3,748,605 and \$1,658,156, respectively.

PERSONALS

A. W. Newberry gives as his present address the Tumco mine, Tumco, via Ogilby, California.

Robert H. Richards has been spending a few days at Ishpeming, Mich., on professional business.

E. F. Lake, consulting metallurgist, has removed from Bayonne, N. J., to 1453 Waterloo St., Detroit.

John L. Malm, of the Malm-Wolf Co., Denver, has gone to California to examine mines in Eldorado County.

M. W. Atwater, of New York, is about to make a complete examination of the Ohio Copper property, both mine and mill.

F. P. Dewey, chief chemist of the Bureau of the Mint, has gone to San Francisco, where he will be for about two months.

Arthur H. Gruber, of Milwaukee, Wis., who has been operating in Mexico mines, also in Arizona, is in Oregon looking over mining properties.

James W. Neal, head of a mining syndicate operating a gold dredge on Merced River, California, is looking over southern Oregon mining conditions.

W. H. Grant, E. K. Soper, F. C. Calkins, J. E. Thomas, and H. Wittingham, are at present assisting George H. Garrey in geological examination work in Mexico.

G. D. Van Arsdale, who has been engaged in hydrometallurgical research at Douglas, Ariz., during the last year for Phelps, Dodge & Co., Inc., will be in New York during August.

E. W. Honeyman has resigned as superintendent of the smelting works of the Detroit Copper Mining Co., at Morenci, Ariz. Smelting operations are at present in charge of V. P. Hastings.

We noted last week that Joseph McDonald was on trial at Juneau, Alaska, on the charge of murdering N. C. Jones. Mr. McDonald was acquitted by the jury, on the ground of self-defense.

Mr. Albert J. Bone is at Anyox, B. C., having resigned as smeltery superintendent of the Tennessee Copper Co. to become superintendent of the new smeltery of the Granby Consolidated Mining, Smelting & Power Co., at Anyox.

L. R. Palmer, of Pittsburgh, who for several years was safety expert of the Jones & Loughlin Steel Co., has been appointed chief of the state bureau of factory inspection. He will be in charge of the factory inspection throughout the state of Pennsylvania.

George J. Young has been appointed professor of mining at the Minnesota School of Mines. Mr. Young is a graduate of the Mining Department of the University of California and has been on the instructional staff of the University of Nevada since 1900. In 1908 he was made professor of mining and metallurgy, and since that date has been in charge of the Mackay School of Mines of that institution.

W. H. Schmal, superintendent of the South Eureka mine in Amador County, Calif., for the past four or five years, has been appointed general superintendent of the South Eureka, Oneida and Hardenberg. Under Mr. Schmal's superintendency the South Eureka has been advanced to the dividend class of mines in the Mother Lode region, and the Oneida has been reopened and put into the producing class. These two mines adjoin and are owned and operated by the same company. The Hardenberg is situated three miles south of Jackson and about four miles south of the Oneida and is owned by the same interests which control the South Eureka.

SOCIETIES

Oregon Agricultural College—The most recent and approved mining apparatus, designed after patterns now in use in the Massachusetts Institute of Technology, will be installed in the School of Mines Building. Plans for this machinery were brought from Boston by George E. Goodspeed, Jr., instructor in mining at the college. The new machinery will be installed in sections, part being built during the summer so that mining students for the first semester may have the advantages derived from their use.

American Mining Congress—The annual convention will be held at Philadelphia, Oct. 20-24. The chief points for discussion will be safety in mining and the coal and iron industries of the United States.

American Institute of Mining Engineers—The semi-annual meeting of the institute will be held in Butte, Mont., beginning on Aug. 16 at Great Falls, and continuing at Butte until Aug. 21. At this meeting about 50 papers will be presented and discussed, and visits will be made to the mines and metallurgical works of the Butte district, which are to be thrown open both above ground and underground to an extent never before offered.

Lake Superior Mining Institute—The program for the annual meeting shows that the opening session will be held at Duluth, Minn., Aug. 26. The afternoon will be spent in a trip to the plant of the Minnesota Steel Co., which is now under construction. A special train will leave at midnight for the range, arriving at Biwabik in the morning, where the first stop will be made. The train will then run to Eveleth or Virginia, where the party will remain for the night, and where the first business session will be held. The greater part of Thursday will be spent in the Hibbing district and there will be a social entertainment in the evening. The party will reach Coleraine on Friday afternoon and the final business meeting will take place there. Saturday morning an inspection will be made of the Coleraine washing plant and the return trip to Duluth will start about noon. The partial list of the papers to be presented is as follows: "Sanitation for Mine Locations," by W. H. Moulton, Ishpeming; "Concreting the Hamilton Shaft at the Chapin Mine," by S. W. Tarr, of Iron Mountain; "Winona Stamp Mill," by R. R. Seeber, of Winona; "Mining Methods on the Mesabi Iron Range," by Willard Bayliss, J. S. Lutes and E. D. McNeil; "What Our Neighbors Are Doing in Mining Iron Ore," by Dwight E. Woodbridge, of Duluth; "Safety in the Mines of the Lake Superior Iron Ranges," by Edwin Higgins, engineer in charge of Mine Rescue Car No. 8.

OBITUARY

Walter Brown, who for the past six years has been head of the power department of the Bethlehem Steel Co., was drowned recently in the Lehigh Canal, while canoeing. He was unable to swim. Mr. Brown was 41 years old.

Ephraim Bayard, 45 years old, superintendent of the American Steel & Wire Co.'s plant at Donora, Penn., died recently at the West Penn hospital, Pittsburgh. He had been superintendent of the plant for 23 years, and for some time previous to his appointment, was with the American Steel & Wire Co. at Cleveland.

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.

BLAST FURNACES—Improvements in Blast Furnaces. W. J. Foster, Walsall, Eng. (Brit. No. 12,390 of 1912.)

STEEL MANUFACTURE—Improvements in the Manufacture of Steel. F. Thuaud, Sheffield, Eng. (Brit. No. 27,978 of 1912.)

PIG IRON—Improvements in the Making of High-Grade Pig Iron. P. L. Troussaint Heroult, New York. (Brit. No. 25,858 of 1912.)

STAMP MILLS—Improvements in and Relating to Stamp Mills. R. R. V. Jeffreys, Bulawayo, South Rhodesia. (Brit. No. 8688 of 1912.)

TUBE-MILL LINING. William Alfred White and William Frederick Schmidt, East Rand, Transvaal. (U. S. No. 1,068,289; July 22, 1913.)

DRILLS—Improvements in Valve Apparatus for Percussive Rock Drills and Like Tools. G. Rayner, Sheffield, Eng. (Brit. No. 19,424 of 1912.)

BARIUM AND STRONTIUM—Process of Manufacturing Barium and Strontium Compounds. Arvid W. Elkstrom, Los Angeles, Calif. (U. S. No. 1,067,597; July 15, 1913.)

WROUGHT IRON—Method for Making a Material Having the General Properties of Wrought Iron. Bernard C. Lauth, Pittsburgh, Penn., assignor to Thomas S. Blair, Jr., Chicago, Ill. (U. S. Nos. 1,067,528 and 1,067,529; July 15, 1913.)

TIN—Improved Process for the Treatment of Tin Ores and Other Materials Containing Tin, for Example, Pyritic or Other Tin Ores, Tin-Ore Concentrates, Tin Waste, Tin-Plate Waste, Stanniferous Slag, Tin Slag and the Like. Jan Rueb, The Hague, Holland. (Brit. No. 27,148 of 1912.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—July 31

Mining in Sierra County is progressing in a small way in most of the districts. At Alleghany operations are more pretentious than in other places. There is no occasion for talk of a boom in mining in the county at present. In fact, there is not as much general work being done as at this time last year. There are several properties making fine showing, particularly the Tightner at Alleghany. The North Fork mine at Forest promises much, but there is no mill on the property, although it is said that one is to be built and that it will put the mine in the producing class. The Ironsides mine south of Downieville has produced rich ore in the last year and the owners are talking of building a small mill. The Sierra Buttes mine at Sierra City is being extensively developed and the extraction of ore is equal to the demands of the small mill and cyanide plant. The large mill is still idle. The Keystone is progressing favorably and the sovereign and Lee mines, it is stated on good authority, are to be reopened. Extensive development is in progress at the Kate Hardy near Forest, and the three-stamp mill is crushing ore from the old dump. Development at the Orient mine near Mountain House has reached the old workings, out of which a large amount of gold was taken in the early operation of the mine. Mining men in the district between Poker Flat and Downieville are contributing to a fund to build a new wagon road in order to avoid the necessity of traveling over a private toll road. The road was originally built as a state road at large cost several years ago, but was never completed. The changing of the route of the new wagon road between Alleghany and Nevada City has caused a good deal of complaint because the new route does not materially change present conditions and does not afford the desired relief to the upper side of Nevada County.

DENVER—Aug. 1

Cripple Creek Production for July amounted to \$1,206,683, with a gross tonnage of 81,863 tons. This is a decrease from June, owing to the three days' Fourth-of-July celebration, when practically all the mines and mills of the camp were shut down. The following outputs were reported: Golden Cycle, 83,000 tons, worth \$660,000; Portland, 9665 tons, worth \$212,630; Portland, Cripple Creek district, 13,600 tons, worth \$35,360; Stratton's Ind., 11,073 tons, worth \$24,692; Ajax, 4400 tons, worth \$12,496; Kavanaugh, 1700 tons, worth \$3740; Gaylord, 1600 tons, worth \$4000; Rex, 1200 tons, worth \$1320; Wild Horse, 1100 tons, worth \$2420; Isabella, 700 tons, worth \$1400; Smelters', 2825 tons, worth \$248,625; total, \$1863 tons worth \$1,206,683.

Newlin's Gulch Placers are to be developed by Denver men, if a movement now on foot is carried out. These sandstone conglomerate reefs, 35 miles southwest of Denver, have been known for many years, and on a small scale considerable gold has been taken out by panning and sluicing. Now, however, it is proposed to excavate the conglomerate stratum, screening out the coarse rock and boulders and crushing and cyaniding the residue; \$10,000 will be expended on this project, and a lease has been obtained on 140 acres of government land. The mill will start with 75 tons daily capacity. The formation is composed almost entirely of horizontal bedded stratified deposits, mostly coarse-grained sandstones or grits, and conglomerates, with occasional layers of rhyolite tuff. Parker, the nearest railway station, is 5½ miles distant.

BUTTE—July 31

The Flotation Process Litigation at Butte, in which the Minerals Separation Process, Ltd., of London, brought suit for infringement of patent rights against James M. Hyde, who claimed to have invented a process of his own, has resulted in a decision being handed down in favor of the plaintiff, the court denying the damages asked for in the bill of complaint. Hyde will appeal. Judge Bourquin summarizing the evidence stated that the defendant was using the complainant's process and that the defendant's contention that he was using the Froment process is not sustained, the differences between the two processes being so obvious as to constitute different processes. The Hyde flotation process had been installed in the Butte & Superior mill when it was under the management

of A. B. Wolvin, and before the present management came into control. The new interests naturally inherited this lawsuit, and have been active in defending the company's position. Should it ultimately be found that Butte & Superior will be compelled to pay a nominal royalty for the use of this process, the additional cost will not be a material factor adversely affecting the company's interests. The Minerals Separation company is at present seeking to make contracts for the treatment of porphyry copper slimes and the same interests influential in the management of the porphyries in question are also dominant in Butte & Superior. With this situation in mind it is inconceivable that there should be anything but an amicable adjustment of the present controversy between the Minerals Separation and the Butte & Superior companies. As a direct result of the decision, Butte & Superior stock dropped a few points. Approximately 900 tons of ore are now being hoisted daily, principally from the 700-ft. level, as it is the policy of the management to mine the ore from the upper levels first. Superintendent Bruce stated that the June production of concentrates from the mill was 6800 tons, and that he expected the July production would slightly exceed 8000 tons. Mr. Bruce has figures to prove that the recoveries in the mill are gradually improving. It is shown that in 1912 the recovery was less than 60% of the zinc, whereas it is nearly 90% at present.

