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Milling the Porphyry Ore of Bingham

The Utah Copper Company Will Mill 6000 Tons per Day and the Boston Consolidated 3000 Tons in the New Works at Garfield

BY WALTER RENTON INGALLS

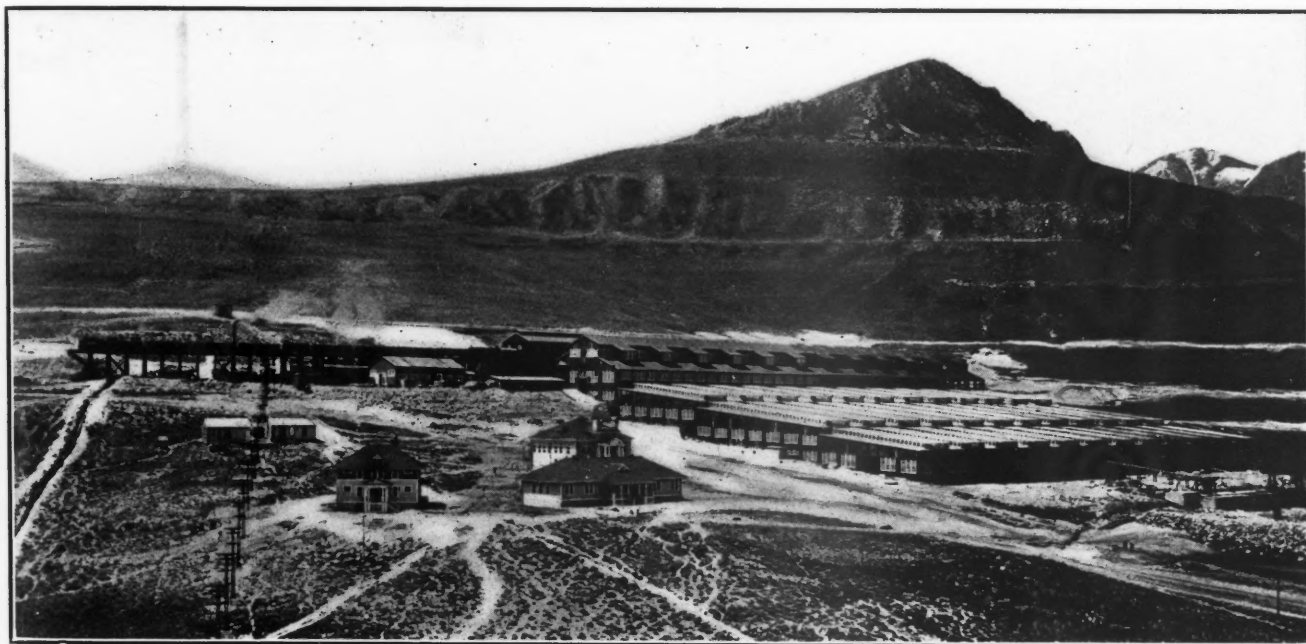
In a former article I described the occurrence of the porphyry ore of Bingham and the methods that have been adopted for mining it. For milling it the erection of works close to the mines was out of the question. The sides of the hills are too steep and the gulches are too narrow to give room for works of the magnitude that are required in these operations, while moreover the provision of the necessary supply of water and the disposal of the immense quantity of tailings would

ing driven to the Ohio mine. This will put a charge for transportation for only three or four miles upon the crude ore against 27 miles in the case of the Utah and Boston companies.

THE GARFIELD LOCATION

The location of the mills of the two companies at Garfield was determined chiefly by the previous decision to erect at that place the works of the Garfield Smelting Company, which is a Guggen-

pany was concerned, there was little or no hesitation in the matter, it being a Guggenheim interest as previously mentioned. The Boston Consolidated had been seriously considering a location on the shore of Utah lake. About the time this matter came up, however, negotiations were on foot for the transfer to the Guggenheims of a large interest in the company, and although those negotiations fell through, such inducements were held out to the Boston company to erect its works at



GENERAL VIEW OF UTAH MILL, GARFIELD, UTAH

have been insuperable difficulties. These conditions led to the location of the works at a distant point, the transportation to which costs an amount substantially equivalent to the cost of mining per ton. It is opportune to state here that the Ohio Copper Company (a Heinze interest) which is now erecting a mill of 2000 tons daily capacity to treat the quartzite ore (referred to in my previous article) is pursuing a different policy. Its mill is situated on the edge of the Salt Lake valley, at the foot of the mountains, a short distance south of the mouth of Bingham cañon, and from that point a large tunnel (called the Mascot tunnel) is be-

heim interest, as is also the Utah Copper Company. The Garfield smelting works were located near the shore of Great Salt Lake, about 24 miles west of Salt Lake City, because a territory possessing good railway connections could be secured there under conditions that would probably forever prevent any complaint against a smoke nuisance. In purchasing and developing the large tract of land that was acquired, including the building of a town, the bringing in of water supply, etc., it was considered desirable to have the three works in reasonably close proximity to each other upon this metallurgical tract of land. In so far as the Utah Copper Com-

Garfield that it was led to abandon its other plan.

THE SITUATION OF THE WORKS

The Boston mill is about three miles east of the Garfield smelter. The Utah mill is a little less than a mile east of the Boston mill. The town of Garfield is between the Boston mill and the smelter, nearer to the latter. The three works are at the foot of the northern end of the Oquirr mountains, where the land slopes down gradually to the lake. The smelter is near the lake. The two mills are further back, facing the broad expanse of flat land southeast of the end of the lake. Both

mills are placed sufficiently high up that they ought never to have difficulty in running off their tailings. The San Pedro, Los Angeles & Salt Lake railway runs below the works, furnishing communication with Salt Lake City, while the Rio Grande Western furnishes communication with Bingham cañon and Bingham Junction, and through the latter with the whole Rio Grande system. The matter of accommodations for the employees has already received attention by the erection of about 100 dwelling houses in the town of Garfield. The number is probably insufficient, and the distances the men have to go to and from work are long and inconvenient, but more houses and means of transportation will doubtless be provided as soon as possible. The ownership by the companies of the tract of land upon which the works are situated, and the magnitude of the tract, enable them to keep out many of the evils which generally grow up in the neighborhood of such works, while

dealing with this problem up to date is viewed by the mine managements with disgust, and properly so. Up to date, bear in mind, the railway has been called upon to handle only an additional 2000 tons per day; the remaining 7000 tons is yet to be offered. It would have been better if the two mining companies had united in the construction of their own railway (the Rio Grande had to build a new line, so there was no saving in first cost) and operated it in the light of their own expert knowledge of what was required, which would doubtless have been economy in more ways than one, but the Guggenheims did not want to enter into any competition with the Goulds in the railway business, wherefore this matter was turned over to the Rio Grande Western.

The old line of railway up Bingham cañon stopped about a mile below the town. From that point the Copper Belt railway extended at very steep grades, operated by Shay locomotives, to many of

are doubtless correct. The trouble arises from the insufficient equipment of rolling stock. As one of the mine managers expressed himself to me, "The railway people figure out on paper how many trains of a certain number of cars can be moved under the conditions and provide that equipment, but they do not allow sufficiently for loss of equipment by accident. They should be prepared not only to stand a single accident, but also to replace the losses of equipment through two or three accidents in quick succession." Of course that is precisely what he, or any other good manager, would do in his mine, and the management of the Rio Grande Western railway will have to awake to the exigencies of the situation. It has made a contract to move the ore of these companies to Garfield for 20 years, and moreover has made a contract with the Utah Copper Company to remove its waste rock. Until the contrary has been proved, therefore, the mining companies assume that



GENERAL VIEW OF BOSTON MILL, GARFIELD, UTAH

the independent vendor of bad whisky can be reached only by a railway trip or by a long walk. In the town of Garfield there is one place where alcoholic liquors are sold under license from the management. It is not the intention of the companies to enforce prohibition, or even to make it hard for the men to secure whisky, but merely to insure the preservation of good order, and so far as possible the efficiency of the men.

TRANSPORTATION OF THE ORE

For a long time the prompt movement of the great tonnage of ore out of Bingham cañon has been a serious question, and the ability of the Rio Grande Western railway to handle an additional 9000 tons of ore per day, not to speak of the large and rapid increases by other companies, was regarded dubiously. It appears that these doubts were fully justified. The poor record of the railway company in

the mines further up the cañon. The Rio Grande has now constructed a new line up the cañon, known as the "high line" which extends to the properties of the Utah and Boston companies. At the mouth of the cañon it parallels the old line as far as Garfield Junction, a few miles out, and then turns off to the north, skirting the mountains, to the smelting works. This line is wholly down grade, except for about 1000 ft. at an up-grade of 0.8 per cent. The distance is 27 miles. On this line it is proposed to move down trains of 30 to 32 cars, or 1200 to 1600 tons of ore. Going up the cañon 20 empties constitute a train. The ore for the Bingham mill of the Utah Copper Company, which requires 1000 tons per day, comes down the Copper Belt and old line.

So far as trackage is concerned, the railway people are confident that they can handle the traffic, in which opinion they

their tonnages of ore will be moved as offered to the railway company. Nevertheless, during July, when I visited Bingham, there was a serious shortage of cars and a general complaint among the mine managers, whose ore-bins were filled to the limit while their coal-bins were distressingly low.

The price for transporting the porphyry ore from the mines to the Garfield mills is 27c. per ton, or about 1c. per ton-mile, which is high in comparison with the rate on mill-ore from Butte to Anaconda, Mont., where the cost is only about 0.5c. per ton-mile for about the same length of haul as from Bingham to Garfield.

THE MILL OF THE UTAH COPPER COMPANY

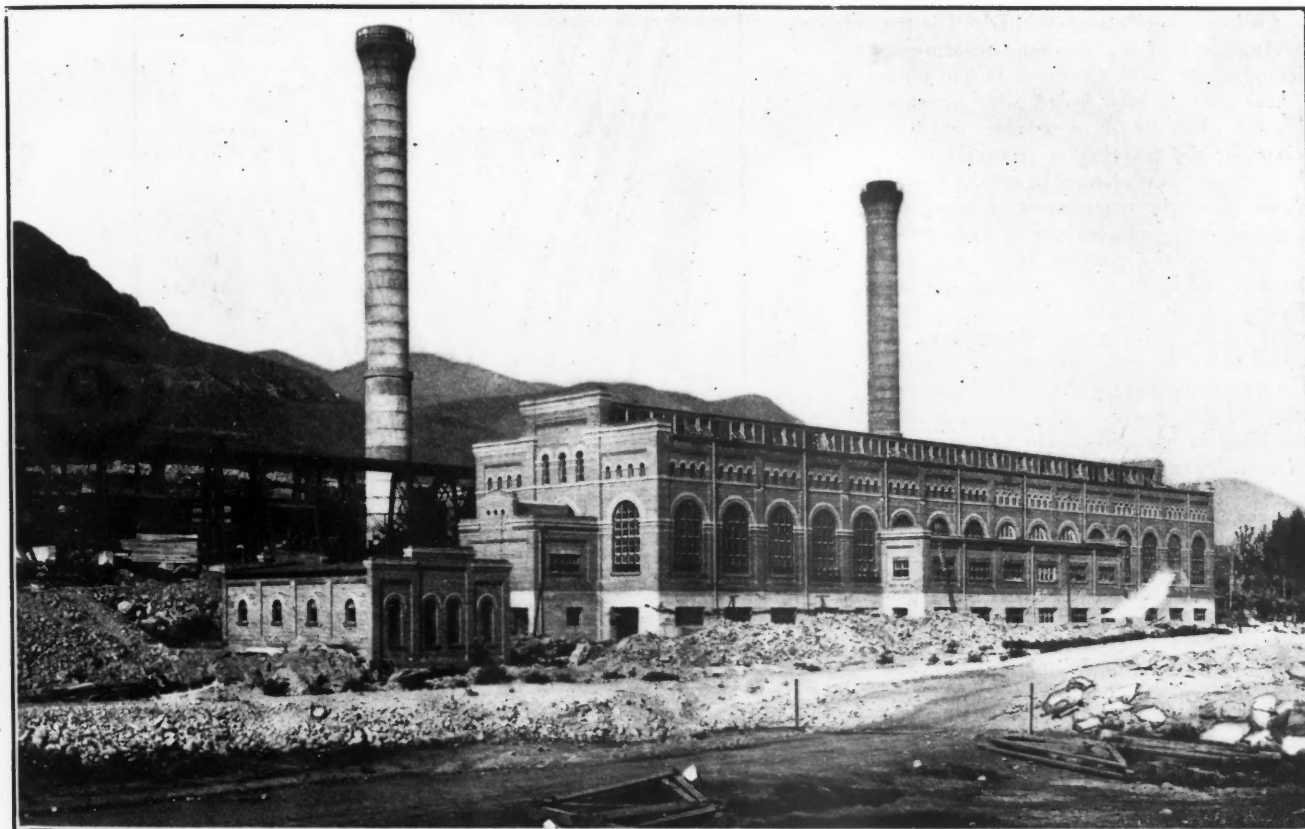
This mill is designed for 6000 tons daily capacity and is divided into 12 symmetrical sections of 500 tons each. Four sections are now (July 18) in operation and are working up 2000 to 2200 tons of ore

per day, so it is believed that the whole mill will easily come up to the estimated capacity. The remaining sections will soon go into operation, one after the other.

The ore comes in on a track behind the mill, passing over a scale, and is dumped into a long bin, on the top of which there are three railway tracks. This bin is constructed of timber, the sides being built up of plank, laid flat, 12 in. wide at the bottom and diminishing in width toward the top. In front of this bin are the coarse crushing departments, of which there are two, each of 3000 tons daily capacity, arranged symmetrically with respect to the main mill building. It is aimed to dump

No. 7½ Gates breakers, reducing the ore to 1.5-in. size, which deliver to two 22-in. belt elevators, which deliver to trommels with 0.5-in. perforations, the oversize going to two sets of 20x54-in. rolls, provided with rolled-steel tires, as are all the rolls in the mill. These rolls run at 60 rev. per min. Their product, 0.5 in. in size, is lifted by a 20-in. belt elevator, which delivers it to a series of belt conveyors for distribution in a storage bin of 15,000 tons capacity in the back of the mill, extending the full width of the latter. Between the elevator and the conveyors there is a modified Vezin sampler, designed to cut out 1 per cent. of the ore as a sample; but this will not be done as a regular

ered with steel plate with ¼-in. perforations. The oversize from the trommels goes back to the rolls, while the undersize goes to hydraulic classifiers. The fine products of the classifiers go to the tables; the coarse and heavy products go to six jigs. The hutch-work of the jigs goes to four Wilfley tables, which make a finished concentrate. The tailings from the jigs and Wilfley tables are received by a 20-in. belt elevator which delivers to three Chile mills. The latter are supposed to crush to approximately 40-mesh size. Their product passes to hydraulic classifiers and thence to the slime tables, which are modified Johnson vanners. These have corrugated belts for the treatment of the



POWER HOUSE, UTAH MILL, GARFIELD, UTAH

the ore received from the mine into hoppers directly connected with the two crushing departments, i.e., so long as the mill is crushing 6000 tons of ore per day and the railway delivery is the same, the ore dumped from the railway cars will pass directly through the large breakers. This involves the dumping of the ore normally at two places. The remainder of the bin, which is of total capacity for 35,000 tons of ore, is for reserve. There are two passage ways under the bin, in which large electric larries are operated. When it is necessary to take ore from the reserve portions of the bin, it is drawn off through gates, operated by compressed air, into the larries, which tram it to the hoppers, from which the breakers are fed by gravity.

Each coarse-crushing division has two

thing, the uniformity of the ore being considered such that constant sampling is unnecessary. The distributing conveyors are 200 ft. long, 24-in. belts, contained in a traveling frame, which is movable in either direction, while the belt can be run either way. The discharge of the ore is over the end of the conveyor, the distribution being effected by the lengthwise movement of the whole apparatus. In this way the use of trippers is avoided.

From the bin last described the ore is drawn to the 12 sections of the mill, each of which is a precise duplicate of the others. In each section the ore passes first to two sets of rolls, 16x36 in., in parallel, running at 80 rev. per min., which deliver to two 22-in. belt elevators, which deliver to four cylindrical trommels cov-

coarser material and smooth belts for the finer. There are 92 vanners per section, or a total of 1104 in the mill.

The disposal of concentrates and tailings throughout the mill is by gravity. The concentrates flow to a series of rectangular masonry bins below the mill, with suitable overflows for the water and filter-bottoms. From these bins the mineral is removed by a crane and clam-shell bucket and loaded directly upon the railway cars.

This is only a sketchy account of the milling process, but perhaps it gives a clearer idea of the nature of the latter than a more detailed description would do. Apparently the details of the treatment, especially of the finer material, have not yet been fully determined, wherefore it is premature to give a flow-sheet.

DETAILS OF CONSTRUCTION

The mill building proper is 600x600 ft. The frame is of structural steel. The sides are of corrugated iron, painted. The roof is of 2-in. plank, shiplap, covered with corrugated iron. The floor is of concrete, surfaced with cement. The mill is built upon a side-hill, sloping moderately. The floors are arranged in steps and slope downward to insure proper drainage. Each floor extends some distance beyond the retaining walls which form the steps up the hill, giving thus easy access to launders, etc., below the floors. In these portions the floors are supported by concrete posts and girders and beams of reinforced concrete. The building is well lighted by windows in monitors on the roof.

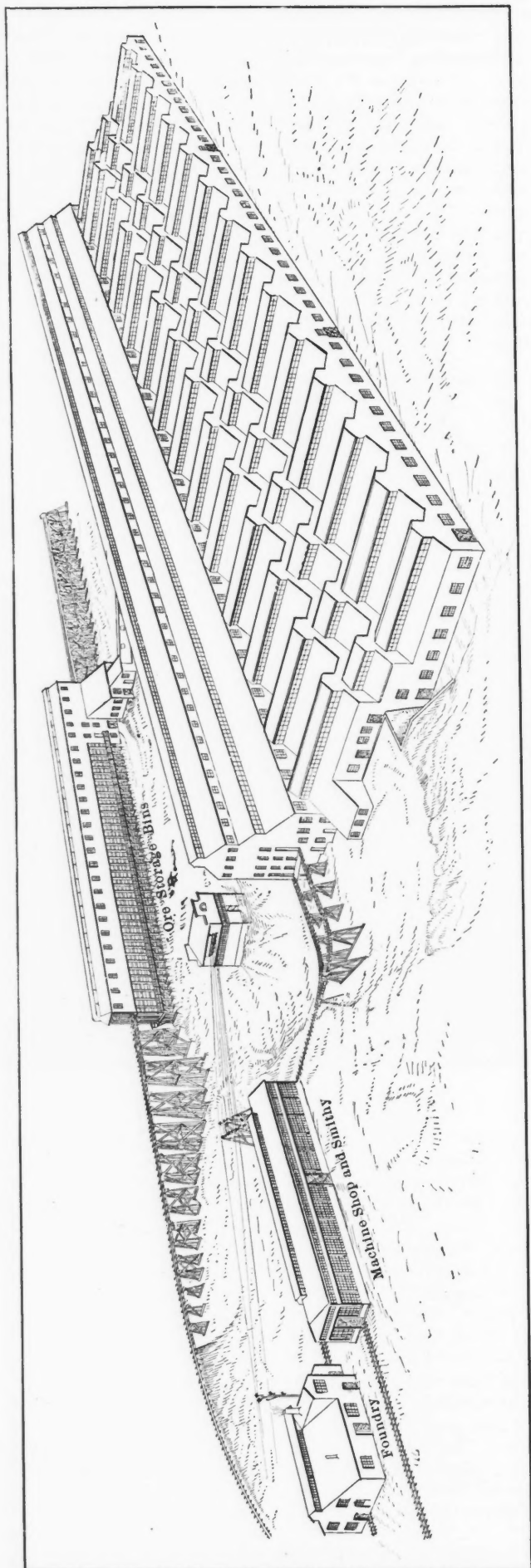
An important feature of the mill is the arrangement of the crushing department, including the rolls, screens and Chile mills. These are set in a broad alley, extending the whole length of the mill, which is clear for the travel of a powerful overhead crane. It is planned in case of breakdown of, or the requirement of repair to, any machine—rolls, screens or Chile mills—to remove the machine bodily and put another one in its place, repairing the defective one at leisure in the shop. The main shaft driving this department is under the floor and there are no belts in the way to interfere, either with the movement of the crane, or easy access to the machines in operation. The arrangement of this department is thoroughly good.

THE POWER PLANT

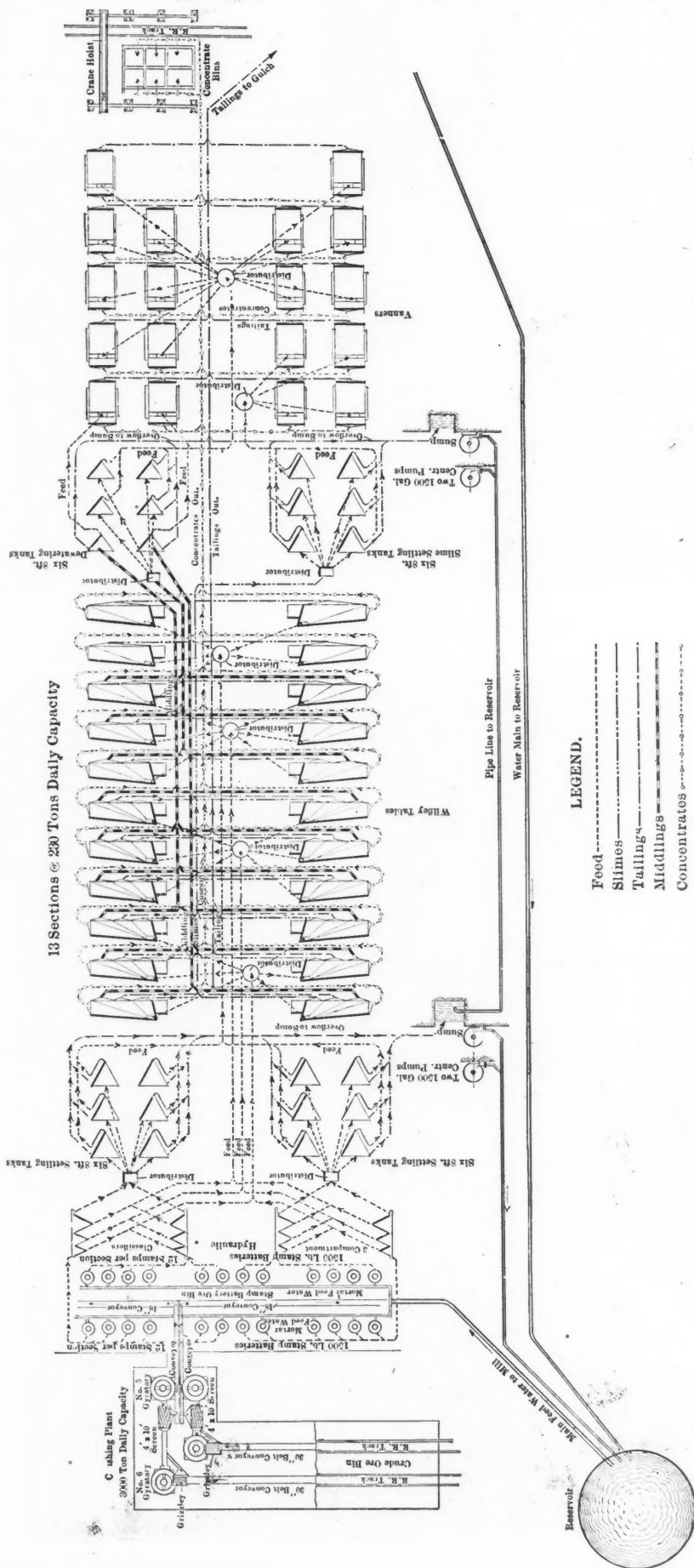
The power is generated in a magnificent plant at the foot of the hill. This comprises Heine boilers set front to front with a broad alley between the two lines, and overhead a commodious steel tank into which the coal is dumped directly from the railway cars running on a track over the tank. The firing of the boilers is by means of American stokers. In the engine-room there are five large generating sets, each driven by Nordberg-Corliss compound condensing engines, directly connected. The capacity of this power plant is estimated at 12,000 to 13,000 i.h.p. It is expected that the mill will require 6000 h.p., or 1 h.p. per ton of ore treated. A certain amount of power is to be transmitted to Bingham for operations at the mine, and there is a large surplus for unforeseen contingencies and future developments.

The electric current is generated at 4000 volts and is transmitted to the mill over a line about 2500 ft. long, supported by poles of structural steel. The sub-station at the mill is an absolutely fire-proof building between the two main crushing houses. Here the current is reduced to 440 volts for use in the mill. For transmission to Bingham it steps up to 40,000 volts.

The driving of the machinery in the mill is by motors, which are segregated not only according to independent sections, but also according to groups of machines; and with a highly developed sys-



PERSPECTIVE DRAWING OF BOSTON MILL, GARFIELD, UTAH



tem of clutches, operated by compressed air, and a perfect system of electrical control, it is possible to cut out any machine. Centrifugal pumps are employed for the return of water from the settling tanks. Above the mill there is a reservoir holding 5,000,000 gal. of water, and a little higher up there is a smaller reservoir. Near the main mill building is the office, store house and a well-equipped machine shop.

THE BOSTON MILL

The ore for this mill is received in the same general way as at the Utah, but from that time on the design is radically different. The storage bin behind the Boston mill, which has two railway tracks, is of structural steel and 18,000 tons capacity. It is planned that the ore may be dumped indiscriminately in this bin, the delivery from it being by means of belt conveyors, of which there are two, extending lengthwise beneath it. The discharge openings in the bottom of the bin are open, the feed to the belts being by means of broad traveling belts of corrugated steel. At the bottom of the bin the latter is surrounded on the outside by a gallery and holes from the outside give access to the feeders in case it be necessary to remove obstructions.

The main conveying belts deliver ore from anywhere in the bin to the breakers at the west end of the bin. Each belt feeds a No. 6K Gates breaker. From the latter two short belts on an incline deliver to two No. 4 Gates breakers, and the latter discharge upon a large belt, rising at 20 deg., which takes the ore (crushed to 1 1/4-in. size) into the main mill building. In the coarse crushing house, grizzlies and screens are naturally interposed between the several steps to relieve the breakers of material that is already fine enough.

In the main mill building the ore delivered by the inclined conveying belt is distributed by belts operated with trippers in a bin of 15,000 tons capacity, extending lengthwise through the mill. From this bin, which is an elevated structure with a clear space beneath it, the ore is delivered by means of suspended, modified Challenge feeders to the stamps.

There are 312 Nissen stamps, which set back to back in two rows of 156 each, four stamps to a battery, eight to a group. The individual stamps weigh 1500 lb., and drop 6 in., 106 times per minute. Each stamp has its own screen, which extends around the front of the mortar somewhat more than 180 deg. Screens of 28 mesh, No. 28 wire, are to be used.

From the stamps the pulp flows to hydraulic classifiers, the products of which are to be treated on 286 Wilfley tables, while the middlings from the Wilfleys are to be re-treated on 234 Johnson vanners with smooth belts. As in the case of the Utah mill the concentrates and tailings are to be discharged by gravity. The means for loading the concentrates

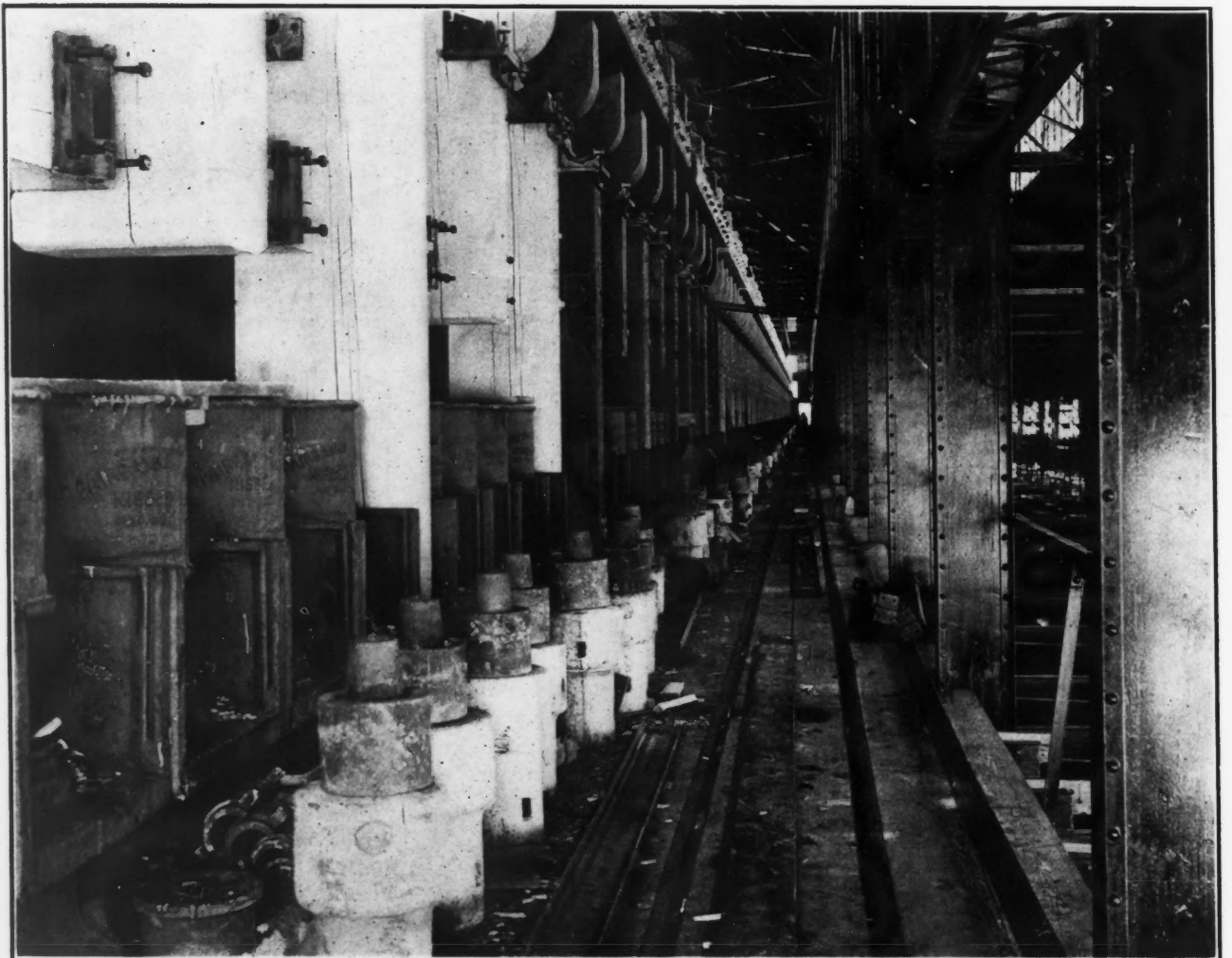
FLOW-SHEET OF BOSTON MILL, GARFIELD, UTAH

LEGEND.

- Feed - - - - -
- Slimes - - - - -
- Tailings - - - - -
- Middlings - - - - -
- Concentrates - - - - -



HYDRAULIC CLASSIFIERS, BOSTON MILL, GARFIELD, UTAH



NISSEN STAMPS, BOSTON MILL, GARFIELD, UTAH

are similar, the only difference being in the form of crane and minor details.

DETAILS OF CONSTRUCTION

The main building of the Boston works is 600x335 ft., the larger dimension being lengthwise along the hill, and the smaller the down-hill direction. The framing of the building is structural steel, with roof and sides of corrugated iron, painted, while the floor is of plank. As in the case of the Utah mill, the Boston goes down the hill in steps and the floors have a small slope downward, but with the exception of one big step from the floor of the Wilfley tables down to the re-treatment floor, comparatively little grading or retaining-wall work was done, the floors being supported by short piers and posts above the original surface of the ground.

Extending lengthwise through the mill under the classifier department is a broad commodious tunnel, from which smaller tunnels at right angles go down through the mill, one of these tunnels to a section. At the bottom of the mill these tunnels enter another lengthwise tunnel, sloping from both ends toward the center, and from the center a main tunnel carries the concentrates and tailings to a point further down the hill, where the tailings are discharged and the concentrates are collected in bins. The launders, which throughout the mill are to be lined with plate glass, are to be placed in these tunnels, but in the tunnels at the foot of the mill where the main discharges are collected, the launders are cement troughs constructed on the bottom of the tunnel.

POWER PLANT

The Boston mill is to be operated with electric power supplied by the Telluride Power Company. This is received in a transformer house at the top of the mill, between the main building and the ore bin. The transformer house is being equipped to take current at 40,000, 60,000 or 80,000 volts, it being optional with the power company to furnish current at any of those voltages. For the operation of the mill motors the current will be reduced to 400 volts. The mill motors are sub-divided among departments and groups of machines, so that any may be cut out as required with the minimum reduction of milling capacity. The transformer house is a building of reinforced concrete, which is designed to be absolutely fireproof.

ACCESSORY DEPARTMENTS

There is an admirably equipped machine shop, convenient to the mill, in which any kind of work can be done that a city shop is capable of. Near by is a foundry, where stamp shoes, dies, etc., will be cast. Above the mill is a reservoir of 1,500,000 gal. capacity.

COMPARISON OF METHODS

It will be observed that the methods

adopted by the two companies differ radically. Before entering upon a discussion of them, I make haste to say that both mills have been designed and constructed by accomplished and thoroughly competent engineers, and the differences between them are based upon carefully considered data. Both mills will be successful, but they will not give the same economical results, i.e., the same percentage of extraction of mineral and the same operating cost per ton of ore. However, it will not be a clear-cut contest between the two radically different methods of concentration, for reasons which will be pointed out below, and consequently the economic results will not differ to the extent they might otherwise.

In the Utah mill attention has been fixed upon the avoidance of unnecessary sliming of the mineral. Following that idea the crushing is done by means of rolls, and after reduction of the ore to a comparatively coarse size, the mineral is extracted as far as possible by means of jigs and Wilfley tables. So far this is certainly a good procedure; the band of clean concentrate that is cut off on the Wilfley tables is broad and thick, and a large percentage of the total mineral is doubtless recovered directly in this way. For the further grinding which is necessary to liberate the remainder of the mineral, logic would appear to indicate the use of more rolls, but instead of that Chilean mills are employed, which are as bad slimers as any other form of crushing machine. Consequently, while a good degree of granularity of product is obtained by the use of rolls down to a certain point, and is well taken advantage of, the character of the pulp is subsequently sacrificed by the use of the Chilean mills.

In the Boston mill the leading idea appears to have been to secure an uninterrupted descent of the pulp by gravity after the original elevation of the ore. Moreover, it was held evidently that inasmuch as the ore had practically to be slimed anyway, it might as well be done first as last. These considerations pointed to the use of stamps, and while the sliming tendency of stamps was fully recognized, that evil was found to be minimized in the Nissen stamp, because of the far greater area of screen per stamp head as compared with the ordinary gravity stamp. The Nissen stamp is an entirely sound mechanical design, differing from the ordinary stamp substantially only in its greater weight and the arrangement of its mortar. It was carefully tested by the Boston company before adoption and found to be capable of crushing about nine tons of porphyry per day, consuming about 2.5 h.p. per stamp, with reason to believe that nine tons might be somewhat exceeded. However, nine tons was adopted in the estimates, and consequently, although the Boston mill is commonly referred to as being of 3000 tons daily capacity, the actual estimate is about 2750 tons.

It seems to me that in both mills attention should have been given to the advantages of the ball mill, which is very economical of power and in respect to granularity of product surpasses rolls. The ball mill, moreover, eliminates the trommels and elevators, especially the latter, which the management of the Boston Consolidated strove to do. I am unaware if there be any wet-crushing ball mill of so large capacity as required in these works, but it would not have been a difficult matter to design one.

As to power consumption, the Utah Copper Company expects that one indicated horse-power will be required per ton of ore milled. The Boston Consolidated expects to use 2500 electrical horse-power, which will be about 0.9 per ton of ore, if 2750 tons be milled.