SALT LAKE CITY—Aug. 2

The output of Tintic during the first half of 1913 has been estimated at 4659 cars, or approximately 232,000 tons of ore, the monthly shipments ranging from 875 cars in January to 674 cars in June, an average monthly output of 770 cars. The five largest shippers in the order of their output have been the Centennial-Eureka, Chief Consolidated, Iron Blossom, Eagle & Blue Bell and Grand Central.

Park City shipments during July amounted to 5504 tons, which shows a slight falling off as compared with the average of the first six months. The Silver King Coalition, Daly West, Daly-Judge, Thompson-Quincy and the American Flag were the principal shippers. The general condition of the camp is good, and an increased production is looked for during the remainder of the year. Several new properties should be added to the shipping list, and others will increase their production.

CALUMET—Aug. 4

General Strike Conditions are little changed from last week with the exception that the mine pumps in practically all of the mines have been started. The men operating the pumps are under guard, and at some places are being cared for at night at the property. At the Calumet & Hecla and the Copper Range mines, work has been resumed in the shops, but at none of the properties have attempts been made to resume underground work. C. E. Mahoney, vice-president of the Western Federation of Miners, called on Governor Ferris and asked to have the military force withdrawn from the district. The strikers are resorting to mass picketing and reports of intimidations and violence continue to come in. Several arrests have been made, and one man was apprehended with three sticks of dynamite on his person, which he tried to ignite when he was being searched. Governor Ferris suggested that a conference be held at the executive offices, between five representatives of the two factions. To this the mining companies replied that under no circumstances would they either directly or indirectly confer with the Federation, but that they were willing at any and all times to meet the men as employees. In their statement to the governor, the mine managers put forth the conditions that have prevailed throughout the district for the last 50 years, and called attention to industrial conditions, and the consideration that has been given to the welfare of the men. They said that there had never been any serious labor trouble in the copper country, and that previously any disagreements between the employees and employers had been readily and satisfactorily adjusted. The present trouble, it was claimed, was brought about by professional agitators sent here by the Western Federation of Miners from the Western camps. The statement also contained a history of the lawlessness and violence that has accompanied the various strikes fostered by the Federation, and gives these as the companies' reason

for not dealing in any way with the Federation. Nothing has been given out by the companies in regard to their future plans for the resumption of work and the developments are being awaited with much interest by the entire region, which is dependent entirely upon the mining industry; there being no industries of any consequence other than those directly affiliated with the mining industry.

DULUTH—Aug. 4

A Strike of Dock Hands resulted from an accident at the Allouez docks, July 31. Three laborers are known to have been killed, two were fatally injured, four were badly hurt and a score more were unaccounted for as the result of a collision of ore trains. Indignant over the accident, 250 dock hands struck. The accident is blamed to careless switching. A moving ore train ran into a standing train, throwing the workmen into ore pockets and covering them with ore. All the ambulances in the city and a dozen doctors were summoned. The dock managers ordered work resumed, but the men who are foreigners refused. Special police then took charge of the docks. A number of boats loading will be delayed unless an agreement with the strikers is reached. Awaiting settlement of the strike, 19 ore boats are tied up at the Allouez dock. The dock superintendent has met the men half way in their demands for their protection. Wages was not a question.

MARQUETTE—Aug. 2

No Labor Trouble in the Iron Country is anticipated. Contrary to sensational reports appearing in certain daily papers, the strike troubles in the copper country are not likely to be reflected on the Lake Superior iron ranges. The iron fields have been singularly free from threatening labor disturbances for several years past. There have been a few manifestations of discontent from time to time, notably on the Mesabi range in Minnesota two seasons ago, but these have been local. The men apparently are contented with wages and working conditions. These conditions have steadily developed for the better. The iron fields have not been the seat of such a persistent union propaganda as has been carried on in the copper region. The Western Federation of Miners has branches only in the Marquette district and on the Mesabi, it is understood, and its membership embraces but a small percentage of the whole number of workers. In general, the men in the iron mines have not responded to organizers and the campaign of envoys from the West has made comparatively little progress. So far as can be ascertained, the Federation is not represented in the Menominee and Gogebic district at all. There is one union at Ishpeming and one at Negaunee, on the Marquette range, but in neither case is the membership large. In the Mesabi region, where the Federation is the strongest, probably not more than 20% of the men are enrolled. The iron country is interested in the strike in the copper country naturally and its developments will be followed with the closest attention. So far as the Marquette range is concerned, a peaceful tone characterized a meeting held in connection with the union men's sixth annual picnic and at which the situation was discussed by speakers in four different tongues. Any purpose of inciting a strike was expressly disclaimed, it being asserted that the purpose was to consider ways and means by which the Marquette range members of the organization could help their copper-country brethren. Should it be necessary, temporary homes will be provided for families of strikers and a weekly assessment levied on the members of the union. The attitude of the Marquette leaders, in brief, is to conserve their resources for the aid of the copper-country men. It is realized that if the strike settles down to a long, hard pull, as is likely, since the copper mines are operated at a profit only by the exercise of the greatest economies, and since the operators are determined not to recognize the Western Federation, the union men in the red-metal district will need all the assistance they can obtain from their fellows. No meetings in the interest of the strikers have yet been held elsewhere in the iron region.

A short-lived strike on the Cuyuna, several weeks ago, was the only labor trouble in the iron fields this year. This, it was claimed, was instigated by Socialists. The strike was won by the operators. The properties affected were closed directly after the walkout took place and following a suspension of several days the men returned at the conditions that previously prevailed. Later, there was a "strike" at the Sec. 30 mine, near Winton, on the Vermillion range. The men in this case demanded that they should be paid on the tenth of the month, instead of on the twentieth. This concession was granted. In the meantime, the iron fields are reaping a benefit from the strike in the copper country, to the extent that they are obtaining important additions to their working forces. The migration of men from the troubled zone is serious. Many of the best miners are departing and in most

instances they are going to the iron region. So extensive has been the exodus that the general manager and the general passenger agent of an important railroad have been on the ground personally to look after the traffic. In the great majority of cases, the men participating in the hegira are English-speaking mine workers, steady and industrious and not affiliated with the Western Federation, and it is noticeable that wherever possible the iron-mining companies are adding them to their payrolls.

GALENA—Aug. 2

A Great Prospecting Campaign, one that is declared to be the greatest in the history of the Kansas zinc-mining field has been growing during the last month. S. R. Ping, a land owner greatly interested in the mines of the district, said recently that in all his experience in the last 20 years in the field he had never seen so many drill rigs at work in the Galena camp as are now being operated. He estimated that there are as many drill rigs at work in this field as there are in all of the other southwest Missouri camps combined, a condition that is surprising. However, this campaign is only part of the general campaign that has been going on in the territory stretching from the old Badger camp in Kansas to the new Miami camp in Oklahoma. Stimulated by the strikes made in what was known as the Klondike camp, many years ago, several prospectors have set to work to test a large area of ground in that vicinity and stretching southwestward along Spring River. Simultaneously the deep drilling and mining operations south of Galena on Shoal Creek by the Hartford Mining Co., which showed such exceptionally good ore at the deep level of 300 ft. started operators to testing out land in that part of the field and drilling companies are now entering upon work that will last until the winter season. Among the operators interested here is J. M. Short, who is setting two machines to work this month on a lease of 80 acres which he has just secured. The Empire Zinc Co. is also continuing its drilling and prospecting operations.

At Blue Mounds, just above the Kansas and Oklahoma line, is found the northern advance guard of prospecting drills. These have been steadily advancing from Hattonville tracing the orebodies in a northerly direction until it now appears that the zinc-blende ore deposits of the district are going to be found extending much further under the Carboniferous Pennsylvanian shales and sandstones than has been anticipated from previous study and experience. The steady advance of the prospectors to the north has already demonstrated the existence of promising deposits of ore already far past the margin where the Pennsylvanian overlaps the Mississippian rocks. Previous study of the district had indicated that it was unlikely that profitable bodies of ore would be found beyond the general margin of the coal measures. It now appears that this opinion will have to be modified and there are those who now believe that there is a possibility of tracing the present "run of ore" as far north as Columbus, where some of the best coal mines of Kansas are now being operated. Hardly less important has been the extension of the prospecting operations to the southwest of Hattonville and the development of the fact that there exists there a stretch of territory about one mile wide by six miles long of demonstrated mining ground. This is comparable to the famous Oronogo-Duenweg "run of ore" in the Missouri district from which has come 50% of the ore production for a good many years.

FLAT RIVER—Aug. 1

A Demand for Higher Wages has been made by the miners of this region and unless the mine owners grant the desired increases, the question of a strike will be put to a referendum vote. The miners some time ago gave the owners until July 31 to grant them a straight increase of 50c. per day, recognition of their union, and adoption by the company of the check system, whereby the companies deduct union dues from the pay of the union members and turn it over to the union officials. The miners contend that they are the poorest paid of any mineral workers in the country, and say that even if the demands are granted the average salary will be only \$2.50 per day.

GRANTS PASS—July 29

A Railroad to the Coast is to be built from Grants Pass. Actual construction work has been begun. Such a railroad will open this section and the country to the west to development of its mineral resources. Many efforts have been made to build a railroad from this town to the seaport town, Crescent City, Calif., but this is the first actual construction work to be done. A construction company has been organized in Oregon and California to build this road. The capital is \$2,500,000. Offices of the company have been opened at Grants Pass and contracts have been let for the first 10-mile section, which will be owned by the city of Grants Pass.

THE MINING NEWS

ALASKA

MIZPAH (Fairbanks)—Twenty tons of ore were crushed at the Fursteneau mill at the head of Fairbanks Creek. The recovery was \$30 per ton, and \$17 was lost in the tailing.

HOMESTAKE (Fairbanks)—A recent 25-ton shipment milled about \$100 per ton. The effort to sink a winze has been abandoned, as considerable water was encountered at a depth of 8 ft. below the tunnel level.

NEWSBOY (Fairbanks)—A clean-up from 202 tons of ore was made June 30; it yielded \$3600, or \$18 per ton. The ore was from the 150-ft. level, where the vein is 6 to 8 ft. wide. The mill is now crushing ore from the 215-ft. level.

COOK BROTHERS (Fairbanks)—A test shipment of three tons from a recent discovery on the left limit of Fairbanks Creek yielded \$27, per ton by amalgamation. The concentrate, which comprised 2½% of the ore, assayed \$175 per ton.