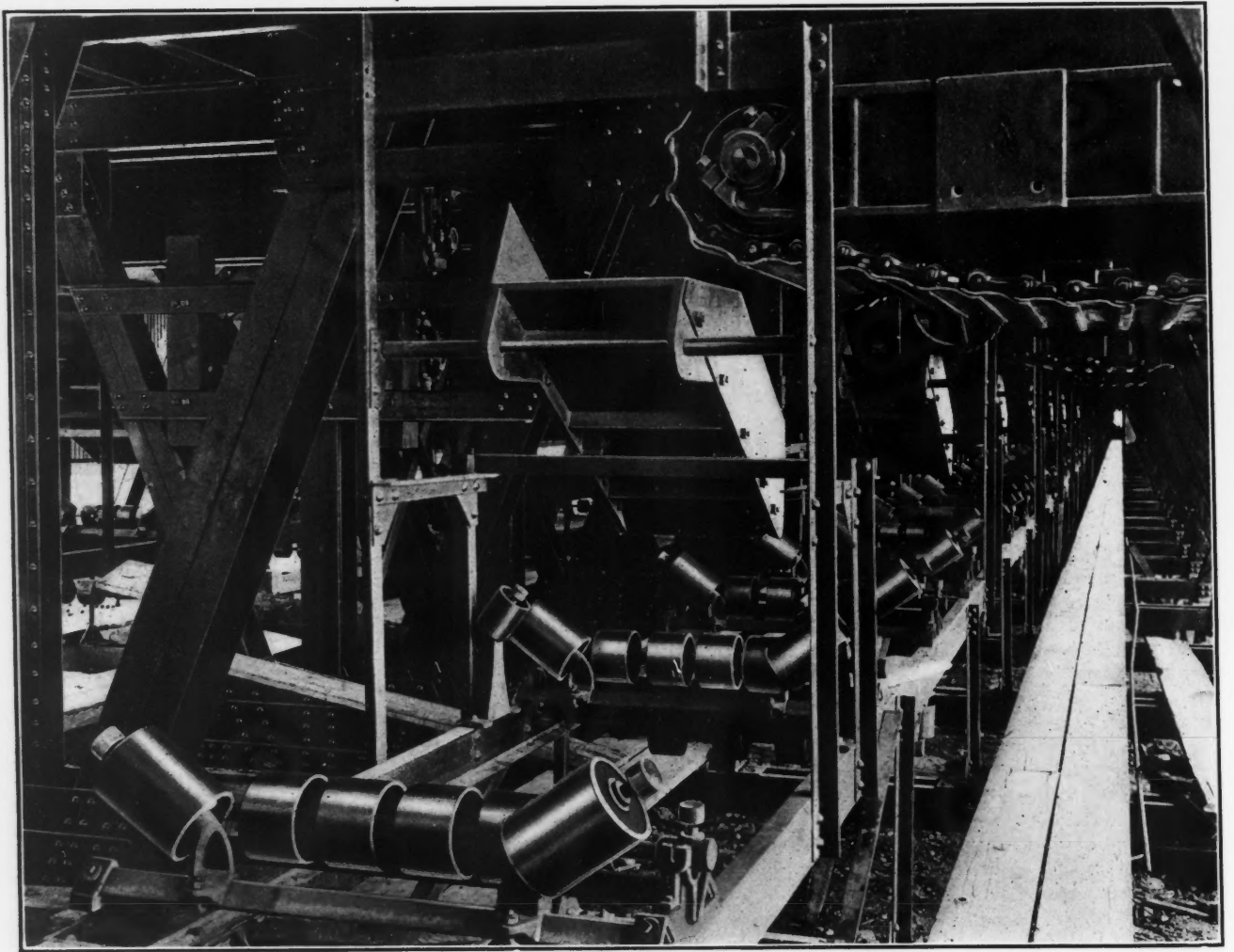
COSTS AND EXTRACTION

The cost of power will be the largest single element in the milling of these ores. The cost of coal to the Utah company will be probably in the neighborhood of \$2.50 per ton and the cost of a horse-power per annum will be probably about \$60. I believe that somewhat less is estimated, but the figure mentioned above is more likely to be the actual one. The Boston company secures electric power under a contract that has not been published, but is doubtless less than \$48 per horse-power per annum, at which price other contracts have been made. At \$60 per horse-power and 360 days operation, the power cost per ton of ore would be 16.7c., if 1 h.p. were used per ton of ore. At \$48 per h.p., 360 days operation, and 0.9 h.p. per ton of ore, the cost would be 12c. The preliminary estimates of the cost of milling this ore were 35c. per ton. The Utah Copper Company is said now to be doing it for 30c. per ton, but is not yet incurring regular charges on account of repairs and renewals. If the estimates of power consumption and cost are approximately correct, it is fair to assume a probable milling cost of 35c. for the Utah Copper Company, and 30c. for the Boston Consolidated. The wages of the mill-men are \$2.50 per eight hours; of common labor, \$2.

The extraction of mineral by the Utah Copper Company is about 70 per cent. In milling ore assaying 1.8 per cent. copper the tailings assay in the neighborhood of 0.5 per cent. The Boston Consolidated estimates that its extraction will be at least 65 per cent. and expects to do better. How much better it will actually do remains to be seen. In concentrating ore containing 1.8 per cent. copper, with 70 per cent. extraction, the concentrates contain about 25 per cent. copper, the ratio of concentration being 20:1. The cost of shipment of the concentrates to the smelter is 10c. per ton. The terms for smelting are a private matter of the companies, at least have not yet been disclosed. However, let us assume \$6 per ton, 95 per



VANNER ROOM, UTAH MILL, GARFIELD, UTAH



CONVEYER UNDER MAIN ORE-BIN, BOSTON MILL, GARFIELD, UTAH

cent. of the copper and freight and refining charges of \$11 and \$18, respectively, per ton of crude copper. The cost of production then will be approximately as follows:

Mining 2000 lb. ore.....	\$0.300
Freight on 2000 lb. ore.....	0.270
Milling 2000 lb. ore.....	0.350
Administration and general expense.....	0.150
Freight on 100 lb. concentrates.....	0.005
Smelting 100 lb. concentrates.....	0.300
Freight and refining 24 lb. of crude copper.....	0.348
Total	\$1.723

The produce of a ton of ore will be about 23.32 lb. of refined copper. Deducting from the cost per ton of ore the value of the gold and silver recovered, say 15c. per ton of ore, the net cost is \$1.573. On this basis the cost of a pound of copper will be $\$1.573 \div 23.32 = 6.75$ per lb. Of course it will be perceived that in the above estimate no allowance is made for

6000 h.p. which is actually required for the Utah mill at \$90 per horse power, the cost of that mill is about \$3,540,000, or about \$1.64 per ton of annual capacity. The cost of the Boston mill is about \$1.20 per ton of annual capacity. The difference is largely in the matter of power plant, but in other details the Boston mill is a little less costly than the Utah mill.

With its two mills, the Utah Copper Company will be able to treat about 2,500,000 tons of ore per annum and produce the equivalent of 58,300,000 lb. of refined copper. The Boston Consolidated can treat 1,000,000 tons of ore per annum and produce the equivalent of 23,320,000 lb. of refined copper.

According to a report in the London *Engineer* (Aug. 2, 1907), the reduction in the number of ironworks in the Urals

The Production of Anhydrous Hypochlorite of Lime

In British patent 24,101 of 1906 the Chemische Fabrik Griesheim Elektron, of Frankfort, Germany, describes a new method of producing an improved bleaching powder, which contains far more available chlorine than the ordinary chloride of lime. The inventors pass chlorine through milk of lime, stirring until the solution is almost saturated. The solution is then filtered and evaporated either *in vacuo* at a low temperature or rapidly at a high temperature. This method of evaporation is the point of the invention for it produces an anhydrous hypochlorite of lime $\text{Ca}(\text{ClO})_2$ which is quite stable. Many years ago C. T. Kingzett, of London, produced a similar hy-

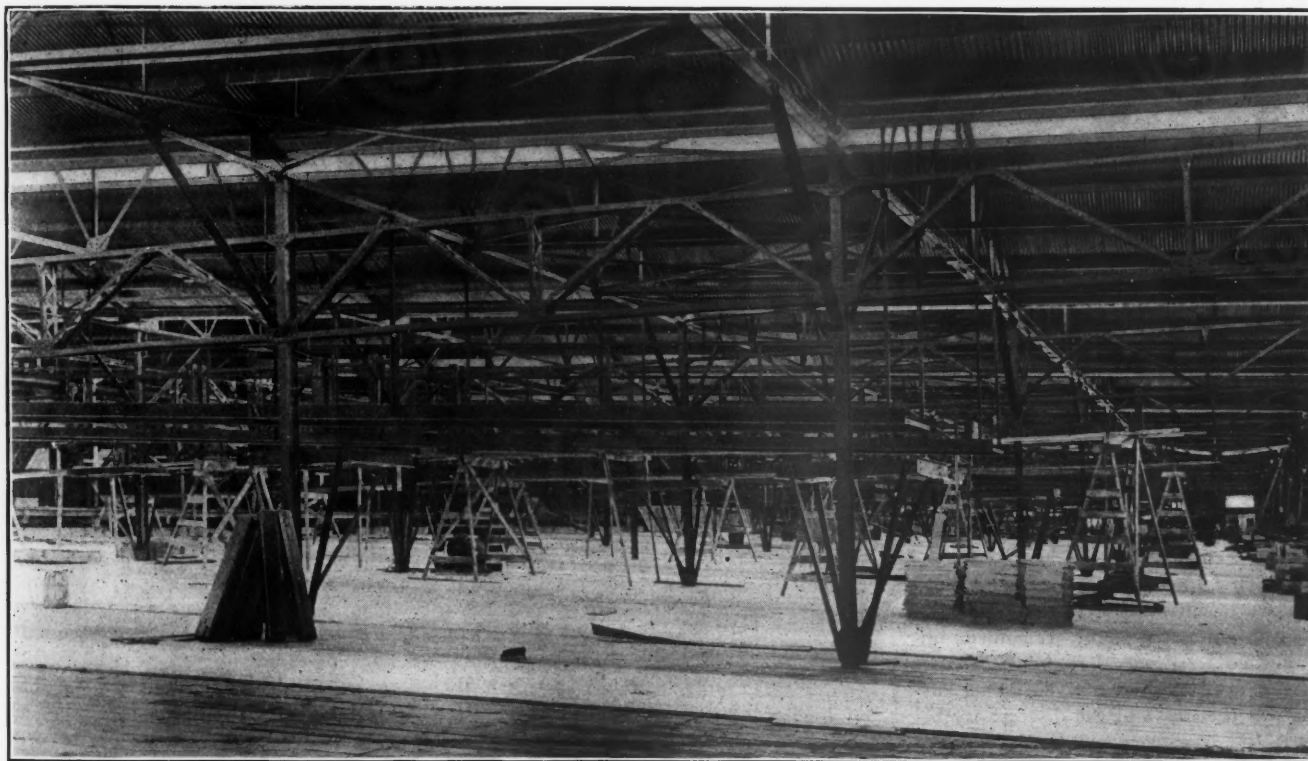


TABLE FLOOR, BOSTON MILL, AT GARFIELD, UTAH

accidents and unforeseen contingencies. As a broad generalization, without entering into a discussion of the relative position of the two companies, it may be assumed that copper can be produced from the Bingham porphyry ore for about 7c. per lb. when operations are in full swing.

The ability to produce copper at this low figure is the result of a great deposit of favorable ore that is after all of good grade in comparison with what is mined at Lake Superior and an immense expenditure of capital to work the ore on a huge scale. Without referring to the developments at the mine, the Utah mill has cost about \$4,000,000, of which \$1,000,000 was for the power plant. The Boston mill has cost about \$1,200,000. Reckoning the

continues. During the past three years 13 small factories have closed. Besides these, in 1907 the Verchnyturinsk, Serebriansk, Brantchinsk, Neviansk, Nizhiturinsk, and Irbit factories ceased making cast iron. At the moment the total number of furnaces working in the Urals is 82. These produced in January 57,120 tons, and in February 54,320 tons, or a total for the two months of 111,440 tons, while in the corresponding period of 1896 the combined production of the 93 furnaces then working was 121,519 tons. There is also to be observed a reduction in the production of finished iron, due to decreased orders received by the Bogoslovsk Works on account of the Siberian railway.

pochlorite but in a hydrated form with four molecules of water of crystallization. This, however, easily decomposed and the compound was of no value commercially. Probably the method of preparing the compound in an anhydrous state as adopted by the Frankfort firm will overcome the difficulty.

The British consul at St. Nazaire, the port in France at the mouth of the Loire, states that the export of iron ore is increasing. These supplies come from the Chateaubriand district, and are exported to Holland and to Great Britain. The mines are operated by a Dutch company, and none of the ore is used locally. It is said that the ore is not of high grade.

A New Method of Shaft Connection

By HENRY BRIGGS*

When a mine surveyor is called upon to effect a connection between the surface and underground surveys through the medium of a single vertical shaft, he generally has recourse to the method of suspending a pair of wires in the shaft, determining the bearing of the line joining them from surface observations, and then utilizing that line as a base from which to carry his underground traverse. The operation is admittedly a difficult one. Instrumental methods of great refinement must be employed in the determination of the bearing of so short a base and in the underground sightings. Yet the chief drawback is not in any way connected with the instruments; it is due to the liability of the wires to be deflected from the perpendicular.

CAUSES OF DEFLECTION

Many will remember the discussion evoked in this and other journals about five years ago by the fact that the pairs of wires hung in the Tamarack No. 5 and No. 2 shafts were found to be respectively 0.07 ft. and 0.1 ft. farther apart at the bottom than at the surface. In 1898 Brathuhn was plumbing a shaft in Germany 130 m. in depth, at the bottom of which were a number of rails lying approximately in the magnetic meridian; he found that the iron plumb-bob nearer the rails was attracted 7.5 mm. and that the line was swung six minutes of arc.¹ There was no such magnetic attraction at the Tamarack mine, however, for when lead bobs were substituted for the original cast-iron ones, the error remained undiminished.² It was left for Professor McNair to prove that the ventilating current was the cause of the discrepancy between the measurements in the case of both shafts.

It is difficult in all mines entirely to stop the air circulation even for a short time, and in a fiery colliery it is positively dangerous to attempt it; hence we see the necessity for testing the verticality of the wires previous to making the sightings. With two wires there is no satisfactory method of performing this test. All that is usually done is to measure accurately the distance apart of the wires at the surface and at the shaft-bottom, and to conclude that if the measurements agree the wires are perfectly plumb.

Now if P and Q , Fig. 1, represent the plan of two strictly vertical wires in a

shaft, one of them, say P , may conceivably diverge to a position P_1 without altering the bearing of the line joining them, and yet the surface and underground measurements would disagree. Again, the wire P may assume a position P_2 , at which, notwithstanding the fact that the two measurements tally perfectly, a serious angular error would be called into being. The error in this latter case would remain unnoticed; the divergence in the former case would be at once manifested, and, although absolutely of no importance, means would be taken to discover its cause and to eliminate it.

VARYING CURRENTS

Nor would the test of hanging different weights on the wires be of any avail in this latter case; if the wire P were deflected to P_2 when subjected to a certain tension, then the only result of applying a greater tension would be to bring the wire back to such a position as P_3 , but not in any way to affect the distance between the wires.

It has been proved in practice that the deflection of wires hung in a shaft is generally due to air currents. Now when a current of air is made to change its direction from the vertical to the horizontal, or *vice versa*, as at a shaft-bottom, it invariably takes upon itself a corkscrew or helicoidal motion in obedience to the law of "least work." Hence two wires hung at either side of a shaft will be given, by virtue of this motion of the air, a crosswise or circuitous swing in opposite directions; from which we see that of the two motions discussed above, the sidelong movement, which, of the two, is the more dangerous and the more difficult to detect, is the more likely to result.

Of course, in the generality of cases a discrepancy between the surface and underground measurements will be due to a combination of both the circuitous movement and the simple divergence; yet, in view of the delicacy of this mode of carrying bearings underground, it behooves the surveyor to be prepared for the worst case.

Bearing these considerations in mind, the writer has evolved a method of shaft connection in which a shifting of the wires in any direction may be easily detected.

NEW METHOD PROPOSED

The salient point in the method is the suspension of three instead of two wires. If the shaft be of circular section, and two of the wires be at about equal distances from the side, then the third should be placed, if possible, nearer the center as shown in Figs. 2 and 3. If the shaft be rectangular the three wires should be hung, if possible, in separate compartments; the object in both cases being to place the wires so that the disturbing effect of drafts will be different with each wire. It is also apparent that the

wires are best placed so that the lines joining them inclose an equilateral triangle.

Once the wires are suspended their perpendicularity is tested by measuring their distances apart at the surface and at the shaft bottom, and the business in hand should not proceed farther until these measurements agree perfectly. This being attained, the sightings may, if the surveyor thinks fit, be only made upon two of the wires in the usual manner, the third having already served its chief purpose. For reasons to be afterward stated, however, the writer recommends that ad-

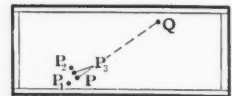


FIG. 1

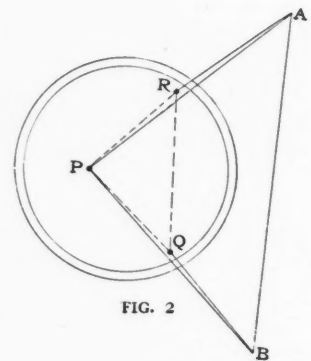


FIG. 2

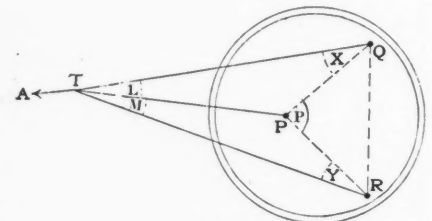


FIG. 3

METHOD OF SHAFT CONNECTION

vantage be taken of all three wires in the following manner:

SURFACE OBSERVATIONS

After the wires P , Q and R (Fig. 2), are suspended in the shaft, sightings must be taken to them at the surface to determine the bearings of the lines PQ and PR . All three lines have already been very accurately measured, by taking the average of, say, ten readings of each of them with different portions of the steel tape.

Choose two stations, A and B , almost in line with PQ and PR , respectively, and preferably intervisible, and connect them to the triangulation scheme. Center the transit over A ; sight three triangulation stations, also P and B , and finally obtain the small single PAQ by frequent repetition. Transit the telescope and repeat the observations. Mea-

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¹*Berg und hüttenmännische Zeitung*, 1898, p. 164.

²*Eng. and Min. Journal*; Vol. LXXIII, Pp. 578-580.

sure the lengths PA and GA (no special care need be taken in measuring these lengths providing the triangle PAQ is a very narrow one; with a triangle of this shape an error in the measurement of one of the sides has exceedingly little effect on the calculated values of the angles at P and Q). Remove the transit to B , and take similar sightings to P, R, A , and to three triangulation stations. Finally measure BA .

Solve the triangles PAQ and PBR . If the angles at A and B are respectively less than about three minutes, the sine rule takes the simplified form:

$$\frac{\text{Angle } A \text{ in seconds}}{PQ} = \frac{\text{Angle } P \text{ in seconds}}{AQ} = \frac{\text{Supplement of } Q \text{ in seconds.}}{PA}$$

Thence obtain the bearings of PQ and PR , and from them the angle RPQ . This angle should be checked, first by solving the triangle PQR , and then by means of the triangle ABP , in which the angles at B and A were measured (this gives the angle P directly) and also the sides are known, from which P may again be calculated.

UNDERGROUND OBSERVATIONS

The method of solution of the well-known "three point problem" may be employed to establish the bearing underground:

Plumb the transit under a spad at T (Fig. 3). Carefully measure the singles L and M , also sighting the next station A up the level. From these observations alone, without measuring any of the lines ending at T , the bearing of TA may be calculated. Of course, one of the lines, preferably TP , will have to be measured as forming the first line of the underground traverse, but this measurement, since it plays no part in the establishment of the bearing, need only be made with the degree of accuracy considered necessary for any traverse line.

Giving to the various angles and lengths the letters shown on Fig. 3, we have:

$$\frac{\sin X}{TP} = \frac{\sin L}{r} \tag{1}$$

$$\frac{\sin Y}{TP} = \frac{\sin M}{g} \tag{2}$$

Eliminating TP between these equations, we obtain:

$$\frac{r \sin X}{\sin L} = \frac{g \sin Y}{\sin M} \tag{3}$$

We also have the identity:

$$P = X + L + M + Y$$

or

$$X = (P - L - M) - Y \tag{4}$$

Equations (3) and (4) are simultaneous in $X + Y$ (the only unknown quantities), from which either or both angles may be easily obtained.

The only lengths which enter into the calculation are r and g , both of which have been measured with great exactitude when testing the verticality of the wires.

The bearings of the lines PQ and PR are known from the surface observations; from them, using the calculated values of X and Y , the bearings of PT and TA may be arrived at.

A check on the observations is provided by equations (1) and (2), in which the length of the first traverse line, PT , may be introduced. The check is, however, only a rough one, since the triangles QPT and RPT are rather too wide to be of good shape.

ADVANTAGES OF THE METHOD

The following advantages are claimed for this method of shaft connection:

By means of three wires an almost perfect test for the verticality of the wires is obtainable.

The underground observations are of the simplest nature and may be performed very speedily. This is a great point in a busy mine where the shaft bottom may not be at the disposal of the surveyor for more than a few hours.

The distance of the instrument from the wires does not enter into the main reduction formula; hence the accuracy of the underground work is independent of the shape of the triangles QPT and RPT (Fig. 3).

State Aid to Mining in Western Australia

For many years the Government of Western Australia has shown its interest in the mining development of the State by giving the greatest possible assistance to mine-owners and prospectors. The numerous railroads running to the chief mining districts have all been expressly built to promote mining; and the Coolgardie water supply system, which is one of the greatest hydraulic engineering propositions ever undertaken, forms probably the largest work any government has undertaken solely in the interest of mining. The mining industries of the State are at present in a most flourishing condition. The leading mines at Coolgardie and Kalgoorlie are yielding satisfactorily and the deep workings are developing well. The tin fields in the Greenbushes district are being actively prospected and promise well. Copper mining at Phillips river and other centers is prosperous, and a most promising copper field is being developed on the south coast east of Esperance bay. In a recent speech at Perth the Premier stated that the Government's policy in promoting the mining industries will not be in the slightest degree abated. There is, however, some difficulty experienced in finding the best means of helping the industries.

Aid by means of State batteries is a method which has had the support of successive Governments, and, although perhaps it has not given universal satisfaction, gold ore to the value of two million pounds sterling has been recovered at the State mills, and a very considerable number of men have been assisted thereby. It will be the endeavor of the Government to improve this system and to extend it by the erection of pioneer plants. Further funds will also be provided for assistance to be given under the Mining Development Act, which allows of loans to the holders of mining properties, and under which considerable sums have been disbursed in past years without much apparent result. It is manifestly impossible for the State to provide a huge prospecting fund. Much discrimination must be exercised in making advances. It is proposed to confine advances as much as possible to cases in which it is desired to purchase machinery. The importance of geological surveys is recognized by the Government, and it is proposed, as far as possible, to have probable mineral-bearing areas examined and described by the geological staff in advance of their occupation for mining purposes.

Victor Fuel Company

This company owns important coal properties in Colorado. The report for the year ended June 30, 1907, shows \$3,621,500 capital stock and \$1,980,000 first-mortgage bonds. The income account for the year was as follows:

Gross earnings for the year.....	\$2,631,301
Operating expenses.....	2,038,091
Net earnings	\$593,210
Other income.....	97,294
Total net income.....	\$690,504
Fixed charges	\$146,446
Depreciation accounts.....	82,568
Total charges.....	\$229,014
Surplus for the year.....	\$461,490

The surplus showed an increase of \$96,917 over the previous year. The coal statement is as follows:

	1906	1907	Changes
Coal mined	1,528,280	1,773,312	I. 245,032
Coke made....	98,449	99,827	I. 1,378

This shows a gain of 16 per cent. in the coal mined. The coke production was about stationary.

In the matter of heating storehouses, etc., tightness of walls and windows, meaning ability to keep out cold wind, has a large effect on inside temperatures and the cost of heating. Special care should be taken to make the walls non-conducting and tight. A moderate amount of mason and carpenter work in stopping cracks and making doors and windows fit more tightly will make an important showing in the fuel bill.

Gold Mining in Santo Domingo

Occurrence of Placer Gold Deposits in Santo Domingo. Evidence of Rich Yield in Early Spanish Mines. Existence of Platinum Probable

BY F. LYNWOOD GARRISON*

In the issue of this JOURNAL for June 15, 1905, I contributed an article entitled "Gold in Santo Domingo." Since that time, having made two more long visits to this interesting West Indian island, additional data upon this topic have come to my attention, especially on the recent publication of some original documents of Columbus.¹ In Thacher's "Life of Columbus," Vol. II, pp. 258-260, there is an account of the expedition sent by Columbus into the Cibao mountain region in search of gold. These documents and the later observations of my own have impressed upon me the importance of the subject, and the seemingly persistent indifference

as were, for example, referred to editorially in this JOURNAL for Jan. 26, 1907, the fact that these companies had a brief and inglorious existence should not deter honest and sensible business enterprises from being promoted in this rich island. That people could be so easily gulled by persons of bad reputation both at home and in Santo Domingo, shakes one's faith in human nature. At best, it is the old story of investors and perhaps perfectly honest promoters trusting their own judgment upon matters requiring technical skill and special knowledge. The last word has not been said on this subject, nor the last lamb sheared, for Santo Do-

"Santo Domingo," pp. 509-511, is altogether unreliable, mostly rubbish. Very little that has been published about the mineral resources of Santo Domingo since the time of Columbus can be trusted. The one notable exception to this is Gabb,² who is entirely reliable in his geological conclusions, but in some error regarding the practical deductions therefrom.

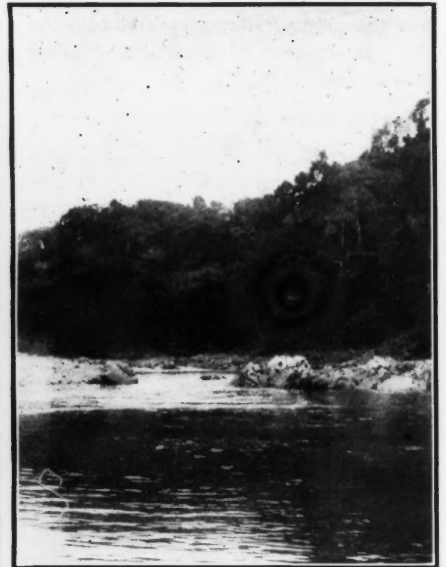
At the time of Columbus, the Spaniards appear to have imposed a tribute of gold upon the natives, which amounted to about \$400,000 per year during the first years of the occupation. According to Soetbeer's statistics, the world's production in the end of the fifteenth and beginning of



GOLD-BEARING BENCHES ON THE JAINA RIVER



THE NIGUA RIVER



THE UPPER JAINA RIVER, A SOURCE OF MUCH EARLY GOLD

with which the American public regards the natural resources of this country, and the unusual opportunities offered there.

In the previous article I called attention to the large production of gold obtained in the early days of the Spanish occupation, the crude methods then in use of obtaining it from the river and gravel benches, and the probability that with modern mechanical systems of washing the production would be much greater. While I have little doubt, my observations may have been regarded as rosy by some and have been used by others to promote dubious gold-mining schemes lately floated in connection with Santo Domingo, such

mingo offers a handy and fertile field to the crooked promoter, and he will be sure to find some congenial spirits among the native and semi-native population of Santo Domingo City ever ready to aid in fleecing an American to the undeserved detriment and bad name of the island. In publishing additional notes upon the subject of this article, I realize I am providing data liable to be distorted and exaggerated for the purposes of questionable promotion. That seems, however, a risk which must be taken, since it is right and proper to add further to the scanty reliable information concerning this rich, fertile, and healthy country.

The report of Don Juan y Nieto Barcel, mineralogist to the king of Spain, a translation of which appears in Hazard's

the sixteenth century was 5800 kilograms, or 186,500 oz.; or it may be roughly stated that Santo Domingo then produced one-tenth of the world's gold.

Allowing for exaggeration by Columbus and his contemporaries, who were all naturally desirous to please the Spanish sovereigns, his letters and journal show that in the early years of the occupation the production of gold must have been large. In one of Columbus' letters,³ referring to the abundance of gold, he states that one person collected 120 castellanos (one castellano is 1/7 of an ounce—say about \$3);⁴ that is, \$360 in our money;

²"Geology of Santo Domingo," *Trans. Amer. Philosophical Society*, Vol. 15, 1872.

³To the nurse of Prince John, about the year 1500.

⁴To be exact, one castellano is equivalent to 0.148 troy ounce.

*Mining engineer, Philadelphia, Penn.

¹"The Northmen, Columbus and Cabot." Original narratives of early American history. Chas. Scribner's Sons, New York, 1906.

others obtained 90 (\$270) and even the number of 250 (\$750) has been reached; from 15 to 50 (\$45 to \$150) is considered a good day's work. The usual quantity is from six to 12 (\$18 to \$36) and anyone obtaining less is not satisfied. Columbus further states it was the general opinion that every individual, however inefficient, could obtain from one to two castellanos (\$3 to \$6) per day. The first inference from the text here is that these extremely large quantities of gold were obtained as a day's labor of one person by washing in the stream beds or river banks. From a more careful perusal of the context I am disposed to think this statement is not meant that way, but that the accumulated stores of the natives were obtained by these individual persons or else a number of natives were engaged in washing for one person, probably a Spaniard. It is extremely unlikely one indi-

but pans or *bateas* were used by the natives. According to Thacher the tribute exacted from the natives at the time of Columbus in the provinces of Cibao and Vega Real, and those near the mines, was a Flanders hawk's bell⁵ full of gold every three months from each native over 14 years of age. Manicaotex, one of the caciques, gave each month one-half calabaza of gold (valued by Las Casas at 150 castellanos, or \$450). Those natives remote from the mines were obliged to contribute an arroba (25 lb. Spanish) of cotton for each individual.⁶

The largest nugget of historical record found on the island was that which Bobadilla sent to Spain in July, 1502, and which was afterward lost in the ship that carried it. This nugget is said to have weighed 600 oz., which, if correct, would be worth today \$12,000.⁷

Making due allowances for exaggera-

them. Gravel from which an expert individual can pan \$4 to \$6 a day would be considered rich in California, and while, of course, pockets are sometimes found that will yield more, it is doubtful if even in the palmiest days of gold mining in California, the average operator made more than this a day; hence, while accepting these old Spanish statements *cum grano salis*, we are forced to believe the gold gravels they found in Santo Domingo were unusually rich. Whether they washed the river beds exclusively or the banks and river terraces as well, is not clear. According to Thacher, "the gold was collected by undermining the banks of a stream, the earth being washed away by the current, leaving the gold among the stones on the bottom." "In this way grains of as much as a drachm in weight were frequent."⁸

The fineness of this gold in Santo Domingo is notable. Blake gives it as 0.946.⁹ My friend, Prof. F. A. Genth, Jr., of Philadelphia, has kindly tested for me some of the gold obtained from the upper Nigua river in the San Cristobal district, which gave the result of 970.5 fine.

A small amount of gold is still washed by the natives at certain localities, but the total production is very small, and is sold to the local goldsmiths and merchants. Adolphe Chalas has kindly supplied me with the following information regarding the existing local traffic

In Santo Domingo, gold is sold by the *tomin*, which is equal to $\frac{1}{8}$ castellano, or $\frac{1}{54}$ oz. troy. Hence there are 54 *tomines* in 1 oz. troy.

The gold is generally sold at a price of from 20c. to 25c., sometimes as high as 30c. per tomin, corresponding to \$10.80, \$13.50, \$16.20 per oz. troy, but a few months ago, gold having been eagerly purchased for "salting" purposes, the women gold washers of the upper Nigua valley reported that they had sold their gold as high as 80c. per tomin, or \$43.20 per oz. troy.

The Creole goldsmiths of Santo Domingo City can afford to pay as high as \$16 per oz. troy on the spot, as they manufacture their own alloy for jewelry, which does not assay over 6 to 8 carats, and which is sold as 18 to 20 (fine).

In my previous article in this JOURNAL, I called attention to the possible presence of rhodium (a metal of the platinum group) in the alluvial gold of Santo Domingo, although at that time I was doubtful as to the correctness of the observation. Since then, however, the existence of peridotite rocks in the Cibao or mountain section of the island, has been proved by Adolphe Chalas, of Paris; hence the old tradition of platinum in the Yaqui del Norte river gravels would seem to have some foundation in fact, but I never had a particle of confidence in the assertion



BANANAS GROWING ON GOLD-BEARING GRAVEL, JAINA RIVER

vidual could wash with a pan or *batea* over \$100 per day from the richest gravel known anywhere, except in some very exceptional instances where rich pockets have been discovered. Even what Columbus calls the usual quantity obtained per day, that is, from \$18 to \$36, would be remarkably rich in California or Alaska, and I do not believe this statement can be accepted as the work of one person. His last remark regarding what an incompetent individual might wash seems to me to be nearer the truth, since under favorable conditions it takes a good miner or Chinaman to make \$5 or \$6 a day by ordinary hand work. Of course some mechanical contrivances may have been used by the early Spaniards, which enabled them to handle relatively large quantities of gravel; the best evidence we have, however, is to the effect that nothing

tion, it seems the Spaniards must have obtained a great deal of gold in the first years of their occupation, and as the rich spots known to the Indians were exhausted along with the disappearance of the laborers by the rapid extinction of the Indians, this supply steadily decreased, practically ceased, and since those days, for nearly four centuries, no systematic efforts have been made to work these gravels. The natural accretion of gold in the streams by erosion during this long interval has perhaps more than replaced all the Spaniards ever obtained from

⁵A Flanders hawk's bell, from the best information that can be now obtained, would hold about $\frac{1}{6}$ oz. troy of gold dust.

⁶Ibid., Vol. II, p. 353.

⁷Las Casas, "Historia," III, 31. Bourne, "Spain in America" (Harper Bros., 1904), p. 78.

⁸Ibid., Vol. II, pp. 258-260.

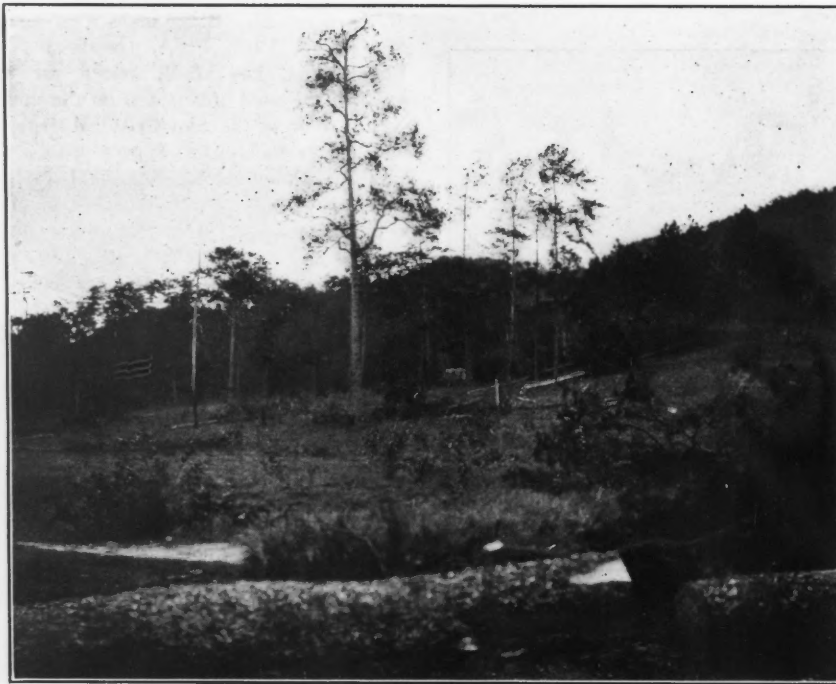
⁹Report of U. S. Commission on Santo Domingo, Washington, 1871, p. 123.

until I learned of the existence of the ultra-basic rocks in the island. The old Spanish documents speak of "many grains of silver glittering in the bottoms of the streams." As far as I know, no native silver has ever been found on the island; consequently it seems likely these glittering grains may have been platinum, which metal was unknown to man in the sixteenth century, and was usually mistaken for silver.