ALASKA UNITED (Douglas Island)—In the Ready Bullion mill, 18,242 tons of ore milled in June, yielded \$40,362, or \$2.23 per ton, \$15,950 being estimated as profit. In the 700-Ft. Claim mill, 17,955 tons of ore yielded \$49,155, or \$2.76 per ton, \$18,548 being estimated as profit.

GUESSMAN (Fairbanks)—From a vein discovered last winter on the right limit of Bedrock Creek, just above the Rhoads-Hall mine, five tons of ore milling \$150 per ton have been shipped. The vein is on one of the claims embraced in the group owned by the Tanana Quartz & Hydraulic Mining Co., and is being developed by Guessman & Kipps under lease.

CRITES & FELDMAN (Fairbanks)—A shipment of 40 tons of ore from the Helen S. claim on Moose Creek was recently put through the Willis mill on Chatham Creek. The ore returned \$60 per ton, much less than was obtained last mill-run. Another shipment of 40 tons of about the same grade will be made soon. In the mine, two shifts are driving the adit, stopping and raising. Definite plans have not yet been made, but it is probable that a small mill will be built before winter.

RONAN & SPALDING (Fairbanks)—The last clean-up at the mill returned \$2500 from a run of three days; or \$130 per ton of ore. The lease expired July 15; Brumbaugh & Spalding will continue operations under a new lease. Development work, which has been allowed to lag because of the short time available to the lessees for the mining of ore, will be hastened. The little mill of three 250-lb. stamps, which was destroyed by fire last winter, will be rebuilt, and will be used to crush the occasional pockets of high-grade ore. The ore of lower grade will go, as before, to the larger mill.

ARIZONA

Mohave County

COPPER GIANT (Hackberry)—This property was recently purchased by the Clark interests, of Jerome. The shaft is being sunk to the 300-ft. level and it is reported that a large shoot of copper ore has been found. The ore contains some gold and silver, as well as copper.

YELLOW JACKET (Aubrey)—This property is under bond to C. L. Davidson and George Theis, Jr., of Wichita, Kan. At present the shaft is being sunk and drifting is in progress on the 100-ft. level. The ore contains gold, silver, lead and copper; some of it also carries zinc. It is expected that a hoist will soon be placed on the property.

SAN FRANCISCO (KINGMAN)—This property is in charge of J. E. White, formerly manager of the Quartette mine at Searchlight, Nev. He has a small force of men at work sampling the workings preparatory to outlining a plan of development. The ore contains gold, lead and some copper, and some of it has been found richer than was anticipated.

KINGMAN COPPER CO. (Mineral Park)—This company recently purchased a new standard drill rig on account of the difficulty it experienced in drilling to depth with the old rig. The new rig has been put in operation on the claims at Ithica Peak and an effort will be made to drill to a depth below the 800-ft. level. At present, the first hole is down about 100 ft., and copper-bearing quartz has been penetrated.

WHITE ELEPHANT (Cerbat)—The Pacific Investment Co., which is operating this property, has just completed improvements which will increase production. A 60-ton ore-bin has been built and two ore wagons have been secured for the 4-mile haul to the railroad. There is a large tonnage in sight, of ore carrying gold, silver, lead and some copper, silver, however, is the principal valuable metal, considerable native silver being found.

CALIFORNIA

Alpine County

IN THE MONITOR DISTRICT the Curtz and the Morning Star mines owned by Captain Curtz, and the adjoining mines bonded by Gunn-Thompson are being extensively developed. The Curtz property has developed a large body of milling and concentrating ore carrying silver and copper. An electrically driven mill and concentrator will be built this summer. If warranted, small smelting plants will be built. The activity at these two properties is attracting attention to the entire district, which is sometimes called the Loope district.

Amador County

MARKELEY (Volcano)—A new development shaft will be sunk to 500 ft. at a point 600 ft. east of the old shaft. The mine formerly produced high-grade ore.

BUNKER HILL (Amador City)—The electric hoisting motor used in sinking the shaft was recently shipped to San Francisco for repairs. The shaft has been deepened 200 ft. below the 1950-ft. level. During the suspension of sinking the cutting of the 1100-ft. station is in progress. Dividend No. 86 of 2½c. per share was paid July 15.

Butte County

GOLD BANK-GOLDEN QUEEN (Forbestown)—The mill and cyanide plant are temporarily closed down for lack of water. The demand for irrigation water by the farmers is the cause. The South Feather Land & Water Co. is unable to supply both the farms and the mines since the present season is exceptionally dry. Recent development in the Gold Bank mine has disclosed large orebodies that were believed by the former owners to have been exhausted. The Forbestown Consolidated under the management of M. J. Cooney has proved that the mines were not worked out as claimed by the former owners.

Calaveras County

WHEELLOCK (Sheepbranch)—High-grade quartz is reported at the 200-ft. level. The vein is said to average 3½ ft. wide, carrying free gold ore and sulphides.

CALAVERAS COPPER CO. (Copperopolis)—It is reported that creditors have assumed charge of the mine for the purpose of settling accounts. The June payroll for labor, which was passed at the end of June, was paid in July. The liabilities are said to be \$54,000. Copper matte on hand is valued at \$18,000.

Lassen County

FROM SKEDADLE CREEK DISTRICT comes news of a gold strike at Stacey. It has caused a small rush of prospectors to the district which lies east of Honey Lake. The region has never been mapped as a gold-producing district, and there is no available information as to the prospects for uncovering either quartz or gravel commercially profitable for gold mining.

Modoc County

FORT BIDWELL MINES CO. (Fort Bidwell)—George H. Kent has filed suit against the company for compensation for caretaking. The mine is situated at 8000 ft. elevation, and during the winter there was 20 ft. of snow at the mill. In his complaint Kent sets forth the facts of isolation and the illness of his wife, who was carried out over the snow to secure medical attendance.

Nevada County

GASTON (Graniteville)—The 10-stamp mill is being removed from the upper workings to the tunnel level. The tunnel is 4000 ft. long, and the development of the mine is such that greater economy may be practiced by tramming the ore than by hoisting.

Siskiyou County

SISKIYOU MINES CO. (Happy Camp)—George P. Burbank, manager, has gone to New York, and William Maguire, of Nevada City, has been appointed manager. Mr. Burbank is still largely interested in the company and will return in the fall. The machinery will be overhauled. Ten men are employed. In June the mine was running on a full ditch, and it is reported that the last clean-up was about \$16,000.

Tuolumne County

ATLAS (Tuttle town)—This mine and the Soldiers' Gulch mine, with about three acres of adjoining land, have been purchased by J. L. Witney. The Atlas mine was formerly known as the Waters, and was reopened last year by Mr. Witney.

COLORADO

Eagle County

LADY BELLE (Eagle)—Notwithstanding all the sensational reports from the Brush Creek district, the fact remains that this is the only mine that is shipping ore or that has ore in place. The extension of the ore has not been found.

El Paso County

HOLLINGSWORTH VS. TUFTS—In the district court at Colorado Springs the litigation involving mining property in Mexico, which has been in the courts for 10 years, was practically settled in favor of Edward R. Tufts. Judge W. S. Morris declined to accept the report of the referee, O. E. Collins, awarding Dr. J. G. Hollingsworth, of Kansas City, title to 1,500,000 shares in the Grand Union Mining Co., and a personal judgment of \$351,000 against Tufts. Hollingsworth's attorneys will probably take the case to the appellate courts. Hollingsworth claimed that in 1899 he grubstaked Tufts for a mining trip into Mexico. He claimed that he had advanced several thousand dollars and that he was entitled to half of the profits of the mines. Tufts, on the contrary, claimed that he had borrowed only \$350 from Hollingsworth and had repaid him. Later, Tufts' ventures in Mexico were exceedingly profitable.

Lake County

THE ARKANSAS VALLEY SMELTING WORKS is now operating five furnaces in full blast.

LITTLE ELLA (Leadville)—The lots of zinc ore that have been shipped by the lessee contained 40% zinc, so he is now blocking out reserves for stoping. The usual amount of lead-silver ore is being shipped daily.

MILLER (Leadville)—The Miller mine bids fair to be as productive as the Mount Champion, as in a new drift started recently in the intermediate tunnel between the upper and lower workings on the Miller vein ore, has been opened that extends the entire width of the tunnel. From the bottom the assays give returns of 6.70 oz. gold and 4.6 oz. silver per ton. Another orebody, from 2 to 3 ft. wide, worth \$15 a ton, has been opened near the end lines of the Mount Champion, it is reported.

Pitkin County

TIN CUP (Tin Cup)—The power plant of this dredging company will be built on Chalk Creek, in the Leadville national forest, near St. Elmo. The first installation will be about 6000 hp. The power line will cross the continental divide at an elevation of 12,000 feet.

San Juan Region

GENESSEE VANDERBILT (Ironton)—This mine in the Red Mountain district is being unwatered and shipments of ore will be made next month. The ore is covellite, and the vein was struck 3000 ft. in from the portal of the tunnel, which was driven by the Red Mountain company prior to its being sold out for debt.

Summit County

ARCTIC (Breckenridge)—The 10-stamp mill was started last week on gold ore from the mine. The property is operated by electricity.

SAND MINING CO. (Breckenridge)—Amalgamating tables will be added to the mill on the Ohio River as there is much free gold in the ore.

ST. JOHNS M. & M. CO. (Breckenridge)—This company will operate a steam shovel on the dump, which contains 65,000 tons of good concentrating ore.

REILING GOLD DREDGE (Breckenridge)—This dredge will be moved up-stream a mile to very rich ground. It is said to have yielded cleanups of \$1000 per day.

Teller County

ISABELLA (Cripple Creek)—A rich strike by a lessee is reported through the camp, but the company will give out no information until the shoot has been more developed. McIntyre & Butler, lessees, have made a strike of good ore on the eighth level and a carload sent out a few days ago ran \$40 per ton.

PORTLAND (Victor)—The mine is now being developed with the object of going 150 ft. deeper. Through the deep drainage tunnel the water is receding 7 ft. per month. For the quarter ended July 30 the mine made a net profit of \$243,043; of this \$60,000 was paid as a dividend and \$180,000 carried to the reserve fund.

IDAHO**Coeur d'Alene District**

PLACER MINING OPERATIONS are well under way in the Murray district. The late rains and heavy snows of last winter giving ample water supply for extensive operations. One of the largest crews at work is on East Slagle Creek, where Dunlap & Smith, pioneer placer miners, are washing a large strip of rich pay. Ten miners are employed, and booming is practiced in getting to bedrock, which lies at a depth of 8 to 12 ft. Assured of a strong water supply, the owners are working a larger strip this summer than for many seasons, and from the present outlook will make one of the largest cleanings of the North Side. The gold is coarse and averages \$18 per oz. Nuggets worth from \$25 to \$55 have been taken from the creek, but the bulk of the gold is nuggets averaging from \$1 to \$5 each. The season's cleanup will probably be close to \$10,000.

LACLEDE (Burke)—Extensive development of this mine, between the Hercules and the Tamarack & Custer and adjoined on the north by the Interstate-Callahan, is planned. Operations have been hampered by the heavy flow of water in the main tunnel, but recently the workings became dry. It is supposed that the mine is being drained by the others in the vicinity. The No. 2 tunnel is now in 2200 ft., 1600 ft. of which is a crosscut to the vein and the remainder a drift on the vein. The showings in the bore were not satisfactory, and recently sinking was started 1800 ft. in from the portal. Certain stockholders report that after a visit to the mine they found conditions were never more promising in the Coeur d'Alenes than now. Every prospect of any promise is being worked and the producing mines are shipping to the limit of their equipment. More men are employed in the mines and mills than at any time since the first property was opened, and it is thought that the output for the current year will be far in excess of all previous records. The district is attracting attention from mining operators and investors all over the country, and the hotels in the different towns are being taxed to provide accommodations for transients, while practically every train in and out of the region is crowded with passengers.