Dana ("System of Mineralogy") speaks of platinum in Santo Domingo. Roscoe and Schorlemmer ("Treatise on Chemistry," Vol. II, p. 390) speak of it as being found in Hayti. Guyton de Morveau refers to a sample of platinum in the ferruginous sands of the Yaqui del Norte, presented to the Institute de France by Percy on February 12, 1810. It is found principally after heavy rains in the river

of this kind in Santo Domingo, although of course in a much smaller area, but probably in no less a degree of richness. Consequently, as in California, the gold miner in Santo Domingo would do well to devote his attention to alluvial deposits exclusively, but at the same time be careful not to be misled by fraudulent or lying statements regarding the extraordinary richness of these gravels. There is abundance of water in the gold districts of the island, cheap timber, labor, and a healthy climate. Mineral fuel is very expensive, as are tools and imported food supplies. The Santo Domingo mining laws permit the importation of tools free of duty, and if the native food is used—and it is far better than canned goods—the costs of living and operating should be much cheaper than in California. The labor supply, while plentiful, is of uncertain effi-

where, and there are always difficulties to be met and conditions to be foreseen that are rarely or never quite the same in any two places; hence the danger and folly of inexperienced people embarking on their own responsibility into this extremely complicated business. Sometimes they succeed, in other words, have "tenderfoot luck," and the world resounds with their name and fame; usually, they fail, but their disasters are kept quiet. A shoemaker cannot be expected to make watches, or build bridges; is he more likely to read the secrets of success in mining on the bottom of his last? Some philosophers tell us there is no such thing as luck in life, that success is due solely to individual effort and ability. It is needless to observe that no mining man will believe this, but if he be experienced he knows that "dumb luck" is rare, and fortune often smiles on the man who knows his trade and uses common sense.



CUTTING PINE TIMBER, MONTE CHRISTI DISTRICT

at the foot of the Cibao mountains. These sands also contain gold and are collected by women who without washing sell them for a few maravedis (cents).¹⁰

The source of the alluvial gold in Santo Domingo is in the quartz veins of igneous rocks constituting the central core of the island, and in this respect it resembles California. The quartz veins of both countries are usually small, relatively poor, and in California do not often pay to work. The gold of California has been mined and milled by nature from the innumerable lean quartz veins of the Sierra Nevada; these primal deposits are of little practical value themselves, but their golden contents when concentrated and stored in alluvial deposits, have made the name of California a synonym for wealth. Similarly nature appears to have done something

ciency, which objection is offset by its extreme cheapness, wages ranging from 40c. per day up according to the skill of the individual.

The methods or systems of operating these alluvial gravels will depend upon many circumstances that cannot be discussed in this paper. The stream beds and low benches in the Yaqui valley appear to present especially favorable conditions for dredging, namely, soft bed-rock, no boulders, uncemented or loosely consolidated gravels, and a sufficient flow of water in the river to provide electrical power. The most serious danger is that from floods, which in tropical countries are likely to be sudden and severe. This, however, is a contingency not unknown in California, although perhaps they are not so uncertain nor unexpected. Ideally perfect conditions for mining, as in most other affairs of men, do not exist any-

Shortage of Coke at Smelters in British Columbia

The provincial Government of British Columbia has sent R. F. Tolmie, deputy minister of mines, to the Kootenay and Boundary districts of the province to ascertain the position at the several smelting works of those sections in regard to a reported shortage of coke and the consequent shutting down of some of the blast furnaces. All three copper smelters in the Boundary are stated to have lately been much hindered in their operations, first by there having been at times too few railway cars available to keep the furnaces supplied with ore, of which there is an abundance broken down in the mines; and next by an insufficiency of fuel. Similar conditions have in degree affected the copper smelters at Trail and Northport, at which ore from Rossland mines is treated, and in a measure the lead smelters at Trail, Nelson and Marysville, respectively, have also been placed at a disadvantage. Coke for all the smelters mentioned is obtained usually from collieries in the Crow's Nest region, some of them on the western slopes of the Rocky Mountains in British Columbia, and others in the eastern foothills in southwest Alberta. It has been represented to the provincial Government that it has power to require that no coke be shipped from the first-mentioned collieries to other countries until after provincial requirements shall have been supplied. It is claimed that coke is being exported to Montana in considerable quantity, and that as a consequence the smelting works in Kootenay and Boundary districts are unable to obtain a sufficient supply. Mr. Tolmie's mission is to ascertain whether or not the allegations made are correct. If so there is little doubt the provincial Government will speedily exercise its powers in the direction indicated.

¹⁰(*Annal. de Chemie*, LXXIII, 1810, pp. 334-336.)

Notes on Antimony Smelting*

By G. PAUTRAT

The object of these notes is to describe the plant and the processes now actually employed at a smelter in Mayenne, France, for the production of antimony metal and oxides from stibnite ore. The ore comes in two classes: Rich, carrying 50 to 60 per cent. antimony; and poor, consisting of quartz impregnated with stibnite, and carrying 10 to 20 per cent. metal. Only the rich ore is used for the recovery of metal, the poor being burned for the manufacture of oxides.

The prevalent method of antimony smelting, as practiced elsewhere, involves five steps: Liquefaction of the stibnite by simple fusion; oxidation of the crushed sulphide by roasting; reduction of the oxide with coal, to yield crude metal; refining by fusion with soda; treatment of volatile oxide caught escaping from the oxidation roast. This process is tedious, and requires an excessive amount of labor, especially during the oxidizing roast, when the mass must be thoroughly rabled so as to break the oxide crusts and permit complete desulphurization.

A much shorter process is employed at the smelter under discussion, and, although it has been criticized as being incapable of yielding pure metal, it does actually operate to entire satisfaction. It involves only two steps: Fusion with scrap iron to produce crude metal; followed by a refining fusion, yielding metal with only 0.5 to 0.8 per cent. of impurities.

FIRST FUSION

The reverberatory furnace used in the first operation, Fig. 1, has a total length of 8 or 9 m., width of 1.25 m., and height of 1.6 to 1.7 m. from hearth to roof. It comprises fire-box, *A*, hearth, *B*, and dust chambers, *C*, *D* and *E*; the utility of these chambers is questionable, since but little oxide is caught in them, at their prevailing high temperature.

Assuming the furnace empty, the process is begun by heating the hearth and charging a mixture of fusible slags and Solvay-process soda. A charge of the rich ore, mixed with enough soda to give a quick fusion, is then added, and the whole is stirred until melted. Silicious and other impurities form a slag which is skimmed off and thrown away.

When the surface of the bath is clear, scrap iron, usually in the form of detinned cans from which the lead solder also has been carefully removed, is added and stirred in, after which the door is closed and the temperature raised. The metallic antimony, robbed of its sulphur, settles underneath; the concurrently formed iron sulphide floats on top. This process is repeated until the level of the bath is raised conveniently near to the working

door. The furnace is now ready for continuous operation.

As soon as each addition of iron has undergone reaction the layer of iron sulphide is ladled off in an iron pot, care being taken not to dip too deeply, and poured into molds. The furnace is then allowed to regain its heat, when the crude metallic antimony is ladled out in the same way and cast into molds; between 300 and 350 kg. of metal are removed each time. This cycle of operations—introduction of ore, with stirring; skimming of slag; addition of iron, with stirring; pouring of iron sulphide; pouring of crude antimony—occupies about three hours. The usual life of a well-built hearth, working at this rate, is five to six months. The weights of the materials put into this furnace at each charge are about as follows: Crude ore in lumps, 450 kg.; washed fine ore, 150 kg.; slag from second fusion, 20 kg.; soda, 20 kg.; iron scraps, 240 kilograms.

The crude antimony, the principle impurity of which is iron, has a crystalline

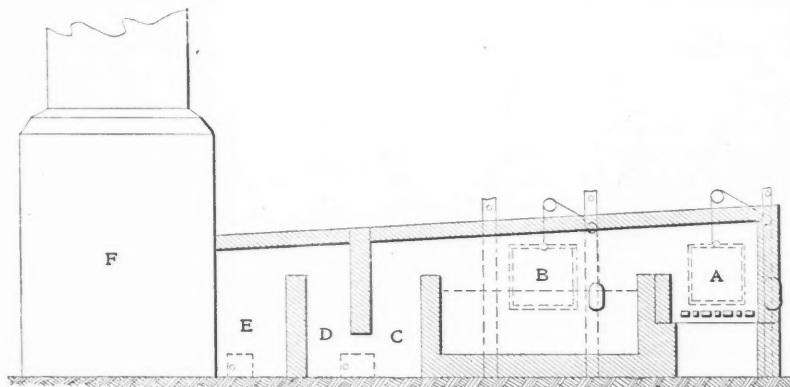


FIG. 1. ANTIMONY SMELTING FURNACE

fracture. If the working of the charge in the hearth is not thorough, the crude metal may carry as much as 4 or 5 per cent. of iron, and will show a finely crystalline fracture. If the furnace work is done with care, the metal will carry not more than 1 or 2 per cent. of iron, and its fracture will be exceedingly coarse. A representative sample of crude antimony shows the composition: Fe, 2.75; S, 1.95; As, 0.54; Pb, 0.22; SiO₂, 0.12; Sb (by difference), 94.42 per cent.

Both of the waste products of this first fusion carry antimony, and at present no attempt is made to save it. The slags should not carry over 1 or 2 per cent. antimony. The amount of antimony carried off in the iron sulphide occasionally reaches 10 or 12 per cent., averaging 6 or 7 per cent. It occurs here in the sulphide state, or as globules of metal, the latter proving that the furnace was not sufficiently hot to permit clean separation. It would be a simple matter to crush the iron sulphide and then recover the metallic antimony, included in it, by a jigging process.

SECOND FUSION

The refining operation is done in a furnace like the first, but smaller. The crude metal is re-melted, taking care to avoid oxidation by covering the bath with a thin layer of fusible slag, composed mainly of soda. The melted bath is kept for a while at a brisk heat, to allow the impurities to rise, after which the door is opened and the impure oxides, are skimmed. The workman judges the progress of the refining by pouring little ingots from time to time, carefully covered with slag; the end is denoted by a fern-leaf crystallization of the surface of the ingot. Before drawing off the refined metal, a protective covering is thrown over the bath, composed of antimony oxide (the unmarketable portion of the oxide furnace product), oxy-sulphides, soda, and a little coal. The antimony is then ladled out in iron pots, and cast in rectangular molds holding 20 to 21 kg. of metal. A small portion of the protective material is taken out of the furnace and put into each mold, before

the metal, so as to give a bright, crystalline surface to the ingot. This is supposed to advance its market price, but is not an accurate index to its purity. Analyses of two samples of such antimony are given:

	I	II
Sulphur	0.069	0.075
Iron	0.190	0.070
Lead	trace	0.081
Arsenic	0.265	trace
Silica	trace	0.008
Antimony	99.450	99.690
	99.974	99.924

As a rule, three charges are put through the refining furnace in 24 hours. The slags from this process frequently carry as much as 20 per cent. of antimony, and are put back into the first treatment as noted above.

EFFICIENCY OF THE PROCESS

The amount of antimony put into the first furnace, at one charge, is about as follows, in kilograms:

Lump ore, 450 kg. at 55% Sb.....	247.5
Fine ore, 150 kg. at 45% Sb.....	67.5
Slag, 20 kg. at 20% Sb.....	4.0
Total antimony in charge.....	319.0

*Revue de Chimie Industrielle, March, 1907.

From the 2552 kg. of antimony thus put into the furnace in eight charges, about 2350 kg. of crude metal is obtained, a loss of 7.93 per cent. At 95 per cent. pure, this contains 2232 kg. antimony, from which, after refining, about 2127 kg. of pure metal is obtained, a loss of 4.71 per cent. The actual efficiency of the process is thus 83.3 per cent., but some antimony is introduced in the oxides used in the refining furnace. Disregarding this factor, the efficiency would be about 79 or 80 per cent.

DOUBLE-HEARTH FURNACE

It has been found possible to combine two hearths in a single furnace, the crude metal being reduced on one hearth, then, while still melted, transferred to and refined on the other. The individual processes are carried out exactly as already described for separate furnaces. A gas-burning jet was once tried in a double furnace of this sort, but its excessive heat ruined the structure.

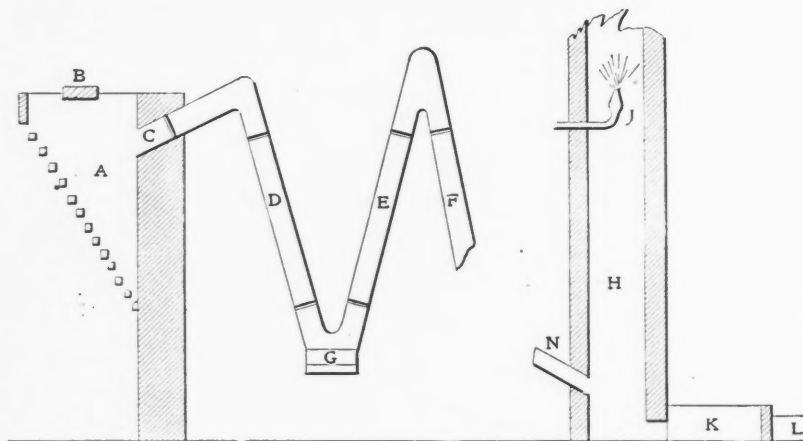


FIG. 2. ANTIMONY OXIDE PLANT

OXIDE MANUFACTURE

The apparatus for converting the low-grade ore into antimony oxide consists of a furnace, condensing chambers, and a chimney equipped with an upward projecting steam jet to provide draft.

The furnace consists of an inclined grate composed of square bars, *A*, Fig. 2. The ore is charged in at *B*; the oxides pass out at *C*, and the burnt ore is raked out through the bars at the bottom. The condensing chambers, *D*, *E*, and *F*, are cast-iron pipes, with V-elbows at the top and bottom. A sliding plate *G* in each bottom elbow allows the condensed oxides to be removed. The series of condensers passes at *N* into the bottom of the chimney *H*.

A coke fire is started in the furnace; on this is spread a layer of ore in lumps of first size, then more coke, another layer of ore, and so on. The air reaching the furnace is ample to oxidize the ore, the residue averaging not more than 1 or 3 per cent. of antimony.

The product of the first condensers is rendered a gray color by admixture of coke dust, and contains oxides of iron and

arsenic; it is nevertheless merchantable. The middle condensers yield a white oxide, analyzing 90 to 92 per cent. Sb_2O_3 . In the chimney, the steam from the jet, *J*, condenses and moistens the remaining oxides, which run down the shaft and are collected periodically by decanting from the vessels, *K* and *L*. This oxide, after drying, is either sold or used in the antimony refining process, as described above.

The best white product will average about as follows: H_2O , 0.75; Sb_2O_3 , 91.30; Fe_2O_3 , 1.15; As_2O_3 , 5.25; SiO_2 , 1.60 per cent. The arsenious acid, which always accompanies the antimony oxide, is the more volatile of the two, hence is found in greater abundance toward the chimney, as shown by the following determinations of arsenious acid present: Gray oxide, 4.52; white oxide, 5.25; wet oxide, 6.46 per cent.

The output of these oxide furnaces is not wholly satisfactory, owing to losses during charging, while the condensation of oxide also is far from perfect. The

plant under discussion has four such furnaces, which are served by two men.

The Tallest Chimney

According to *Power*, September, 1907, the Eastman Kodak Company recently finished a brick chimney 366 ft. high, 19 ft. 6 in. inside diameter at the base and 9 ft. inside diameter at the top, lined throughout with a 4-in. acid-proof lining, with a 2-in. air space between the walls. The construction is of Custodis brick. This chimney is 1 ft. higher than that of the Orford Copper Company at Constable Hook, N. J., and consequently is the highest in the United States, but will be greatly exceeded by the new chimney of the Boston & Montana Mining Company at Great Falls, Mont., which is now under construction.

The legislature of Michigan has repealed the law which limited the land holdings of mining companies to 50,000 acres.

A Rifled Pipe Line for Conveying Oil

Contract has been let by the Southern Pacific Company for the building of a rifled oil-pipe line, 256 miles long, from oil properties in Kern county, in California, to tidewater on San Francisco bay. A feature of the line is the character of the pipe used, its rifled construction being a radical departure from that of the lines now in use for conveying oil. Spiral indentations made in the rolling of the pipe constitute the rifling.

A series of experiments has demonstrated that, after a small proportion of water has been added to the oil, and the necessary pressure applied, the whole will develop a whirling motion, and that the water, being heavier, will seek the outside of the pipe, thereby enveloping the oil in a thin film or shell of water; this shell or film of water acting as a lubricant between the oil and the pipe, greatly reducing the friction and allowing the core of oil to glide through the pipe readily.

Throughout the length of 256 miles of pipe there will be 23 pumping stations, the equipment of each station being in duplicate, so that in the event of a breakage of any part of the machinery of one pump the other may immediately be put into service.

With the size of the pipe, which is 8 in. diameter, the high pressure carried and other improved facilities, a rapid transmission of oil has been shown to be possible, and it is estimated that at least 23,000 bbl. fuel oil can be delivered every 24 hours.

British Students in Canada

It is proposed that a party of from 50 to 100 university students, chiefly those taking a scientific course in the colleges of Great Britain, shall make an eight weeks' tour of Canada. The intention is that the students shall visit numerous industrial plants in the various parts of the Dominion so as to give them an adequate idea of the industries established and in operation. Lord Strathcona, high commissioner of Canada in London, is president of the committee having this matter in hand, and Sir Wilfred Laurier, prime minister of Canada, one of the patrons. The secretary, a young Canadian engineer resident in London, was in British Columbia lately in connection with this proposal.

Silicon and platinum give, by direct union, a silicide corresponding to the formula $SiPt$. This compound, which can be obtained crystallized, has chemical properties somewhat like those of platinum, though more readily attacked by oxidizing agents.

Metal Mining in the Philippines

A review of the present status of mining metallic minerals in the Philippines is given by Maurice Goodman in the *Far Eastern Review* (June, 1907).

GOLD

Gold-bearing deposits are known in most of the provinces of the archipelago. The most important districts as regards output and general activity are the provinces of Benguet and Masbate. Two new mills are now in course of erection, one in each province. At Binanlonan in the northern part of Pangasinan some narrow veins of good grade ore have been found and two companies undertook exploitation, which promises definite results, now that the settlement of various disputes is in sight.

On the island of Marinduque and in the northern Camarines prospecting has been carried out with the result of several discoveries of promising veins. The mining industry in the northern Camarines was of much importance in the past, but died out. Considerable capital would be required to put the old mines on a working basis.

In the Suyoc region of southern Lepanto the Igorotes formerly worked rich ground, which was flooded out many years ago, stopping all work. Recently a drainage tunnel built by an American exposed the ore and operations were resumed. Calaverite, the telluride of gold, has been observed in these deposits.

Dredging never amounted to very much but promises better in the future. One dredge has just arrived at its proper working field after digging its way through pretty low grade or even barren ground. A New Zealand company imported a dredge and started it working on the Paracale river. In Neuva Ecija ditches and flumes have been constructed and everything is in readiness for active operations during the coming rainy season.

COPPER

Copper ores rank next to gold in importance on account of their wide distribution among the islands and the former output. However, production is stated to have been practically nothing since the American occupation. The chief reasons for this cessation of output are the absence of smelters on the islands and the difficulties which attend the transportation of ore from the mountainous districts, where it occurs, to the nearest shipping port.

The Mancayan copper mines are the most important and best known of the Philippine deposits and have now come under the control of a local syndicate of American and English capitalists. They have applied for a franchise to build a railroad from Mancayan to Bangar, a town on the western coast of Luzon.

SILVER AND LEAD

Native silver has been obtained from one of the Suyoc mines, near to where the telluride of gold was discovered. As an associate of gold it is found in many ores, but in most of them only in inappreciable quantities. With lead it has been determined in the galena of Marinduque and Cebu, running over 1 oz. per ton in the former, while in the latter the proportion is unknown, although it is reported high.

The lead deposits were not worked during 1906. Some newly discovered outcrops were visited by representatives of the Mining Division of the Bureau of Science, but the lack of development work made it impossible to predict their importance.

IRON ORE

In the Angat region an improvement in industrial conditions was brought about by the termination of the legal disputes which have hampered operators during the past four or five years. Increased economies and possibly increased output may result from this settlement. The new wagon road being built between San Miguel de Mayumo and Sibul may prove an impetus to the iron smelters of that district, as it will reduce the cost of transportation of their product from the mines to the railroad and heretofore one of their largest expenses.

Buffalo Mines, Ltd.

The first annual report of the Buffalo Mines, Ltd., operating in Cobalt, Ont., for the year ending May 1, 1907, shows a net profit of \$113,105 of which \$81,000 was paid in dividends. The ore shipments yield a gross value of \$213,984, which with income from other sources makes the gross income for the year, \$216,813. The ore shipped amounted to 792 tons containing 217,192 oz. silver and 12,251 lb. cobalt. Freight charges were \$10,656; sampling, \$991; and smelting charges, \$24,256. Mining expenses amounted to \$48,815; general expenses, \$17,687; and prospecting costs, \$1,302. These figures give only the ore sale proceeds received before May 1. The company had at that date considerable ore both in transit and at the mine, upon which all mining expenses had been paid, but from which no returns had been received. The capital stock of the company is \$1,000,000, of which \$900,000 has been issued.

Owing to the number of new veins discovered on the property it was determined early in January to double the power plant: 10 drills are now working. At the annual meeting in May the erection of a mill with a daily capacity of 50 tons was authorized for the treatment of ores of less than shipping value. Several thousand tons of low-grade ore are now on the dump awaiting completion of the mill

which is expected to be ready for operation in October.

At present all ore mined is raised to the top of the shaft house, and dumped over grizzly bars into small bins from which it is drawn upon picking tables, where it is washed with a jet of water and sorted into three grades, first-class ore, second-class ore, and mill ore. The mill ore is run to the dump for future handling; first-grade material is sacked separately and stored under lock and key; while second-class ore is sacked and made up into lots for shipment to the smelters.

The proposed treatment in the mill now under construction as outlined by the management is as follows: The ore is to be screened over grizzly bars, the fines to fall into bins for sampling, the oversize falling upon the floor before a crusher where the feeder will pick out the first-grade ore which is to be sacked without further handling. The second and mill grades are to be crushed and concentrated by means of jigs and tables, the tailings to be stored for further treatment.

Practically no stoping has been done since October, 1906, the ore obtained being all extracted in sinking and drifting. Large blocks are available for stoping, but no estimate of cubical contents and value is given because of the widely varying nature of the deposits.

A New Process of Welding

The combustion of oxygen and acetylene produces a higher temperature than that produced by the oxy-hydrogen blow-pipe. This fact has been taken advantage of by the Worcester Pressed Steel Company, Worcester, Mass., in welding pressed steel and other metals for automobiles and bicycle parts.

A chemical compound known as "epurite" is introduced into a generator and oxygen gas is evolved. Another generator furnishes acetylene gas and these are mixed in the blow-pipe in the proportion of 1.7 volumes of oxygen and 1 of acetylene. The acetylene is lighted first and the oxygen introduced later. A temperature of 6300 deg. F. is possible, which is about 1200 deg. higher than the oxy-hydrogen flame and nearly equal to the temperature of the electric arc.

The process is used instead of riveting or soldering and two pieces of metal may be joined by placing them edge to edge, and following along the seam with the blow-pipe. It is also claimed that aluminum may be readily welded, practically overcoming the usual trouble from the oxide which forms when treated by other methods.

For measuring apertures in fine screens a quick and accurate method is to project an image of the screen in question on the wall by a stereopticon.

The Emma Mine*

BY FREDERIC KEFFER†

Among the low-grade mines of the Boundary district the Emma is in a way unique in that the magnetite, which constitutes the main portion of the orebody, has persisted from the grass roots to at least the 250 level in a practically continuous vein or deposit; and also in that the vein stands vertically so far as explored.

In the other low-grade mines of the district magnetite is a frequent constituent of the ores, but its occurrence is most erratic, the deposits being irregular, varying

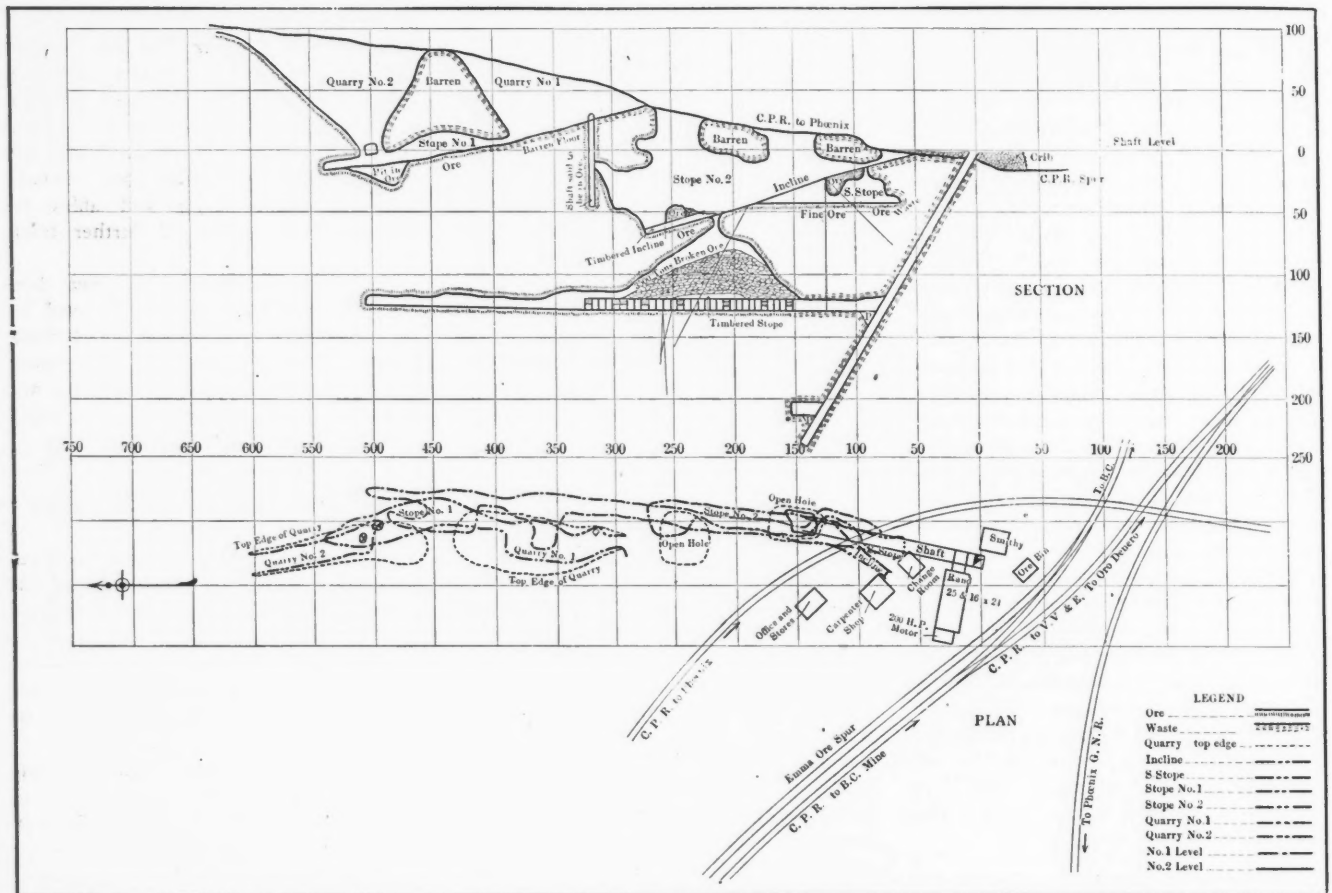
where a slip has thrown the ore about 25 ft. to the southeast) the magnetite continues unbroken to a point some 200 ft. below the surface, where diamond drilling has found what is seemingly another slip, throwing the ore again a short distance to the southeast. Diamond drilling on the 250 level has recently located the ore near the shaft.

The Emma ores are found along the contact of eruptive rocks and limestone, which limestone is here like an extensive island surrounded by eruptive flows. These latter rocks are of the general types characteristic of the Boundary district.

To the east of this island of limestone are several pyrrhotite deposits, the most prominent of which is that occurring on

by a slip, beyond which no further work has been done. But little pyrrhotite was found in this place. To the west of the limestone island occurs the main orebody of the Emma mine, which ore has been developed by quarries and drifts some 575 ft., shown in plan and section on the accompanying map.

Most of the ore next the east wall of the deposit (which here runs about 5 deg. east of north) is magnetite, but minor bands of garnetite also occur. Along the northwest wall, however, the magnetite for the most part is next a garnet zone, which (where crosscut by diamond drilling on the 150 level) passes into a bluish and very silicious rock beyond which the drill was not pushed.



PLAN AND SECTION OF EMMA MINE

in size from a few ounces to masses of thousands of tons, and frequently dipping (so far as any dip is observable) entirely at variance with the general dip of the ores with which they are associated. A characteristic case was that of a body of magnetite of exceptionally good value found on the 300 level of the Mother Lode mine, which lay perfectly flat, being about 20 by 100 ft. in area, but only 7 to 8 ft. thick, and which was incased in barren eruptive rocks.

EXTENT OF THE MAGNETITE

In the Emma (save in quarry No. 1,

*Abstract of paper read before the Canadian Mining Institute, Toronto, March, 1907.
†Manager British Columbia Copper Company, Greenwood, B. C.

the Mountain Rose mineral claim. This pyrrhotite is extensively mined for use as sulphur flux, it being sometimes essential in order to reduce the grade of copper matte, thereby avoiding unnecessary slag losses, which accompany matte running over 50 per cent. copper. This sulphur ore consists of pyrrhotite, together with varying proportions of lime, alumina and silica, but with little or often no magnetite, in striking contrast with the Emma ores, which contain little or no pyrrhotite

On the Emma, to the south of the limestone island, occurs a body of magnetite, which, where mined, was some 20 by 100 ft. in area. This ore was followed to a depth of about 25 ft., where it was cut off

In other places the magnetite stands directly against snowy white crystalline limestone, which latter rock, when near the ore, frequently carries masses of magnetite and chalcopyrite embedded within it, this mineralization extending sometimes several feet into the limestone in diminishing ratio. In other cases, however, the line between this limestone and the ore is clear cut. The garnet zone is about 20 to 25 ft. thick and in places carries sufficient copper to pay for mining.

More or less epidote also occurs along both walls of the ore. The magnetite frequently includes masses of crystalline lime spar, which are always accompanied by enrichments of copper. The garnet zone includes considerable magnetite scattered

through the rock in crystals and little patches.

On the surface, to the north of the workings, the magnetite gives place to garnet ore well mineralized with copper pyrites. Still farther north (about 1000 ft.) the garnet again crops for several hundred feet carrying good values in copper, but now dipping to the west about 70 degrees. The copper and gold contents of the ore show decided increase on the 150 level as compared with the ore mined in the quarries. So that this ore, which was at first mined solely as an iron flux, has, under the conditions obtaining in the Boundary, become intrinsically valuable as well.

The average thickness of the magnetite deposit in the upper workings is some 18 ft., but on the 150-ft. level the ore widens materially, being in places 40 ft. across exclusive of the garnet ore zone. A fair average thickness of the workable ores of the mine would be 25 ft.

It is evident from analyses made that the limestone and eruptives contain in sufficient measure all the constituents necessary for the formation of the garnet and magnetite zones. That these latter rocks were produced by the hot water gases and water carrying dissolved mineral derived from the eruptives, reaching upon the adjacent limestones through replacement and recombination, can hardly be doubted.

It is seen from the analyses of the ore that the sulphur present is very small, barely more than sufficient to form the copper pyrites present.

Iron sulphides are of rare occurrence, and it seems certain that the magnetite was deposited as such, and did not result from the alteration of sulphides. This view is borne out by the fact that as a rule magnetite crystals and not iron sulphides are found in the garnet zone, however far removed from the main body of magnetite. The crystalline limestone found next the magnetite in the mine is considerably purer than the main portion of the limestone formation.

MINING METHODS

Owing to the vertical position of the deposit, mining here is a much simpler problem than in most of the Boundary mines. The shaft is a two compartment incline, angle 60 deg. Across the drifts are placed heavy stulls supported by posts, the stulls and posts in the widest portions of the drift being often 30 in. in diameter. The stulls are placed 5 ft. apart, and are covered with 8- to 12-in. pole lagging. Chutes are provided at convenient intervals, they being at the opening 3½ to 4 ft. wide by 2 to 2½ ft. deep, so as to allow large rocks to pass. The ore is broken down on the timbers to the level above, only the swell being drawn from the chutes, which swell amounts to about 40 per cent. After the level above is reached the stopes can be drawn at will,

and, commencing at the point farthest from the shaft, the timbers can be removed if in condition to be used elsewhere. In commencing a slope it is, of course, necessary to first raise to the level above to secure ventilation. In portions of the work where bodies of crystalline limestone or poor garnet ore are found these are left as pillars to reduce the cost of timbering. The ore is so heavy, averaging from 8 to 8½ cu.ft. to the ton when in place, that timbering must be of the heaviest description to bear the weight above, which weight owing to the vertical walls rests almost entirely on the timbers. Power is supplied from the Bonnington Falls electric plant, some 85 miles distant, the machinery at the mine consisting of a 12-drill cross-compound Rand compressor driven by a 200-h.p. motor, together with a hoist now driven by compressed air, but which will shortly be replaced by an electric hoist. There is also a steam driven Ingersoll straight-line Class A compressor, capacity about 8 drills, which machine is held as a reserve. There have been shipped from this mine to date some 93,500 tons of ore.

Mineral Production of Tasmania

The progress of the mineral industry in Tasmania for the quarter ending Mar. 31, 1907 has just been reported by W. H. Twelvetrees, Government Geologist. The output of the principal ores and metals during this period was as follows; figures are in long tons unless otherwise noted:

Gold, oz. fine.....	16,101
Silver-lead ore.....	22,573
Blister copper.....	1,920
Copper ore.....	463
Tin ore.....	887
Iron ore.....	1,000
Coal.....	10,949
Tungsten ore.....	3

Of the gold won, 7302 oz. were from quartz, 4888 oz. from blister copper, and 1262 oz. from silver-lead bullion. The remainder came from alluvial, cyanide and chlorination works.

At the Anchor tin mine, floods carried away all the plant for working alluvial and buried all the ore ready for washing. Working was carried out only in the upper drifts and lower levels are not ready for operations.

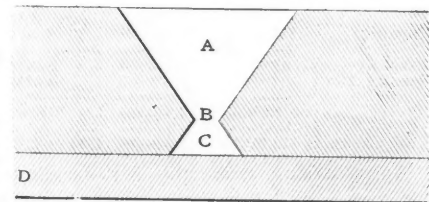
The total number of men employed in or about the mines during the quarter was 7379 and the dividends paid in this period by mining companies amounted to £101,659 in all.

The export of Danish cement is gradually increasing year by year. In 1905, 211,269 barrels were exported; in 1906, 227,229 barrels. Considerable quantities are now being shipped to the East, and as the mills already existing cannot satisfy the demand, the East Asiatic Company has erected a new manufactory in Jutland for exportation purposes.

Assayers' Pouring Molds

J. J. Bailey (*Mining Reporter*, May 23, 1907) has described a new form of pouring mold for assayers. The usual mold consists of conical or half-spherical compartments offering no assistance in the subsequent separation of the slag and metal. Often the separation is difficult, owing to the clinging of the slag to the metal. The new mold aims to assist this separation by retaining the major portion of the slag in one compartment, while the metal and a small portion of the slag pass to another.

The mold is in two parts, the base being a solid piece of metal having a plane surface uppermost, on which rests the other part of the mold. The upper part of the mold has a series of conical or half-spherical compartments on its upper side, each having an orifice at the bottom or lowermost point connecting it with a corresponding smaller compartment directly below on the lower side of the mold. The construction is shown in a partial cross-section of the mold.



POURING MOLD FOR ASSAYS

In operation the molten slag and metal are poured into the upper compartment *A*, the metallic portion settles to *C*, leaving most of the slag in *A*. When cool, a slight tap on the upper mold causes *C* to break off at *B* and drop out of its compartment.

The increased use of automatic or penny-in-the-slot machines has led to a considerable lock-up of bronze coinage in England, and the consequent necessity for issuing further supplies of coins. The mint authorities have collected some information on this extended use of bronze coinage. Out of 56 gas companies which were approached on the subject, all but one provided automatic gas meters operated by pence. Their collections were made, some quarterly and some monthly. In 10 instances the collection realized £5000 at a time, and in one case as much as £43,000 was collected in this way. It is estimated that among the 56 companies reporting there is an amount of bronze coinage aggregating in value £140,000 continually locked up. Inquiries from sweetmeat vendors and from municipalities and railways which use penny-in-the-slot lavatories showed that another £50,000 could be accounted for in the same way. By estimating the figures of companies, etc., which gave no information, the mint authorities believe these figures are low.

American Smelting and Refining Company

The report of this important company for the fiscal year ended April 30, 1907, contains few particulars of operation. The statement of metals produced, given in some former reports, is not included in this one.

The statement of assets and liabilities at the close of the year is as follows:

Assets:	
Property	\$86,845,671
Investments	3,810,595
Metal stocks	18,251,587
Material and Supplies	1,317,544
Cash and cash items	6,706,984
Total	\$116,932,381
Liabilities:	
Capital stock	\$100,000,000
Bonds	457,000
Net current liabilities	439,051
Unearned treatment charges	2,639,302
Surplus	13,397,028
Total	\$116,932,028

The item of investments does not include 177,510 shares of the common stock, American Smelters Securities Company, par value \$17,751,000.