LOUISIANA**Caddo Field**

SEIZURE OF A BURNING GAS GUSHER, 20 miles from Shreveport, was recently made by the conservation commission. The well will be held until the owner, D. D. Davis, of Waterloo, Iowa, pays a fine for the waste of oil. The well is an enormous gasser and has been wild for five or six years. Repeated efforts on the part of the owner to close the well have proved futile and it was accidentally set on fire. The conservation commission will make a renewed effort to have the gusher closed. It is expected that the cost will be between \$10,000 and \$15,000.

MICHIGAN**Iron**

TOBIN (Crystal Falls)—Corrigan, McKinney & Co. closed this mine at Crystal Falls last week because there is more ore on hand at present than the company can dispose of this season. The mine is the next to the largest in Iron County, and employed a large force of men, most of whom found employment at other properties in the district.

FLORENCE (Florence, Wis.)—Felix A. Vogel, general manager of mines for Ladenberg, Thalman & Co., visited Florence a few days ago and left orders to close down the mine. The pumps will continue in operation, so it is believed that the shut-down will not be for long. The company has experienced some difficulty in disposing of its product, and there is quite a large stock pile at the property.

CLEVELAND-CLIFFS IRON CO. (Crystal Falls)—It is now certain that this company has found a mine in the Mastadon section near Crystal Falls, but it has not been learned when mining operations will be commenced. The company's drilling in the Iron River field has also brought good results and a mine has been located there, on the north range. The company has two geological parties working in the district in good territory, and it is not unlikely that other orebodies will be discovered.

AMERICAN (Ishpeming)—The management of this property states that good results are now being secured at the concentrating mill, although it was necessary to make a number of changes from the original plans. All of the tables had to be rebuilt. The low-grade ore that goes through the mill averages from 38 to 45% iron, and the product 60%. Many mine managers are watching these operations, and it will probably not be many years before similar concentrating plants will be erected for the treatment of low-grade ores, which abound in the Lake Superior field.

MINNESOTA**Mesabi Range**

OLIVER IRON MINING CO. (Coleraine)—Mining activities were curtailed in the Canisteo district when men were laid off and several shovels and locomotives were transferred to other parts of the range. For the remainder of the season only day crews will be employed, all night work having been discontinued.

GILBERT (Gilbert)—President Olcott, of the Oliver Iron Mining Co., visited Gilbert a few days ago and gave orders to suspend operations at the mine, but no reason for the action was given out. The mining was being done on leased ground, and the company had removed the minimum quantity required by the fee owners, which is probably the reason for closing down.

Cuyuna Range

THE NUMBER OF MINES ON THE CUYUNA range, according to the annual report of the mine inspector, for the year ended June 30, is 12, of which 10 are in operation. The average number of men employed at the 10 properties is 1327; average daily wage underground, \$2.86; surface, \$3.03; ore shipped, 443,460 tons; stripping removed, 1,018,456 cu.yd.; fatal accidents, two.

BARROWS (Barrows)—This mine of M. A. Hanna & Co. will enter the list of Cuyuna shippers about Aug. 15. This will be the first shipping mine on the south range of the Cuyuna district. The company is about to install a 30-hp. turbine on the mine's waste water line, which will supply power for electrically lighting the surface plant. The water is raised 30 ft. above the collar of the shaft, and there is 25 ft. head at the point of discharge.

PITTSBURGH STEEL ORE CO. (Crosby)—Hydraulic stripping is something new on the Minnesota ranges, but this company has been getting fine results at the Riverton property, and the stripping outfit will be increased in order to move about 15,000 yd. of earth per day. Only one unit is being operated at present, but four more will be added, and it will not be long before the orebody is laid bare. The overburden is sand, with a strata of pebbles here and there, but the pebbles are not permitted to enter the sand-sucker, which picks up the loose sand and water as it comes from the dump and carries it far into Little Rabbit Lake. Some of the Riverton ore carries clean quartzite, and a concentrating mill will be erected to remove it.

MISSOURI**Joplin District**

WILSON (Duenweg)—The capacity of the 300-ton mill on this property is to be increased to treat ore now being taken from a 40-ft. face of ore. The company expects to hoist 1600 tubs daily. The ore is being mined at the 175-ft. level. Operations will continue while the plant is being enlarged.

OAK ORCHARD (Joplin)—The ground is being drained, preliminary to an extensive drilling campaign. It has been idle for several months and the 40-acre lease has been flooded. Previous operations did not extend over the entire tract and many good turn-ins were made. For that reason the new company leasing the property believes the ore has not been worked out.

LINDO MINING CO. (Verona)—The third drill hole was terminated in a run of blende at a depth of 190 to 210 ft. of virgin land immediately south of Verona. The nearest developed mining lands are at Aurora, several miles away and the new properties are considered important as a new mining camp may be opened. Other prospecting is now contemplated by other landowners.

KAIL LAND (Joplin)—Preparations are being made for building a mill on this land by Baum Bros. and associates. Following the drilling of eight drill holes which developed a promising deposit of blende, a shaft was sunk and the ground is now being rapidly opened. The ore taken out is galena at the 60-ft. level and blende at 80 ft. The land has hitherto been used exclusively for agricultural purposes.

MONTANA**Butte District**

BUTTE & LONDON (Butte)—Preparations are being made to continue sinking the shaft at this property in the eastern part of the Butte district from the 1100- to the 1600-ft. level. Electric sinking equipment has been ordered and it is expected that operations will be commenced Sept. 15. The work is to be done by the Rainbow Lode Development Co., in which Thomas F. Cole, E. C. Congdon and others, of Duluth, are interested. The mine has been closed since 1907.

ELM ORLU (Butte)—W. A. Clark, owner of this zinc and copper property in the northern part of the district, has announced his intention of sending the zinc concentrates from the mill now in the course of construction, to the smelteries of the National Zinc Co., which has leased the plants of the United Zinc & Chemical Co., with works at Bartlesville, Okla., Kansas City, Kan., and Springfield, Ill. Mr. Clark decided upon this course after a thorough investigation of the feasibility of establishing an independent plant, using Wyoming gas or coal for fuel.

CORBIN COPPER (Butte)—In a recent week a new record for shaft sinking in Butte was made. The shaft on the Gambrinus was sunk 35 ft., and has now been sunk to a depth exceeding 130 ft. At a depth of 85 ft. a crosscut was driven south to prove the apex, the vein being encountered 35 ft. from the shaft, where it is composed of 4 or 5 ft. of quartz and 20 ft. of lode matter. In the Rochester district the company is developing a group of claims and has just cut the second vein in driving for the main vein at a depth of 500 ft. Two parallel veins 15 ft. apart have been cut, assaying 3 to 7% copper.

TUOLUMNE (Butte)—Strong opposition to the proposed increase of capital is developing, and Lee Mantle, a former senator, is heading a minority interest which threatens litigation to prevent the proposed increase and purchase of the Butte Main Range company's undeveloped ground. The announcement of the plan to double the capital of the Tuolumne cut the market value of the stock in half and shareholders are rather hostile. "As a matter of principle," says Senator Mantle, "I question the wisdom of the men behind Tuolumne buying Butte Main Range with Tuolumne's money, when the ownership is largely the same in both cases."

NORTH BUTTE (Butte)—The work of sinking the Granite Mountain shaft is progressing at the rate of 100 ft. per month, and it is expected that before the end of the year it will have reached the 2800-ft. level, the present depth of the Speculator shaft. As soon as this depth is reached a connection will be made with the Speculator shaft so that in the event that it becomes necessary to close the latter temporarily for retimbering or other purposes, the Granite Mountain shaft can be used for hoisting, thus keeping up the output until the main shaft is in commission again. The mine is producing 2,250,000 lb. of copper per month.

Broadwater County

BLACKSMITH (Hassel)—Charles Muffly, of Helena, has taken an option upon this property of the Thomas H. Carter estate, and it is probable that mining will be started in a short time. There is a 20-stamp mill at the mine, but on account of the refractory nature of the ore on the lower levels it was found impossible to make a sufficient saving and work was suspended several years ago. Mr. Muffly is contemplating making alterations in the mill.

Deer Lodge County

ORO FINO (Georgetown)—Charles Bostrom and W. H. Dunnigan, of Anaconda, recently took a lease on this property. They have installed a hoist capable of sinking to a depth of 400 ft. and will operate on a large scale. Ore assaying from \$15 to \$20 per ton has been encountered on the 200-ft. level.

Madison County

WATSEKA (Rochester)—The owners of this old mine are having tests made of the talling dump with the idea of erecting a cyanide plant should the results indicate that the material can be retreated at a profit.

NEVADA**Douglas County**

WINTERS (Gardnerville)—This mine was sold recently for \$90,000, an initial payment of \$20,000 having been made, the balance to be paid in 24 months. The mine is on the east side of the summit of the Pine Nut range, about 18 miles east of Gardnerville and two miles north of the Longfellow mine. It will be fully equipped at once and placed in condition for operation, probably \$50,000 will be spent in this work.

Humboldt County

GOLD AND SILVER DISCOVERIES have been made recently in Rochester by lessees on the Abe Lincoln, Turpin and Moore, Buck & Charlie, St. Valentine and Nonpareil properties.

Lincoln County

WOOLLEY VS. PALMER—Suit has been filed by Ernest R. Woolley against William J. Palmer, president of the Amalgamated Pioche Mining Co., to collect \$125,000, the amount of a promissory note given to Woolley, for his part in the formation and promotion of the company. Woolley was the principal owner of the Nevada-Utah Mining Co., which later took in several other properties in the Pioche district and was reorganized under the name of the Consolidated Nevada-Utah Mining Co., which in turn took up other mining properties of the district. Woolley alleges in his suit that, acting for the Vogelstein interests of New York, represented by William J. Palmer, he was instrumental in the promotion and organization of the Amalgamated Pioche, and for this service was to receive \$125,000. After the formation and consolidation of the various companies, Woolley alleges, the Amalgamated refused to pay the promissory note given him for his work in organizing the company.

Lyon County

BLUESTONE (Mason)—The experimental concentrating plant has finished its test run and is temporarily closed down. The results of the test, it is said, were quite satisfactory. Development work in the mine is being continued.

BLUE JAY (Yerington)—The retimbering of the shaft has been completed. The hoist is in operation and the bucket will be replaced by a cage at once. Drifting on the 200-ft. level is in progress and the shaft station on the 400-ft. level is being cut out.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended July 24, 1913, were as follows: From Mason Valley Mines Co., 2026 tons; from Nevada-Douglas, 1126 tons; from other mines, 1046 tons; total, 4198 tons, or a daily average of 600 tons. During the same week four cars of matte were shipped.