A comparative statement of income account is as follows:

	1906.	1907.	Changes.
Earnings	\$11,665,885	\$13,250,058	I. \$1,584,173
Taxes & gen. ex. \$	675,945	763,854	I. \$ 87,909
Repairs, etc.	828,582	976,535	I. 147,953
Total	\$ 1,504,527	\$ 1,740,389	I. \$ 235,862
Net earnings	\$10,161,358	\$11,509,669	I. \$1,348,311

Apropriations from the net earnings for 1907 were: Employees' profit-sharing fund, \$540,420; new construction and improvements, \$1,054,996; dividends on preferred stock, \$3,500,000; dividends on common stock, \$3,500,000; total \$8,595,416, leaving a surplus of \$2,914,253. Adding the balance of \$10,482,775 brought forward from 1906, made a total surplus of \$13,397,028 at the close of the year, as shown in the balance sheet above.

The business of the company made uniform progress during the year, as in recent preceding years. The following table of net earnings since the organization of the company is of interest: 1900, \$1,979,908; 1901, \$3,828,441; 1902, \$4,861,619; 1903, \$7,576,786; 1904, \$7,905,573; 1905, \$8,898,811; 1906, \$10,161,358; 1907, \$11,509,669. The capital stock for the years 1900 and 1901 and four months of the fiscal year 1902 was \$65,000,000; for the balance of the fiscal year 1902 and the succeeding years the capital stock was \$100,000,000. The increase in net earnings in 1907 over 1906 was 11.7 per cent.; over 1905 it was 29.5 per cent.

President Daniel Guggenheim's report says: "Net earnings for the year under review amounted to \$1,348,311, in excess of the earnings of the preceding year. The expenditures on account of ordinary repairs, betterments, improvements and new construction have amounted to the sum of \$2,031,531, which has been entirely deducted from the profits of the year. The valuation of the property of the com-

pany, therefore, has remained unchanged, and its efficiency and physical condition remain entirely satisfactory. There has been added to the surplus of the company during the year \$2,914,253. The surplus of the company now amounts to a total of \$13,397,028. Notwithstanding the fact that the metal stocks of the company in process of smelting and refining were valued at the beginning of the fiscal year at figures which were eminently conservative, yet the directors have not deemed it advisable to increase these valuations although high prices have prevailed during the year.

"Preferred stock dividends Nos. 28 to 31 inclusive, and common stock dividends Nos. 11 to 14 inclusive, amounting to \$7,000,000, have been paid regularly each quarter.

"No material change has been made in the valuation of the investments of the company. A reduction in the total value has been due to the sale of a portion of the stock of the United Lead Company owned by this company and referred to in the last annual report. No valuation has been placed upon the common stock of the American Smelters Securities Company owned by the company, of a par value of \$17,751,000. The operations of the American Smelters Securities Company have been entirely satisfactory during the last fiscal year except that, due to inability of the company to obtain construction material, various plants of the company in process of construction were not completed. The earnings of the Securities company for the fiscal year ending May 31, 1907, left a surplus, after the payment of dividends on preferred stock, of \$532,660, and the surplus of the company to date amounts to \$1,016,744.

"In accordance with the statement made in the last annual report the profits of the Mining Department have been used during the past year to liquidate completely the entire cost of purchase and the continuing cost of development of the mines of the company. Due to the extraordinary shortage of cars in Mexico, however, the company has accumulated about 45,000 tons of ore at its mines, which it has not been able to ship nor secure financial returns therefor.

"The 6 per cent. bonds issued by the Omaha & Grant Smelting Company, maturing in 1912, have been reduced through the operations of the sinking fund by the sum of \$92,000 during the past year. This outstanding liability now amounts to \$457,000.

"From the amount of \$540,420, which has been charged to profit and loss for the benefit of the profit-sharing fund, there has been put aside and added to the fund established last year—which it is expected will be used at some later date as an insurance or pension fund for the benefit of laborers—the sum of \$113,784. This fund now amounts to \$176,239.

"In addition to the pecuniary acknowledgement provided by the board of directors in the establishment of the profit-sharing fund, the management desires to take this occasion to thank the very efficient technical and operating staff, together with all the employes of the company, for their faithful service during the year."

Copper in Sonora Quartz Veins

By F. J. H. MERRILL

As the development work continues on the copper deposits of Southern Arizona and Sonora, it appears to be the rule that the important orebodies are on or near lime-porphry contacts and are contained in porphyry or limestone. It has, therefore, been regarded obvious that other geological conditions are not favorable to copper deposition in this region and consequently, that quartz veins would be unlikely to yield copper in commercial quantities.

As a matter of fact few quartz veins are mineralized in Sonora, most of the ore deposits being impregnations of shattered rock. But, to the enterprise of a mining company of the middle West, operating in the Magdalena district, we owe some new facts in this field.

In the property of this company a quartz vein 2 to 3 ft. wide at the surface, has been explored by a shaft to a depth of 200 ft. with promising results. The surface showing was slight, faint green stains of diopside being the only promise of copper below. As the development proceeded, a sulphide zone was encountered and the vein proved to be heavily mineralized with copper glance, associated with grey copper and bornite. The latter gradually passed into chalcopyrite, with which were some pyrites containing a small percentage of copper.

Drifting along therein some 200 ft. this mineralization was found to persist. Further development is now in progress and the work will be watched with much interest, since, even if commercial conditions should interfere with the development of a successful copper mine on a vein of this size, it may still be possible to find copper ore in commercial quantities in some of the large Sonoran quartz veins, examples of which are known to exceed 20 ft. in width. A vein of this character some 30 ft. wide, with similar surface promise, is now under development by another company in the same vicinity, and will soon be cut by a tunnel.

The exclusive lime-porphry contact hypothesis finds here partial support in the fact that these quartz veins are in a mountain mass of limestone penetrated by andesite and granite. The andesite is cut by dacite dikes and some of these dikes are cut, in turn, by quartz veins.

A Bullion Track for Converters

BY CHARLES F. SHELBY

The accompanying drawing shows a pattern of rail which we use underneath our converters, and the method in which they are laid as a bullion track. Fig. 1 shows the rail itself in plan and section. These rails are of cast iron, in 5-ft lengths; they are laid in concrete under the converter, as shown in Fig. 2.

This feature of converting causes more or less trouble and annoyance throughout various sections of the country; but the scheme as outlined is eminently satisfac-

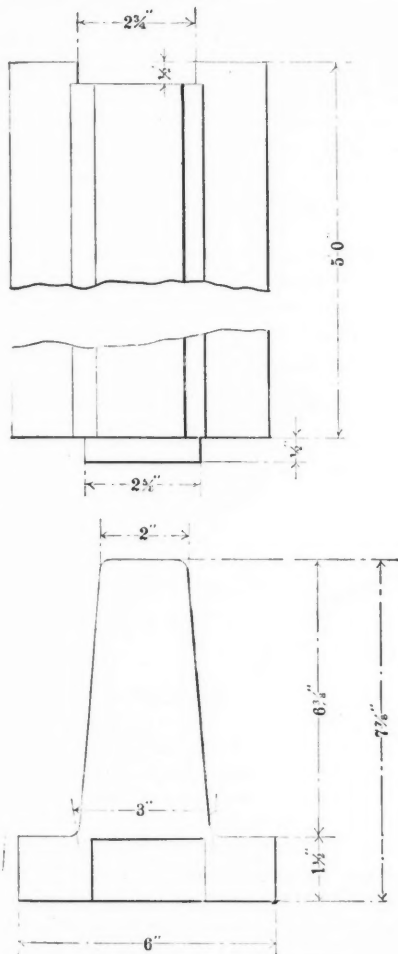


FIG. 1. RAIL FOR BULLION TRACK

tory and, after a period of six months' continuous usage under four of our six stands, we have encountered absolutely no trouble nor cause for one cent's worth of repairs.

In bituminous coalfields, where dusty mines are sprinkled with water and the pipe-line is liable to freeze during cold weather if laid in the down-cast, the line should be carried down the up-cast, if the latter is provided with a hoist and cage; otherwise it is not practical to install the line in the up-cast. When it is not advisable to use the up-cast for this purpose, it is well to insulate the pipe in the down-cast.

Acetylene Safety Lamps *

BY L. H. HODGSON.

After numerous experiments, extending over several years, a safe and efficient acetylene safety-lamp has been introduced. It will only be necessary to point out the slight differences of construction as regards the treatment of the calcium carbide in the benzine safety-lamp. The oil-vessel becomes the receptacle for the calcium carbide, and is filled two-thirds full, thus allowing one-third for the expansion of the carbide when saturated with water. The upper vessel or the water-container is fitted with a filling aperture, an internal friction-igniter operated from the out-

extra velocity, producing, when lighted, a slight puff, which is detrimental to the wire-gauzes. The attachment of the two vessels is very simple: two staples on the side of the water-vessel are brought under two projecting buttons fitted on the carbide-container, and the vessels are firmly connected by pressing down the shank. A gas-tight joint is made with the aid of an india-rubber ring, inserted in a groove running round the circumference of the water-vessel.

The lamp has a flame which is of 10 c.-p. The flame is capable of being reduced at will, and, with 1 per cent. of fire-damp, there is a clearly defined blue cap surrounded by a greenish-yellow halo; while, with 3 3/4 per cent. of fire-damp, there is a well defined cone, with a hem-

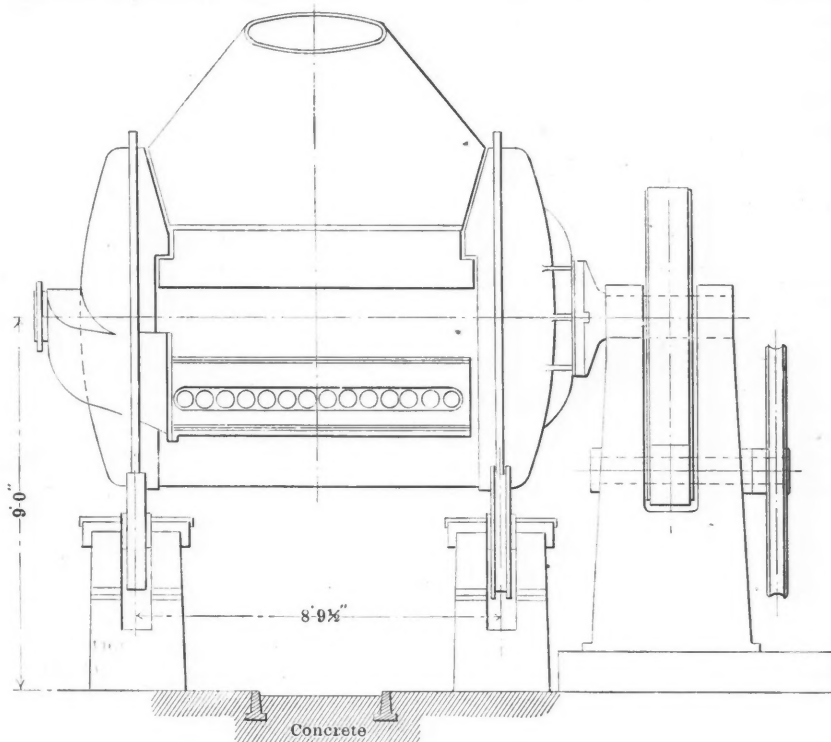


FIG. 2. CONVERTER, SHOWING BULLION TRACK

side, and a water-and-gas shut-off, which comes into action separately, that is, when the outside lever is turned 45 deg. from left to right, the water is shut off and no further generation of gas takes place, but the lamp continues to burn and the residue is consumed in a few minutes; but should the lamp need to be instantly extinguished, the lever is turned the full 90 deg., or as far as the lever will go. The gas thus inclosed gradually escapes through the by-pass. A safety-valve or by-pass is placed adjacent to the burner. Should the lamp be required immediately after it is extinguished, it is advisable to allow, say, five seconds to elapse before bringing the internal friction-igniter into operation, as the pent-up gas issues with

spherical base, of a clear, luminous, greenish-yellow tint.

The period of burning varies from 6 to 12 hours, according to the size of the lamp. The carbide-chamber, for 6 hours' burning, when three-quarters full, contains 4 oz. Carbide may be purchased in quantities at 6c. per lb., and consequently the cost will be 0.25c. per hour, per 10 c.-p. or 7.5c. for 5 shifts of 6 hours.

The large acetylene safety-lamp, of 60 c.-p., is fitted with a water shut-off, which considerably assists in the economical burning of the lamp, as hitherto, it has been necessary to regulate the charge of calcium carbide to the time that the lamp is required to burn. The carbide-chamber, for 20 hours' burning, is filled with 3 1/4 lb. The cost of burning is slightly less than 1c., or 0.016c. per c.-p. per hour.

*From the *Transactions of the Mining Institute of Scotland*, Vol. XXIX, Part 2.

The So Called New Supplies of Anthracite

Recent Discoveries Do Not Upset Established Geology, and Do Not Point to the Existence of Coal Beds in Unexpected Places

BY HARRY W. ALTHOUSE*

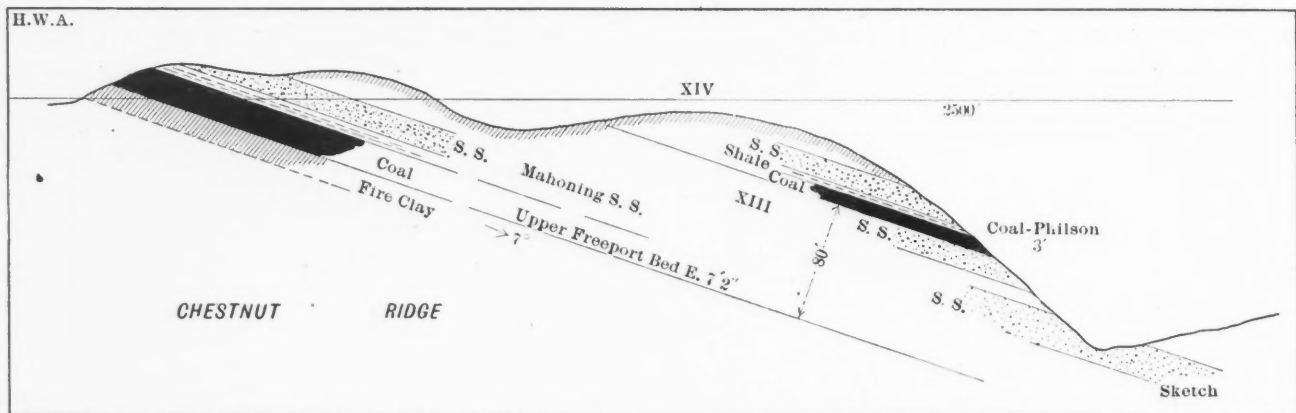
Every now and then we hear of supposedly new finds of coal in the anthracite fields of Pennsylvania. The coal veins just opened in the Black Creek district of the Lehigh anthracite region do not furnish any proof that the geology of the anthracite coalfields is at fault. The Pennsylvania Second Geological Survey, in certain localities, dwelt upon the existence of coal beds below the green sandstone and the red shale of the Mauch Chunk formation. The excellence of this work has not been surpassed anywhere, and today, although 20 years have elapsed, it remains an undisputed authority on account of its integrity and completeness. As an instance of the esteem held for this work by some of the most eminent authorities in geology, I quote one, an extract from a letter of Charles D. Walcott, lately director of

the anthracite regions of Pennsylvania, that of the bituminous regions, or that the true coal measures are not underlaid by the green sandstone and red shale, known as part of No. XII, and No. XI respectively.

No mining engineer, geologist nor mining geologist will ever endanger his reputation by adhering to the stratigraphic succession of the Pennsylvania coal formation as worked out by such authorities as Rogers, Lesly, Platt, Ashburner, d'Inwilliers and others. It is now too well defined to be mistaken, and notwithstanding the theories put forth, not too infrequently by diamond drillers and others, the geologic formation of the field remains the same, and no newer coalbeds have been disclosed, or other beds discovered where the horizon was not pres-

ent in the Ursina basin, south of Jennertown, reported finds of the Pittsburg bed were said to have been made. This was nothing more than preposterous, and merely to satisfy the landowners an extensive examination was made to disprove the possible existence of this bed of coal, the horizon of which was not less than 610 ft. geologically higher than the uppermost bed of workable coal as known to exist within this particular locality.

In prosecuting these investigations other scattered tracts controlled by the interested parties would have to be gone over. The examination was continued over and along the Laurel Hill ridge into Westmoreland county and the Ligonier basin. The Pottsville conglomerate measures No. XII were observed, as well as a portion of the Mauch Chunk red shale No.



GEOLOGICAL SECTION, CHESTNUT RIDGE

the United States Geological Survey: "The Survey is not at present undertaking any new work in the anthracite field. The very detailed work already done in the field will require that any additional work done must be of a very high order, and consequently of considerable expense."

THE POTTSVILLE CONGLOMERATE SERIES, No. XII

Such statements as new supplies of coal in the anthracite regions of Pennsylvania are somewhat misleading, and usually are responsible for the expenditure of large sums of money for diamond drilling and prospecting in a fruitless search for commercial coal areas, and generally where the integrity and continuity of the coal-bearing formation is known to be doubtful. Neither do such statements disprove the well-established geology of

*Mining engineer and geologist, Pottsville, Pennsylvania.

ent to make their existence possible. In other words, the commercial coalfields of established integrity are found above formation No. XI, that is, overlying the Mauch Chunk red shale. But I have seen and casually examined small seams and lenses of coal within the red-shale formation, and below it at several localities in Pennsylvania and West Virginia.

SOME DETACHED COAL DEPOSITS

Five or six years ago, while going over some coal territory in the Berlin basin, south of Scalp Level, and beyond the Buckstown pike in Somerset county, Pennsylvania, my attention was called to a rumor as to the existence of an important find of coal, considerably to the eastward, which after investigating proved to be one of the unimportant coal seams, 1 ft. 2 in. in thickness, with 8 ft. of shale forming the roof, whereas the bed had been reported 8 ft. in thickness of coal. At another time in the same county, but

XI. This investigation was continued farther, across the Ligonier valley, up and over Chestnut ridge into the Connellsville coking coalfield. Yet in all this territory, across the measures of the several coal series, the limits of the productive formation had been well determined by the Pennsylvania Second Geological Survey, the same as with respect to the anthracite coal region.