YERINGTON BULLION COPPER CO. (Ludwig)—This property is about two miles north of the Nevada-Douglas. Shaft No. 1 is 4x5 ft. and is 400 ft. deep. It is equipped with a 40-hp. gasoline engine and compressor, and a 15-hp. hoist. Two air drills are working on development. On the 400-ft. level the shaft station has been cut and about 200 ft. of drifting and 130 ft. of crosscutting have been done, opening some good-grade copper ore. Good-grade ore has been cut in the tunnel 300 ft. west of the shaft, and also in the tunnel 300 ft. north of the shaft. A crosscut will be driven from the 400-ft. level to the west oreshoot. Higher on Bullion Hill a shaft has been sunk 116 ft. and which has cut an oreshoot dipping to the west. North of this shaft, about 200 ft., ore to a depth of 30 ft. has been exposed in an open cut and in a shaft. In addition to the copper the ore contains gold.

Mineral County

WEST EXTENSION GROUP (Mina)—This group is under option to Los Angeles men, it is reported, for \$40,000. A preliminary examination has been made and a final examination will now be begun.

CINNABAR KING (Mina)—In the bottom of the shaft a 5½-ft. shoot of good-grade cinnabar ore is exposed. A bond has been given on this group to Eastern men for a consideration of \$60,000 cash payment when the property is taken over. The property will be reported on in the near future.

DAVENPORT MINING AND DEVELOPMENT CO. (Mina)—This property, situated at Douglas, six miles west of Mina, has been developed by tunnels on the main vein and a shaft sunk to a depth of 350 ft. at a point below the lower tunnel. A large shoot of free-milling gold ore of good grade has been opened. Test runs have been made on this ore at the newly erected custom mill of the Gold Range Mining, Milling & Leasing Co., and after some necessary changes at this plant, regular shipments will be made. There is a promise of greater activity in this district as a result of recent discoveries.

Nye County

ROUND MOUNTAIN MINING CO. (Round Mountain)—Settlement has been effected of the pending litigation between John F. Davidson and this company by the company paying to Davidson and the men interested with him the sum of \$15,000 and 15,000 shares of treasury stock, for a release and satisfaction of judgment of \$165,157. A dividend of 4% per share is payable Aug. 25.

White Pine County

NEVADA CONSOLIDATED (Ely)—It is reported that after a series of laboratory experiments with the oil-flotation process of concentration it has been decided to build an experimental plant. Laboratory tests are said to have been successful.

COPPERMINES (Kimberley)—Repair work which is being done on the reservoirs near the main Giroux shaft is about the only indication of any intention to place the old Giroux mill in commission as an experimental plant. The reservoirs have been empty since the pumps at the Giroux shaft were shut down at the time of the strike last autumn. Water from the Giroux shaft would be the necessary source of supply for the mill. A. J. Sale, chief engineer for the Giroux company, is in Butte and it is rumored that he went to attempt to pacify the Butte & Ely stockholders who object to the proposed consolidation and have applied for a receiver for their company.

OREGON**Baker County**

POWDER RIVER GOLD DREDGING CO. (Sumpter)—This company is now operating its dredge in the river at the edge of the town and the clean-up exceeds \$10,000 per week. The pay is found at a depth of 10 ft. The company contemplates installing other dredges.

GEM (Baker)—This mine, 29 miles east of Baker, is now opened to a depth of 600 ft. and there is 6 ft. of good ore in the face of the drift. Drifting is now being done in the North drift of the 500-ft. level. Electric power is being installed and the work will be completed by September.

PACIFIC LIME & GYPSUM CO. (Huntington)—This subsidiary of the Acme Plaster Co. has extensive holdings of gypsum beds near Huntington. The plant has just recently been completed and is now in full operation; 450 hp. is required to operate the plant and is furnished by the Idaho-Oregon Light & Power Co. There are 75 men employed and from three to four cars of lime and plaster are shipped daily.

BEN HARRISON MINES CO. (Baker)—W. C. Fellows, manager of this mine, charges improper weighing of ore shipped from his mine, and states that the Sumpter Valley R.R. is not giving correct weights. The case is being heard at Baker, before Clyde B. Altchison, of the state railroad commission. Mr. Fellows states that there is a considerable difference between weights made at the mine and at Midvale, Utah, where his concentrates are shipped, and the weights made by the Oregon-Washington R.R. & Naviga-

tion Co. on the scales in the Baker yards. An effort is also being made to reduce the rate on concentrates lower than the present tariff, which is now \$2.65 per 100 lb. in carload lots.

Josephine County

HORSESHOE BAR—This placer mine, 25 miles below Galice, on the Rogue River, is undergoing extensive development work, and three giants are now in operation. A good clean-up has recently been made and another and larger one will be made later in the season.

ALAMEDA CONSOLIDATED (Galice)—Corporation Commissioner R. A. Watson has requested the attorney-general to ask for a receiver for this company, with offices at 207 Board of Trade Bldg., Portland, Ore. The report of the corporation examiner, S. B. Vincent, states that the company is capitalized for \$15,000,000, and has issued and has outstanding stock for \$13,375,550, which Mr. Vincent reports was issued at a discount of \$11,806,456, minus large commissions. There is in the treasury \$1,624,450 in stock and \$203 in cash. Mr. Vincent states that the company is running behind constantly and, according to the statement of the secretary, owes about \$130,000, a large proportion of which is due for salaries and personal accounts of some of the directors. He thinks that the company is hopelessly involved and the corporation commissioner will not allow the management to sell any treasury stock. John F. Wickham, manager of the company, states that it is at present in hard financial straits, but declares that the mines can be put on a paying basis for \$50,000, which he says, will equip the smelting works and then \$300,000 net could be made annually; the company did not run behind until 1911, when the smelting works was built and that but very little of the indebtedness is due for salaries. A later dispatch states that Corporation Commissioner Watson has reversed his action upon a showing made by the company that it owns a profitable mine and the promise that it will suspend the selling of stocks.

SOUTH DAKOTA

WASP NO. 2 (Deadwood)—A system of belt conveyors will be installed under the tanks for removing the tailing, thus doing away with hand tramping, and also reducing the time consumed in dumping.

RATTLESNAKE JACK (Galena)—The owners have purchased the Saginaw mill, at Custer, and will move it to the property, and equip it with a cyanide department. The plant contains 20 stamps, and is practically new and up-to-date.

HILL CITY MINING & DEVELOPMENT (Hill City)—This company is working energetically on its property in the Hill City district, and is securing results of a highly encouraging nature. The deposit is largely free milling and from present indications is of large extent. It is planned to erect a mill at an early date.

MINERVA—Peterson & Co., leasing on this property, in Blacktail Gulch, are getting encouraging results, and are preparing for a mill run. The Esmeralda mill has been secured, and may be repaired for their use. The property is in the conglomerate belt, and the present tunnel is following a course destined, should it continue, to intercept a shoot that produced some fabulously rich ore some years ago.

REPUBLIC—W. T. Boley is making an examination of this property, in Blacktail Gulch, and will outline plans for future work. During last winter and spring considerable development was done, but operations were suspended in April. Officials of the company, residents of Chicago, are at the property. It is reported that Mr. Boley will have charge of work upon resumption. The property contains several good shoots of ore, and a mill is among the possibilities of the near future.

IRONSIDE—Leasers at this mine in Squaw Creek are getting out high-grade smelting ore, and as soon as the wagon road to Maurice station on the Burlington, is repaired, shipments will commence. The ore is the richest sylvanite ever found in the Black Hills. The property lay idle for over 10 years. The present leasers have been working about three months. Their work is being confined to drifting and crosscutting 15 ft. below extensive lateral workings opened by the former operators, giving an illustration of how easy it is in mining to miss a good thing by a narrow margin.

UTAH

Juab County

BLACK JACK (Mammoth)—This mine is to be closed for the present. There is considerable low-grade ore in the upper workings as well as on the dumps.

GRAND CENTRAL (Robinson)—At the July meeting the directors failed to declare a dividend for the quarter just ended. Eleven cars of ore were shipped the week ended July 18. It is reported that the mine is soon to be electrified.

EMERALD (Mammoth)—The work of repairing the shaft has been practically completed, and work is to be resumed on the 1100-ft. level, where drifting will be done. A winze will later be sunk from the 1100 in search of ore stated to have been encountered, when the mine was being worked through the 2000-ft. level of the Opex.

Summit County

SNAKE CREEK TUNNEL—Work has been resumed on this tunnel, which has attained a length of almost 6000 ft., and the ultimate length of which is to be 14,000 ft. The tunnel will unwater and develop a large territory.

SILVER KING CONSOLIDATED (Park City)—A station has been cut on the 1550-ft. level, a switch cut and a hoist, etc., installed. Shaft sinking is being continued, and as soon as the shaft has been completed to the 1800-ft. level the development of the orebody cut at 1480 ft. will be undertaken.

SILVER KING COALITION (Park City)—During the year ended Apr. 30, 1913, 18,229 tons of crude ore and 12,485 tons of concentrates from 31,997 tons of second-class ore were produced. The first-class ore averaged 31.2% lead, 64.48 oz. silver, and 0.0571 oz. gold, and the concentrates 35.55% lead, 55.76 oz. silver, and 0.0648 oz. gold. Net earnings were \$745,102.

WISCONSIN

Platteville District

WILSON (Potosi)—This company has unwatered the Preston Point mine and begun milling.

MIDLAND LEAD & ZINC CO. (Elmo)—This new company has taken over the Beloit-Elmo mine and resumed operations.

B. M. & B. (Livingston)—This company struck the ore range in its shaft on the Biddick land, adjacent to the Ellsworth mine at Livingston.

MINERAL POINT ZINC CO. (Highland)—This company has purchased the Minter property, at Highland, formerly operated by the Milwaukee-Grange Mining Co. The carbonate mines at this camp which were purchased during the last year by the Mineral Point Zinc Co. have been reopened.

CANADA

British Columbia

PROGRESS ON THE HIDDEN CREEK reduction works of the Granby company is being made rapidly. There are 1125 men on the payroll at Granby Bay, most of whom are engaged in construction work at the smelting plant. It now appears that the furnaces and converters may be ready for operations by the end of the year.

BROKEN HILL MINING CO. (Lillooet)—Preparations are being made by this company, owning property in the Lillooet district, to proceed with development on an extensive scale.

NICKEL PLATE (Hedley)—The Dickson incline from No. 4 tunnel has three compartments and is being sunk at the rate of 100 ft. per month in hard ground. The ore averaged for the first half of 1912 a little more than \$1 per ton more than the average of last year.

BRITISH COLUMBIA COPPER CO. (Greenwood)—A concentrator will be built at the Voigt properties, near Princeton. The company has developed 1,500,000 tons of ore carrying 1½ to 2½% copper and \$2 in gold in the properties it has under option; \$20,000 per month is being spent in development work.

SLOCAN-PAYNE (Sandon)—A contract was let early in July by Carlson & Co., of Spokane, for driving approximately 1700 ft. of crosscut tunnel at the Payne mine. The completion of the contract will mark the addition of the Payne mine to the list of Slocan shippers once more, as the tunnel is intended to tap the oreshoots at depth. This property still ranks as the largest dividend payer in the Slocan and one of the largest in British Columbia, having netted its owners considerably more than \$1,000,000 in the bonanza days when the big oreshoots were easily reached from the surface.

RAMBLER CARIBOO (Kaslo)—High-grade shipping and milling ore has been struck on the tenth and twelfth levels. One foot of shipping grade and 2 ft. of concentrating grade were encountered on the tenth level June 22 and had been followed by a drift for 38½ ft. up to July 2. Similar conditions have been developed on the twelfth level, where a drift has been advanced on ore for 41 ft. up to the same date. Two carloads of ore were shipped July 2 and three more loads stood in the bins awaiting cars. Of the five cars, one is of crude ore, the remainder concentrates. The value of previous shipments ranged from \$1800 to \$2700 per carload. The mill is running day and night in the production of concentrates.

Ontario

TIMISKAMING (Cobalt)—Considerable uneasiness is felt by some of the shareholders over the failure of the company to declare the regular quarterly dividend. It is stated that the company has a credit balance of \$166,000, while the dividends will call for only \$75,000. The last dividend was paid Apr. 30.

CROWN RESERVE (Cobalt)—Arrangements for the draining of Kerr Lake by the Crown Reserve and Kerr Lake mining companies are expected to be completed about the end of the month. The pumps employed to pump the water through pipes into Giroux Lake will be of the semi-dredging centrifugal type, and will be operated against a head of 175 ft. It is estimated that at least three months will be required for the work. The drainage of Kerr Lake will render it necessary to procure a new reservoir for the water supply for the working of the Crown Reserve, Kerr Lake and Drummond mines. A tank is being erected with a capacity of 45,000 gal. on a hill behind the Crown Reserve workings, which will be kept supplied with water pumped back

SOUTH AMERICA

British Guiana

EXPORTS OF GOLD from British Guiana for the half-year ended July 1, 1913, were 26,621 oz., or \$550,256, an increase of \$183,310 in value over the first half of 1912. Exports of diamonds this year were 2507 carats, valued at \$23,204; an increase of 354 carats and \$11,816 in value over last year.

AFRICA

Belgian Congo

REPORTS FROM KATANGA, forwarded from Elizabethville, the capital of the province, state that a gold field has been discovered in the southern part of the district and that the ore is high grade.

Rhodesia

GOLD PRODUCTION IN JUNE was 56,991 oz., being 3116 oz. more than June, 1912. For the half year ended June 30 the total gold output was 318,038 oz. in 1912, and 335,497 oz.—or \$6,934,310—in 1913; an increase of 17,439 oz. Other production in June included 12,789 oz. silver, 31 tons lead, 2544 ton chrome ore and 19,844 tons coal.

West Africa

GOLD PRODUCTION OF THE GOLD COAST AND DAHOMEY in June was 30,503 oz., being 2719 oz. more than in June, 1912. For the half-year ended June 30, the total was 161,924 oz. in 1912, and 203,995 oz.—or \$4,216,577—in 1913; an increase of 42,071 oz. this year.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Aug. 5

The metal markets have been rather unsettled. Firmness has developed in some lines, others are weaker, and again there have been advances. The general tendency, however, is toward improvement in prices.

Copper, Tin, Lead and Zinc

Copper—A good business has been done at advancing prices. The market is strong, principally owing to the fact that considerable copper has still to be bought for September shipment and the supplies for early delivery are scant. The strike at the Lake continues and there is no prospect of an early resumption of production there, while some of the electrolytic refineries which have had labor troubles have not yet been able to reach their normal rate of production. The Lake copper that is on hand is selling at higher prices, but our quotations of this week are based on what is relatively retail business, which is all that we have heard of. Electrolytic copper is offered by the agencies at 15¼@15½c., delivered, usual terms. Those who are ostensibly holding for 15¼c. apparently allow themselves to be tempted when real business offers itself. Although the market is strong, the business that has been done at over 15c. is much less than was done under that figure. At the close we quote Lake copper at 15.30@15.40c.; and electrolytic at 15@15.05c., basis New York, cash. Casting copper is quoted nominally at 14@14½c. as an average for the week.

The London market for standard copper has been active. On Aug. 5 it reached £67 17s. 6d. for both spot and futures, and on Aug. 6 it closes somewhat easier at £67 10s. for both positions.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 16@16½c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 6265 long tons. Our special correspondent gives the exports from Baltimore at 3741 tons for the week.

Tin—The sensational decline of July 30, which was described as purely and simply a bear maneuver, was recovered quickly in the London market. American consumers had taken advantage of the lower prices quoted here, and in consequence liberal orders were sent to London from this side. The London holiday interfered with trading here on Aug. 4, sellers not being willing to commit themselves in the absence of a London market. The close is very strong at £188 for spot, and £187 15s. for three months, and about 41½c. for August tin here.

Visible stocks of tin on July 31, are reported as follows: Great Britain, 6043; Holland, 2686; United States, excluding Pacific ports, 3334; total, 12,063 long tons, an increase of 962 tons over June 30, but a decrease of 1283 tons from July 31, last year.

Production of the Nigerian tin district in Central Africa, half-year ended June 30, is reported at 2574 tons concentrates. These vary at different mines in tin contents and value.

Lead—The market is quiet and unchanged. New York lead is quoted at 4.50c., and St. Louis at 4.375@4.40c. It is reported that a strike of the miners in southeastern Missouri is threatened.

The London market continues firm and Spanish lead during the week sold as high as £20 15s. The close is cabled at £20 10s. for Spanish and 10s. higher for English.

Spelter—There is a fair demand from day to day and higher prices have been paid. Consumption is good, while production continues to suffer on account of the reduced supplies of ores, many Western mines having had to suspend shipments for the reason that they cannot make a profit at the present level of prices. At the close St. Louis is quoted at 5.40@5.45c. and New York at 5.55@5.60c. The strike of smelters at Collinsville, Okla., which last week led to the closing of one of the plants there, has been settled.

The London market for spelter is firmer, and at the close good ordinaries are quoted at £20 15s. and special 5s. higher.

Base price of zinc sheets was again advanced ¼c. per lb. on July 29, and is now \$7.50 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Exports of Metals and Minerals from Spain, four months ended Apr. 30, as reported by the "Revista Minera," in metric tons:

	Metals		Ores	
	1912	1913	1912	1913
Iron.....	20,444	4,815	2,882,106	3,393,398
Copper.....	6,972	7,678	53,647	55,642
Copper precipitate.....	3,688	1,798	.....	.....
Lead.....	58,169	73,857	1,117	647
Zinc.....	815	42	43,324	40,376
Quicksilver.....	1,037	1,038	.....	.....
Manganese.....	.....	.....	10,563	8,060
Pyrites.....	.....	.....	948,588	1,105,573

Pyritic ores carrying 2.5% or more in copper are classed as copper ores; below that they are included in pyrites. Exports of salt were 193,484 tons in 1912, and 215,458 in 1913; increase, 21,974 tons.

DAILY PRICES OF METALS

NEW YORK

July-Aug.	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.
31	4.8650	59½	15.00 @ 14.70 15.30 @ 14.80	14.80 @ 14.80	40½	4.50	4.35 @ 5.60 4.37½ @ 5.60	5.50 @ 5.45 5.50 @ 5.35	
1	4.8650	59½	@ 15.40 @ 14.90 15.30 @ 14.85	14.90 @ 14.85	40½	4.50	@ 4.40 @ 5.60 4.37½ @ 5.50	@ 5.45 @ 5.35 @ 5.45 @ 5.35	
2	4.8655	59½	@ 15.40 @ 14.95 15.30 @ 14.95	14.95 @ 14.95	40½	4.50	@ 4.40 @ 5.60 4.37½ @ 5.50	@ 5.45 @ 5.35 @ 5.45 @ 5.35	
4	4.8660	59½	@ 15.40 @ 15.00 15.30 @ 15.00	15.00 @ 15.00	40½	4.50	@ 4.40 @ 5.60 4.37½ @ 5.50	@ 5.45 @ 5.35 @ 5.45 @ 5.35	
5	4.8660	59½	@ 15.40 @ 15.05 15.30 @ 15.00	15.05 @ 15.00	40½	4.50	@ 4.40 @ 5.60 4.37½ @ 5.55	@ 5.45 @ 5.40 @ 5.45 @ 5.40	
6	4.8660	59½	@ 15.40 @ 15.05	15.05 @ 15.05	40½	4.50	@ 4.40 @ 5.60	@ 5.45 @ 5.45	

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. 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. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; 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.

LONDON

July Aug.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
31	27½	67½	67½	72½	182½	182½	20½	20½
1	27½	67½	67½	72½	184½	184½	20½	20½
2	27½	.....	.....	.....	.....	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	.....
5	27½	67½	67½	73	185	185	20½	20½
6	27½	67½	67½	73	188	187½	20½	20½

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

Other Metals

Aluminum—Business is quiet and sales have been only fair. Prices are unchanged, No. 1 ingot being quoted at 23@23½c. per lb., New York. Foreign metal is quoted at 18½@19¼c. in bond.

Antimony—The market has continued fair. Prices remain about the same, Cookson's being quoted at 8.40@8.50c. per lb., and Hallett's at 8@8.10c.; while 7.40@7.50c. is quoted for Chinese, Hungarian and other outside brands.

Quicksilver—Business is steadier and prices rather firm. New York quotations are \$40 per flask of 75 lb. San Francisco, \$39.50 for domestic orders and \$37 for export. London is £7 5s. per flask, with £7 quoted from second hands.

Bismuth—Quotations at New York are \$1.72 per lb. for metal produced from domestic ores; \$1.50 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

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

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

Gold, Silver and Platinum

Gold—While the demand for gold on the open market in London has been strong, especially from Berlin, it has not been enough to cause any premium to be offered. Prices remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. India is still taking some gold. Imports of gold at New York week ended Aug. 2, were \$627,093, mainly from France and Mexico. There were no exports.

Imports of gold in Great Britain six months ended June 30 were £26,476,141; exports were £18,841,946; excess of imports, £7,643,195, an increase of £2,365,883 over last year.

Sales of gold bars from the New York Assay Office in July amounts to \$2,183,140, which is high for a summer month. For the seven months ended July 31, total sales were \$16,490,088 in 1912, and \$19,178,788 in 1913; an increase of \$2,688,700. These sales are to jewelers and other for use in the arts.

Iridium—There is no change in the demand, which is good. Supplies are only a trifle better, and the price remains about \$85 per oz. for pure metal.

Platinum—The market is quiet, and is rather curious about the new Russian export tax. There is talk of some advance, but prices remain at \$45@46 per oz. for refined platinum and \$49@52 per oz. for hard metal.

Silver—The market, as a whole, has been quiet and steady, and buying orders, which have come chiefly from China, have been easily filled. The steadiness which has so long prevailed seems likely to continue with slight fluctuations. Market closes quiet at 27¼d. in London.

Exports of silver from London to the East, Jan. 1 to July 24, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India.....	£4,063,200	£4,196,500	I. £128,300
China.....	933,500	432,000	D. 501,500
Total.....	£5,001,700	£4,628,500	D. £373,200

Imports of silver at New York week ended Aug. 2, were \$108,708, from South America and the West Indies; exports were \$632,743 to London and Paris.

Total imports of silver in Great Britain six months ended June 30 were £7,968,367, of which the United States furnished £5,905,580. Exports were £6,795,774; excess of imports £1,172,593, an increase of £698,312 over last year.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Aug. 2

The base price paid this week for 60% zinc ore was \$43@44 per ton. The base price paid for 80% lead ore was \$52@51 per ton.

SHIPMENTS WEEK ENDED AUG. 2

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week.....	3,177,810	122,400	1,015,500
Year to date.....	82,290,340	4,174,190	36,502,560

Shipped during week to separating plants, 2,267,070 lb. zinc ore.

JOPLIN, MO.—Aug. 2

The high price of zinc is \$47, the base per ton of 60% zinc ranging from \$43 to \$45 for choicest grades, with as high as \$48.50 base paid for blende carrying an excess of iron. Cala-

mine sold on a base of \$21@23 per ton of 40% zinc. The average of all grades is \$40.16 per ton. Lead sold as high as \$55, though the bulk of ore sold on a base of \$54 per ton of 80% metal. The average of all grades is \$53.90 per ton.

SHIPMENTS WEEK ENDED AUG. 2

	Blende	Calamine	Lead ore	Value
Totals this week	10,856,030	1,168,140	1,700,270	\$287,382
Thirty-one weeks	333,757,540	24,229,380	55,023,270	\$9,217,081
Blende value, the week, \$229,136; 31 weeks, \$7,462,016.				
Calamine value, the week, \$12,415; 31 weeks, \$309,216.				
Lead value, the week, \$45,831; 31 weeks, \$1,445,849.				

IRON TRADE REVIEW

NEW YORK—Aug. 5

The iron trade appears to be increasing in confidence and the volume of new orders is larger than for several weeks, though hardly up to rate on which the mills are running. Structural steel bars and riveted steel pipes are the more active lines.

Pig iron is more active and firmer. July sales were probably the largest of any month this year. Large orders are not much in evidence, but there is a considerable volume of smaller ones, which make up a good total. It may be too soon to say that the turn has come, but prices are distinctly firmer. If there have been no quotable advances, there have been no declines.

Freight Rates on Pig Iron from Virginia furnaces are attacked in a complaint filed with the Interstate Commerce Commission by the Low Moor, Alleghany, Oriskany, Princess, Virginia and Pulaski Iron companies. They charge that the rates on pig iron to Eastern points discriminate against this product and should be made to correspond with those from Pennsylvania furnaces. The present rates from Low Moor are \$3 to Philadelphia, \$3.95 to New York and \$3.75 to Boston; while those from Pittsburgh are \$2.25, \$2.45 and \$2.65, and from Youngstown, O., \$2.65, \$2.85 and \$3.05 to the respective consuming points named.

PITTSBURGH, PENN.—Aug. 5

The improvement in sentiment in the steel trade continues, but the gain is chiefly in sentiment. On the whole, however, there has been a slight increase in actual orders, and in several departments figures show an increase. Several mills find their July bookings, of actual shipping orders, greater than those of June. The total volume, however, remains considerably below the tonnage being shipped, so that the mills are running out of business and require a more definite buying movement in order to maintain their position. Such a movement is predicted for September, which will be in time.

Shipments of steel products continue practically up to the producing capacity, which as usual for this time has been restricted by hot weather. Consumption is clearly heavy, for shipments are well taken, and in many instances mills are being importuned to make better deliveries. This is particularly true in tubular goods, and conditions in this branch are distinctly better than at the beginning of June.

There is a possibility that the "unfilled tonnage" of the United States Steel Corporation for July 31 will make a much better showing for July than for the preceding three months, which showed an average loss of over 500,000 tons per month.

Pig Iron—The buying movement in pig iron seems to have lost considerable of its force, as the majority of large consumers are now covered to Oct. 1 at least, but there continues to be fairly active buying by smaller consumers. The Youngstown Sheet & Tube Co. has bought bessemer and basic iron in addition to the 30,000 tons reported last week, and seems to have purchased a total of 50,000 tons in the fortnight, or about 75,000 tons in the past 30 days. Foundry iron is harder to secure at \$13.75, Valley, \$14 being frequently paid on ordinary lots. The pig-iron averages for July, as computed by W. L. Snyder & Co. from actual sales in the trade, are given out at \$15.4085 for bessemer and \$14.227 for basic, showing losses from June of 83c. for bessemer and 27c. for basic. The tonnages involved were larger than for a long time, about 53,000 tons bessemer and 37,000 basic. The market stands today quotable about as follows: Bessemer, \$15.50; basic, \$14.25; malleable, \$14.25; No. 2 foundry, \$13.75@14; gray forge, \$13.50@13.75, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market is very quiet, and concessions might be obtained, particularly on prompt lots. The

regular quotation remains \$58.50, Baltimore, with \$2.16 freight to Pittsburgh.

Steel—The market has been quiet, but with prices very well maintained at a minimum of \$26.50 for billets and \$27.50 for sheet bars, f.o.b. maker's mill, Pittsburgh or Youngstown. Some mills hold to a minimum of \$27 for billets. Demand is not large, but is expected to increase before the end of the month. Rods remain at \$28@29, Pittsburgh.

Pig Iron Production in Germany in June is reported by the German Iron & Steel Union at 1,608,305 tons, or 33,341 tons less than in May. For the six months ended June 30 the make was as follows, in metric tons:

	1912	1913	Changes
Foundry iron.....	1,581,754	1,812,434	I. 230,680
Forge iron.....	269,137	261,856	D. 7,281
Steel pig.....	1,037,902	1,269,563	I. 231,661
Bessemer pig.....	193,763	174,483	D. 19,280
Thomas (basic) pig.....	5,482,432	6,049,330	I. 566,898
Total.....	8,564,988	9,567,066	I. 1,002,078

Total increase this year 11.7%. Steel pig includes spiegel-eisen, ferromanganese and all similar alloys.

British Exports and Imports of iron and steel and manufacturers thereof are valued by the Board of Trade returns as follows for the six months ended June 30:

	Exports	Imports	Excess
Iron and steel.....	£27,932,692	£7,662,575	Exp. £20,270,117
Machinery, hardware, etc.....	29,381,668	7,938,931	Exp. 21,442,737
Total.....	£57,314,360	£15,601,506	Exp. £41,712,854
Total, 1912.....	45,829,951	12,994,092	Exp. 32,835,859

Quantities of iron and steel exported were 2,253,688 long tons in 1912, and 2,503,994 in 1913; quantities imported were 888,673 tons in 1912, and 1,110,703 in 1913. Exports include new ships built for foreign countries.

Foreign Trade of Germany five months ended May 31 was as follows, in metric tons:

	Exports	Imports	Excess
Iron and steel.....	2,722,361	262,629	Exp. 2,459,732
Machinery.....	225,094	39,397	Exp. 185,697
Total.....	2,947,455	302,026	Exp. 2,645,429
Total, 1912.....	2,617,402	304,809	Exp. 2,312,593

The totals show an increase this year of 330,053 tons, or 12.6% in exports; and a decrease of 2783 tons, or 0.9%, in imports.

IRON ORE

Shipments from the Lake country are being pushed. So far there has been little congestion at the Lake Erie docks, and ore boats have been able to move with little delay. August shipments promise to be large.

Texas ore has begun to come to Philadelphia, the first regular cargo having arrived at that port.

COKE

Besides making the reductions ordered by the Interstate Commerce Commission on coke from the Connellsville region to Wheeling and other points, the Baltimore & Ohio R.R. has made an equal reduction on coke from the Fairmont district in West Virginia to the same points.

Fuel Imports and Exports in Germany five months ended May 31 were, in metric tons:

	Exports	Imports	Excess
Coal.....	13,687,651	4,071,183	Exp. 9,616,468
Brown coal.....	26,073	2,911,166	Imp. 2,885,093
Coke.....	2,868,838	236,150	Exp. 2,632,688
Briquettes.....	1,398,240	60,902	Exp. 1,337,338
Total.....	17,980,802	7,279,401	Exp. 10,701,401

Of the briquettes exported 374,660 tons were made of brown coal or lignite.

CHEMICALS

NEW YORK—Aug. 6

The general market is still quiet, but there are signs of improvement manifest.

Arsenic—The market remains quiet, with very little business going. The quotations are unchanged at \$3.12½ @ 3.25 per 100 lb., but these prices are rather nominal.

Copper Sulphate—Sales continue fair and prices are unchanged at \$5.25 per 100 lb. for carload lots and \$5.50 per 100 lb. for smaller parcels.

Nitrate of Soda—There is not much business doing. Cur-

rent demand is small and sales are not being pressed. Quotations are 2.32½c. per lb. for spot and futures up to December.

PETROLEUM

The monthly statement of the "Oil City Derrick" gives the number of new oil wells completed in July as follows: Pennsylvania grade, 735; Lima-Indiana, 128; Kentucky, 18; Illinois, 170; Kansas-Oklahoma, 1092; Texas-Louisiana, 199. This shows that in all 2342 wells were completed, with a new production of 65,976 bbl. Of the completions 435 were dry, and 157 gas wells. Compared with June, this was an increase of 15 in completed wells, a decrease of 7891 bbl. in new production, increase of 25 dry holes and 14 fewer gas wells. On July 31 there were 661 rigs up and 2546 wells drilling.

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.

	March	April	May	June	July
Alaska shipments.....	472,293	1,730,252	1,771,508	2,203,191	.....
Anaconda.....	22,900,000	23,800,000	25,600,000	21,500,000	22,100,000
Arizona, Ltd.....	3,200,000	3,100,000	3,200,000	3,000,000	3,000,000
Copper Queen.....	7,558,709	8,210,166	8,301,605	7,477,936	8,369,607
Calumet & Ariz.....	4,250,000	4,500,000	4,300,000	4,000,000	3,200,000
Chino.....	4,464,723	3,925,409	3,883,611	3,682,706	4,686,250
Detroit.....	1,640,671	1,856,517	2,001,633	1,750,601	1,519,224
East Butte.....	1,400,000	1,400,000	1,268,595	.....	.....
Mammoth.....	1,641,091	1,450,000	1,700,000	1,750,000	.....
Giroux*.....	625,000	600,000	625,000	.....	.....
Mason Valley.....	1,608,492	1,264,304	1,186,560	1,097,014	.....
Miami.....	.....	.....	1,943,900	2,612,000	.....
Nevada Con.....	5,555,320	5,650,000	5,933,275	6,344,863	.....
Ohio.....	591,651	690,001	650,071	.....	.....
Old Dominion.....	2,753,000	3,040,000	2,749,000	2,511,000	.....
Ray.....	4,287,000	4,379,128	4,384,400	.....	.....
Shannon.....	1,260,000	1,238,000	1,080,000	924,000	880,000
South, Utah.....	62,224	132,267	200,000	.....	.....
Tennessee.....	1,796,394	1,718,188	\$1,037,115	1,379,220	.....
United Verde*.....	3,000,000	3,000,000	3,000,000	.....	.....
Utah Copper Co.....	8,248,880	9,539,847	10,003,227	11,637,949	.....
Lake Superior*.....	19,000,000	17,000,000	18,705,000	16,500,000	.....
Non-rep. mines*.....	6,203,606	6,000,000	6,300,000	.....	.....
Total prod.....	102,619,054	104,224,079	109,824,500	.....	.....
Imports, bars, etc.....	24,215,480	25,578,297	22,205,942	.....	.....
Total blister.....	126,834,534	129,802,376	132,030,442	.....	.....
Imp. ore & matte.....	11,911,041	7,177,363	10,528,562	.....	.....
Total Amer.....	138,745,575	136,989,739	142,559,004	.....	.....
Miami†.....	3,102,200	2,312,900	.....	.....	2,890,000
Shattuck-Arizona.....	1,234,450	1,158,326	1,026,170	1,059,625	.....
Brit. Col. Cos.....	.....	.....	.....	.....	.....
British Col. Cop.....	844,735	794,000	.....	.....	.....
Granby.....	1,967,962	1,857,452	1,782,570	1,789,000	.....
Mexican Cos.....	.....	.....	.....	.....	.....
Boleof.....	2,204,720	2,811,200	2,424,800	1,984,640	.....
Cananea.....	4,772,000	3,581,690	2,272,000	2,908,000	.....
Moctezuma.....	3,062,159	2,753,240	2,695,881	3,438,793	2,693,006
Other Foreign.....	.....	.....	.....	.....	.....
Braden, Chile.....	1,472,000	1,512,000	1,150,000	1,804,000	1,046,000
Cape Cop., S. Af.....	732,480	586,880	387,520	414,400	.....
Kyshtim, Russia.....	1,478,400	2,544,640	1,490,000	.....	.....
Spasky, Russia.....	974,400	974,400	721,280	835,520	.....
Exports from.....	.....	.....	.....	.....	.....
Chile.....	7,840,000	7,616,000	3,584,000	5,824,000	.....
Australia.....	6,944,000	6,608,000	7,840,000	7,616,000	.....
Arrivals—Europe†.....	15,585,920	10,545,920	13,661,760	5,277,440	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VII, '12	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII.....	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.....	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.....	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.....	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.....	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912.....	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I, 1913.....	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.....	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	77,699,306	122,302,890	81,244,800	203,547,690
IV.....	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.....	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.....	121,860,853	68,452,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.....	.....	.....	.....	52,904,606	71,904,000	124,808,606
VIII.....	.....	.....	.....	.....	.....	.....

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper anode.

Assessments			
Company	Delinq	Sale	Amt.
Andes, Nev.	July 27	Aug. 19	\$0.02
Belcher, Calif.	July 21	Aug. 14	0.10
Blue Bell, Ida.	July 15	Aug. 20	0.002
Blue Bull, Nev.	July 14	Aug. 18	0.02
Carbonate, Ida.	July 25	Aug. 25	0.001
Central Eureka, Calif.			0.025
Comstock, Ida.	July 24	Aug. 23	0.001
Eagle Mountain, Ida.	July 19	Aug. 16	0.0005
Eastern Star, Ida.	July 25	Aug. 25	0.302
Emerald, Utah (2d install.)		Sept. 13	0.005
Galena King, Utah	July 21	Aug. 11	0.02
Independence Placer, Ida.	July 25	Aug. 29	0.002
Iron Mask, Ida.	July 11	Aug. 11	0.002
Morning Star, Utah	Aug. 8	Sept. 1	0.0025
North Bunker Hill, Ida.	July 15	Aug. 16	0.002
O.K., Utah	July 26	Aug. 12	0.005
Overman, Calif.	July 24	Aug. 13	0.06
Rescue Eula, Nev.	July 6	Aug. 11	0.01
Saltsee, Ida.	July 20	Aug. 20	0.002
Syndicate M. & E., Ida.	July 23	Aug. 23	0.003
Tar Baby, Utah	Aug. 1	Aug. 27	0.0025
Temple, Ida.	July 19	Aug. 23	0.002
Tintic Delmar, Utah	July 16	Aug. 16	0.0015
Tuscumbia, Ida.	Aug. 1	Aug. 23	0.003
Umatilla, Nev.	July 14	Aug. 18	0.01
Utah-United, Utah	July 19	Aug. 11	0.01
Wilbert, Utah	Aug. 1	Aug. 23	0.025

Monthly Average Prices of Metals
SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.988
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606		24.082	28.375	
September	52.440	63.078		24.209	29.088	
October	53.340	63.471		24.594	29.299	
November	55.719	62.792		25.649	29.012	
December	54.905	63.365		25.349	29.320	
Year	53.304	60.835		24.592	28.042	

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		1912	1913
	1912	1913	1912	1913		
January	14.094	16.498	14.337	16.767	62.760	71.741
February	14.064	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.359	14.563	76.636	64.166
August	17.498		17.644		78.670	
September	17.508		17.698		78.762	
October	17.314		17.661		76.889	
November	17.326		17.617		76.890	
December	17.376		17.600		75.516	
Year	16.341		16.560		72.942	

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

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.150
March	42.577	46.832	192.619	213.645
April	43.923	49.115	200.513	224.119
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857		208.351	
September	49.135		223.762	
October	50.077		228.353	
November	49.897		227.619	
December	49.815		226.875	
Av. year	46.096		209.322	

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

Month	LEAD					
	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.351	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.730	4.353	4.603	4.223	18.544	20.038
August	4.569		4.452		19.655	
September	5.048		4.924		22.292	
October	5.071		4.894		20.630	
November	4.615		4.463		18.193	
December	4.303		4.152		18.069	
Year	4.471		4.360		17.929	

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

Month	SPELTER					
	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028		6.878		26.443	
September	7.454		7.313		27.048	
October	7.426		7.276		27.543	
November	7.371		7.221		26.804	
December	7.162		7.081		26.494	
Year	6.943		6.799		26.421	

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

PIG IRON IN PITTSBURG

Month	PIG IRON IN PITTSBURG					
	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	\$15.12	\$18.15	\$13.32	\$17.35	\$14.00	\$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.63
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43		14.90		14.85	
September	16.86		16.03		15.63	
October	17.90		17.18		17.22	
November	18.07		17.09		18.00	
December	18.15		17.45		18.73	
Year	\$16.01		\$14.93		\$15.28	

STOCK QUOTATIONS

COLO. SPRINGS Aug. 5			SALT LAKE Aug. 5		
Name of Comp.	Bid.		Name of Comp.	Bid.	
Acacia	.02		Beck Tunnel	.05	
Cripple Crk Con.	.01		Black Jack	.06	
C. R. & N.	.10		Cedar Fallsman	.00	
Doctor Jack Pot.	.05		Colorado Mining	.14	
Ektor Con.	.55		Columbus Con.	.07	
El Paso	2.86		Crown Point	.01	
Findlay	.02		Daly Judge	.01	
Gold Dollar	.06		Grand Central	6.35	
Gold Sovereign	.02		Iron Blossom	1.22	
Isabella	.12		Little Bell	1.10	
Jack Pot.	.04		Lower Mammoth	.01	
Jennie Sample	.06		Mason Valley	6.00	
Lexington	1.01		May Day	.05	
Moon Anchor	1.007		Nevada Hills	.87	
Old Gold	.01		New York	.02	
Mary McKinney	.55		Prince Con.	.35	
Pharmacist	.10		Silver King Coal'n	3.32	
Portland	.94		Sioux Con.	.02	
Vindicator	.80		Uncle Sam	.02	
Work	1.005		Yankee	.08	

TORONTO Aug. 4

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.07	Foley O'Brien	.22
Conlagas	7.00	Hollinger	15.00
T. & Hudson Bay	65.00	Imperial	1.01
Timiskaming	.29	Jupiter	.29
Wettlaufer-Lor.	.11	Pearl Lake	.36
Apex	.005	Porcu. Gold.	.08
Crown Chartered	.003	Preston E. D.	.02
Dobie	.25	Rea.	.15
Dome	14.00	Swastika	.03
Dome Exten.	.07	West Dome	.10

SAN FRANCISCO Aug. 5

Name of Comp.	Bid.	Name of Comp.	Bid.
COMSTOCK STOCKS			
Alta	.05	MISC. NEV. & CAL.	
Belcher	.22	Belmont	6.25
Best & Belcher	.08	Jim Butler	.65
Caledonia	1.40	MacNamara	.12
Challenge Con.	.06	Midway	.46
Chollar	.01	Mont. Tonopah	1.00
Confidence	1.18	North Star	.86
Con. Virginia	.12	West End Con.	1.22
Crown Point	.23	Atlanta	.14
Gould & Curry	.04	Booth	.01
Hale & Norcross	.07	C.O.D. Con.	.03
Mexican	1.05	Comb. Frac.	.03
Occidental	1.05	Jumbo Extension	.45
Ophir	.21	Pitts. Silver Peak	.51
Overman	1.50	Round Mountain	.02
Potosi	.01	Silver Pick	.51
Savage	.12	Tramp Con.	1.01
Sierra Nevada	.07	Argonaut	2.00
Union Con.	.11	Bunker Hill	1.50
Yellow Jacket	1.21	Central Eureka	.10
		So. Eureka	2.75

N. Y. EXCH. Aug. 5

Name of Comp.	Clg.	Name of Comp.	Clg.
Amalgamated	71 1/2	Adventure	1 1/2
Am. Agri. Chem.	46	Amheek	27 1/2
Am. Sm. & Ref. Con.	66	Alaska Gold M.	19 1/2
Am. Sm. & Ref. pf.	100 1/2	Algomah	3 1/2
Am. Sm. Sec. pf. B	80 1/2	Allouez	1 1/2
Anconda	36 1/2	Am. Zinc	20 1/2
Batopilas Min.	1 1/2	Ariz. Com., cfts.	2 1/2
Bethlehem Steel pf	73	Bonanza	.32
Chino	40 1/2	Boston & Corbin	.99
Federal M. & S. pf.	36	Butte & Balak	1 1/2
Great Nor., ore, ctf.	36	Calumet & Ariz.	6 1/2
Guggen. Exp.	45	Calumet & Hecla	405
Homestake	104	Centennial	12 1/2
Inspiration Con.	15 1/2	Cliff	1 1/2
Miami Copper	22 1/2	Copper Range	39
Nat'l Lead Con.	48 1/2	Daly West	2 1/2
National Lead, pf.	106	East Butte	12 1/2
Nev. Consol.	16 1/2	Franklin	4 1/2
Phelps Dodge	190	Granby	60 1/2
Pittsburg Coal, pf.	85 1/2	Hancock	17 1/2
Quicksilver, pf.	3	Hedley Gold	30
Kay Con.	19 1/2	Helvetia	.35
Republic I & S. pf.	24 1/2	Indiana	5
Republic I & S. pf.	87	Island Crk, com.	49
Sloss Sheffield, pf.	27 1/2	Island Crk, pf.	81
Tennessee Copper	85	Isle Royale	20
Utah Copper	49 1/2	Keweenaw	1 1/2
U. S. Steel, com.	61 1/2	Lake	6 1/2
U. S. Steel, pf.	107 1/2	La Salle	3 1/2
Va. Car. Chem., pf.	99	Mass	3

N. Y. CURB Aug. 5

Name of Comp.	Clg.	Name of Comp.	Clg.
Barnes King	1.73	New Arcadian	1 1/2
Beaver Con.	.32	New Idria Quick	13 1/2
Big Four	.40	North Butte	28 1/2
Bradley Copper	6 1/2	North Lake	1 1/2
B. C. Copper	2 1/2	Ojibway	.70
Buffalo Mines	2 1/2	Old Dominion	49
Can. G. & S.	1 1/2	Osceola	77
Can. Ariz. Sm.	1 1/2	Quincy	58
Davis-Daly	2 1/2	Shannon	7
Diam' Field-Daisy	.02	Shattuck-Ariz.	24
Ely Con.	.08 1/2	Superior	25 1/2
Florence	.27	Superior & Bost.	2 1/2
Giroux	1 1/2	Tamarack	28
Gold Hill Con.	1 1/2	Trinity	