It was, however, while engaged with some of the above work that I was making an examination in the Wilmore basin of Somerset county, Pennsylvania, lying between the Berlin and Ursina basins. Here the surface indications showed unmistakable evidences of the Conemaugh limits of a portion of the immediate terraces above the Allegheny series. The Black Fossiliferous limestone, Crinoidal and others were plainly observed within the formation below the Monongahela, and tory. The nearest coal was the Upper Freeport, bed E, about 4 ft. 3 in. in thick-

ness, and mined for country trade. The bed was locally reported to be the Miller, bed B, or the Lower Kittanning, notwithstanding that the Mahoning sandstone was observed above it. After a thorough investigation of the field, embodying a topographical map, it was found that the entire territory was underlain with the Allegheny formation No. XIII. About this time, a man named Zaner claimed to know of an old drift, then fallen shut, wherein existed 7 ft. of good coal. This drift had already been indicated on the map in reference as barren of coal, consequently little attention was paid to it. This man, so I was informed on fairly good authority, was willing to make affidavit; therefore I was finally persuaded upon to give the matter further consideration. It cost \$67 in actual expense to sink a small test shaft 5 ft. below the level of the drift. We found 8 in. of coal.

Now as the above coal tract was of considerable strategic importance, and in order to settle various differences existing

mond bit was worn down and required re-setting, so that after a month's delay drilling was resumed; but it had been a very hard matter to explain the geological situation to the landowners, as each shared the total expense incurred in proportion to the acreage of each of the many tracts comprising the whole property. The owner of the farm upon which the drilling was being prosecuted claimed that the land appeared as though it had been condemned. However, the Mahoning sandstone was finally entered, after which the drill cut six beds of coal, three Freeports, and the same number of Kittanings, out of which three proved commercially workable.

THE HONEY BROOK DISCOVERIES

The recent disclosures of new seams of coal as having been discovered in the Honey Brook district of the Eastern Middle anthracite coalfield are undoubtedly within the known coal measure. If they exist below the Mauch Chunk red shale,

had previously been found, the old prospects of which had been opened. This bed was found to incline vertically and measured 8 ft. in thickness. It lies considerably to the south of the mountain crest, 760 ft. below the Buck Mountain bed. Of course, no such an interval of 1400 ft. for the Pottsville No. XII can begin to exist in the Black Creek district of the Lehigh region.

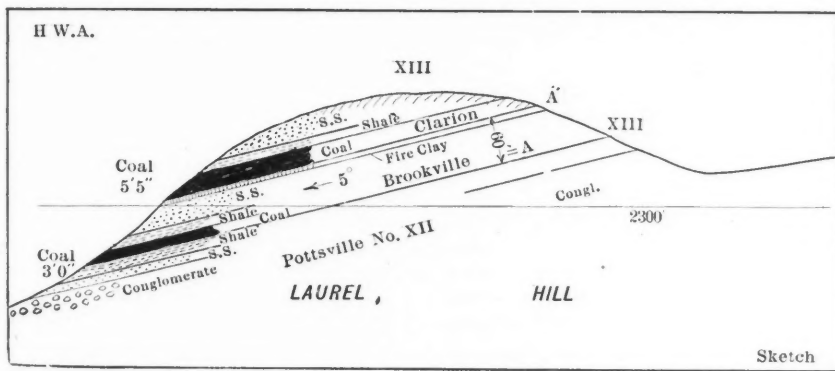
Coal-beds are known to exist in McCauley's mountain. That the measures of the Nescopeck mountain are below the coal formation is undoubtedly true, and where any coal-beds in the Black Creek district come in below the No. XI of the Mauch Chunk red shale and the Pottsville conglomerate measures No. XII—both of which have thinned considerably in that direction—then they are of Pocono age.

AN ILLUSTRATION FROM ALABAMA

Some time ago I undertook the examination of a coalfield in Alabama, considerably northward from the Birmingham district. It appeared that a well-driller who had been in the Pennsylvania coal region was doing some drilling for water in the northern part of the State. This was along the low lands of the Paint Rock river valley and some of its branches, the object of the examination being particularly with reference to establishing the integrity of a large seam of coal which had been reported to have been penetrated in one of the water wells. All of the well waters were strongly impregnated with mineral, and in most wells, below a certain depth, a black substance was claimed to be present. From this it was argued that the entire country was underlain with this large body of coal. The Cumberland Plateau region was everywhere visible in the higher altitudes, 650 ft. above the bottom lands of the valley. Later, an investigation showed several seams of coal in the plateau region below the cliff rocks, ranging to 4 ft. 2 in. in thickness. It was then demanded that the 11-ft. bed of coal be found. The base of the valley land was occupied by a heavy bed of limestone, persistent and regular, but on account of the talus the thickness could not be accurately determined. The 11-ft. coal-bed proved to be a myth. The black substance, composed of clay, sand and pebbles from several water wells was found to have been stained and coated black from long standing by the mineral in the water.

THE MAUCH CHUNK RED SHALE

With respect to the Mauch Chunk red shale No. XI, it is needless to discuss the established rules of geology as being fundamental or specific in what lies above or below. This has been well authenticated long ago by competent authorities as to what constitutes the coal-bearing formation. In the Pennsylvania anthracite field No. XII and the formation above it corresponds exactly to the bitum-



GEOLOGICAL SECTIONS, LAUREL HILL

among the landowners as to the value of the property, it was considered necessary to do some drilling by putting down a hole in the center of the tract, not to exceed 500 ft. in depth, the estimated distance to bed B, the Lower Kittanning coal. On account of the scarcity of drilling outfits, one had to be secured from the Lackawanna anthracite coalfield. The drill runner in charge had never been in the bituminous regions; the drill core, however, was found to be 2 1/4 in. diam., just right for these measures. Drilling commenced and after some days the drill cut what the driller pronounced to be the green sandstone of the anthracite region. This after having cut several beds of highly carbonaceous shale, the man became tired of his work, owing to a caving hole, and reported that there was no reason for further drilling below the Pottsville conglomerate measures into the red shale, which he said would surely show up. Late the next day the variegated red shales of the Conemaugh measures were cut, the overflow of water from the pump showing a heavy reddish color. This seemed to settle the matter with the driller as to no coal below this point. The machine got clogged and broke, the dia-

they must belong to No. X formation, in which the Pennsylvania Second Geological Survey had reported the existence of coal in other localities. Otherwise, if not in the true No. XI, then it must be No. XII, of which formation the Survey knew fully the existence and thickness within the territory in question. Therefore, it is not surprising, or in any way remarkable, that workable coal beds should be found in the Lehigh region below the Wharton and Buck Mountain coal-beds. The formation of No. XII, the Pottsville conglomerate series, is considerably thinner in this field than in the Southern coalfield of the Schuylkill region, where along Sharp mountain it exceeds 1450 ft. in thickness, and contains six coal horizons.

Between Pottsville and Tamaqua, in Sharp Mountain, the Pottsville-Lykens measures were for some time supposed to be devoid of workable coals, although the intervals and various coal horizons were well determined by the State Survey. Recently, between the two named places, it has been my pleasure, while making some geological examinations for coal along the Sharp mountain, to rediscover an old shaft, which indicated the Lykens No. 4 bed, as several of the overlying beds

inous measures of the Pennsylvanian series. Every geologist knows that nature is perfect in her unbuilding and destruction. The synclinal and anticlinal axes can be readily accounted for, as also can the formation of the great coal measures, and their destruction at places. If we investigate, we can reason why the

these features and conditions were governed by the well regulated conditions which existed during the deposition of the coal-beds.

THE ORIGINAL LEHIGH COAL MEASURES

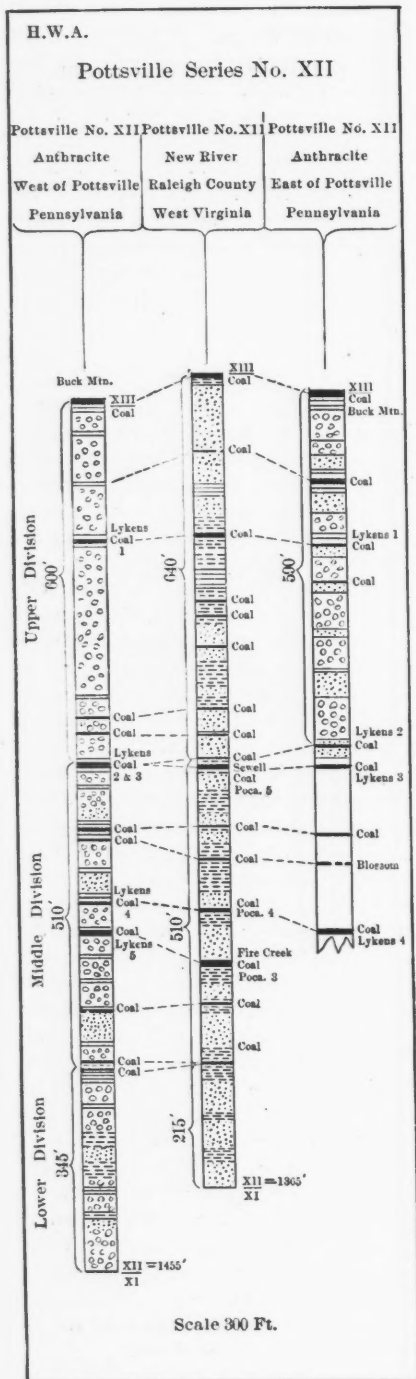
It is misleading to dwell at any length upon the hypothesis whether the original coal measures have been touched in the Lehigh district. The limitations of the field are too well known for further discussion along that line. Professor Lesly claimed that the entire State of Pennsylvania was at one time covered by coal measures, and this is accepted as true. As to whether the original content of this area comprised 17,000 square miles of anthracite measures is a matter that would be extremely difficult of explanation. The combined area of the anthracite field is only about 480 square miles, so that whatever now remains of the original contents of this formation was finally preserved from total destruction by the agencies which were prevented from further exerting their maximum erosive influences. All the causes combined removed the portions now known once to have existed. It is therefore easy for anyone to understand, without getting too busy to see why certain coal areas were preserved from total destruction in their present position and shape.

Briefly, in all of the anthracite areas, the perimeters are entirely surrounded by a persistent stratum of Pottsville conglomerate No. XII, below which no coal-beds of commercial importance are known to exist. These great and conspicuous strata completely encircle every basin of anthracite coal, and may be traced for dozens of miles.

FORMATION OF THE COAL MEASURES

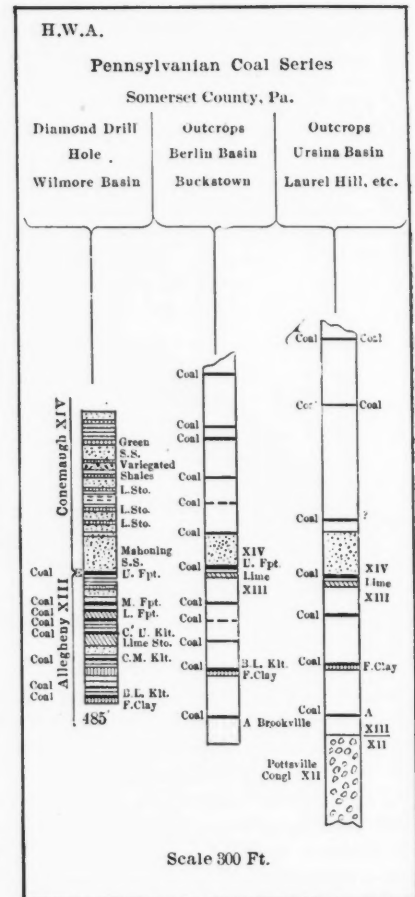
All of the Appalachian coal measures were undoubtedly formed upon the bed of the ocean. There is not anything tangible to support the swamp theory and tilting process of the earth's crust in the formation of the coal-beds. The deposit went forward with as much precision and regularity as the present tides and waves along both the Atlantic and Pacific coasts, during the deposition of the countless numbers of varying minute organisms, the combined products of which resulted in a layer on the successive floors of the ocean, which afterward became our present coal-beds. During the process of growth of these minute and microscopic vegetable organisms in the water, and their subsequent deposition upon the Appalachian ocean floor, the erosive agencies on the earth's surface were sufficiently arrested by seasonable or climatic changes during the formation of each bed and seam of coal. Therefore, none of the coal measures intact then, while forming future coal-beds, was subjected to erosive agencies, other than by currents within the ocean, which had little effect upon such beds as protoplasm.

As to the missing parts of the anthracite formation, the erosion of which did not occur until long after the deposition of the coal measures, how then can they be found to underlie the strata of older formations? After 20 years' service in almost every part of nearly all the important coalfields of the United States and New Mexico, I have not observed or heard of a single instance wherein coal-beds in the various basins, or in the anthracite fields, finally turn over and disappear under the Mauch Chunk red shale or the Pocono sandstone in the latter fields. They will, however, in places in the Pennsylvania anthracite fields be found to disappear within their own geo-



Buck Mountain bed, for example, has a conglomerate top at one place, at another a sandstone top, and again a slate top. Also why the coal-bed thickens and thins out, why it splits into two or more distinct and separate beds, or why one coal-bed is clean, another streaked with refuse, bone, shale, slate and sandstone. All

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logical horizon only, not under or above it, unless inverted within their particular sphere of influence. This is true of the entire Appalachian coalfield of which the anthracite field of Pennsylvania forms a very small portion, and which undoubtedly formed a part of the same deposition as that of the coalfields of Indiana, Illinois, Iowa, and the Indian Territory, lying within the Pennsylvania series. The Pocono coals No. X, and those of earlier age, or later formation, such as the Tertiary and Cretaceous, are out of the question.

THE SO-CALLED NEW SUPPLIES

The so-called new supplies of anthracite coal undoubtedly correspond with the

horizon of the Pottsville No. XII formation. The Pottsville-Lykens series No. XII is identical with the Pocahontas-New River series of Virginia and West Virginia. It also agrees with the inter-conglomerate series of the bituminous regions of Pennsylvania, the Sharon and Mercer coals, and certain workable seams in the State of Ohio. Recently, in looking over the West Virginia coal exhibit at the Jamestown Exposition I noticed in the coal monument, below the Kanawha formation No. XIII, the Pennsylvania-Allegheny formation, that the Pottsville No. XII series included the following beds of coal: The Sewell, Welch, Beckley, Firecreek, Pocahontas No. 4, and Pocahontas No. 3, thus making the seams of the Pocahontas field separate and distinct from the Sewell and Fire Creek beds of the New River formation, when in reality they appear to be of the same geological horizon. The Sewell or Pocahontas No. 5 bed of the New River series corresponds to the No. 5 of the Pocahontas region, and the Fire Creek seam unquestionably agrees with the No. 3 or Pocahontas bed of coal. The Pottsville-Lykens formation No. XII corresponds identically with the Pocahontas-New River districts of Virginia and West Virginia. There is no question about this. The horizon of the top of this comes in below the Wharton and Buck Mountain beds of the anthracite fields. The Pocahontas No. 5 or Sewell seam agrees with the Lykens-Pottsville coal-beds Nos. 2 and 3, and the Pocahontas No. 3, or Fire creek of the New River, with the Pottsville-Lykens No. 5 coal-bed.

As for new supplies of anthracite coal existing below the known horizon of the several coal formations, it is impossible to conceive that the geological theory of the stratigraphic succession can or ever will be set aside with regard to the Pennsylvania Coal Series.

An efficient horizontal centrifugal pump, according to one eminent engineer, should have a suction inlet on each side of the pump case, so that an equal amount of water enters on each side of the piston, thus perfectly balancing the same and preventing all end thrust of shaft. The pump should be made strong and heavy if it is to be used where the lift is high or the suction long, and it should be capable of passing muddy or gritty water without injury to its parts. The pump shell should be swiveled on to a hooded frame, so as to bring the suction and discharge in a position suitable for the work. Shaft bearings each side of the pump should be so arranged that they can be removed without disturbing the pump or pipe connections. Pumps built with an electric motor directly connected take up little space, and are always ready for use. The motor and pump should have the same speed, but in case of the motor having a higher speed, the pump can be geared.

Tunnel Driving

By M. S. HACHITA

Developing mines by tunnel is more common in the anthracite field than in the bituminous region, the reason being that the measures now being mined are highly inclined and deep, and to open such deep seams from the surface would be too expensive when compared with the cost of driving a tunnel.

Underground tunnels are common throughout the anthracite region, especially in the Panther creek and Lehigh districts. When new workings are opened up on a measure by means of a tunnel from a well developed vein, the workings can be developed to a limited area with one opening, but the law requires a second opening to secure proper ventilation of the workings, and the second opening can be used as an exit for the miners in case of a fire or a cave. Where the measure lies at a shallow depth under the surface, the second opening may be obtained by driving an airway up to the outcrop, which may, in some cases, be used as a manway. But when the measure lies deep under the surface a second tunnel is necessary. Such a tunnel should be driven at some distance from the first; the law requires a minimum distance of 60 ft.

In driving a main tunnel, the usual practice is to carry on one side of the tunnel, an airway which is constructed by a brattice carried on a row of props. The usual width of such a tunnel is 12 ft. and the height 7 ft. above the rail, so that the mules can stand in the tunnel without touching the roof. The air-course in the tunnel is usually but temporary in character, to secure ventilation until a second opening is made. Posts and brattices are removed after the new workings are fully developed. In case a double track is required, the tunnel may be driven 14 to 16 ft. wide; much depends, however, on the gage and the size of the cars. For a 3-ft. gage, the width should be 14 ft. with a 7-ft. center for the tracks. A ditch 1½ ft. wide at the top, 1 ft. wide at the bottom and from 12 to 18 in. deep should be provided on one side of the tunnel to drain the water. To insure perfect drainage, the tunnel should have at least 1 per cent. grade in favor of the load. If the grade is less than 1 per cent. the road is apt to become sluggish and water will find its way to the base of the rail, and as it contains sulphuric acid, this chemical will corrode the iron and the rails will soon have to be replaced with new ones.

DEVELOPING A GASEOUS SEAM

In case the vein to be developed is of a gaseous nature it is advisable to make the width and height a little larger to insure ample space for ventilation. It should be remembered that when cars are left on the tracks, the sectional area of the tunnel

will be decreased 20 to 35 per cent., and if such obstacles are placed in the airway any length of time, a serious disaster may result.

COST OF DRIVING

Tunnels of much smaller size are used in mines where the workings are small and free from gas, or where the ventilation is effected by other methods. Under such local conditions the tunnels now in use are from 6 to 8 ft. wide and 7 ft. high. The cost of driving a tunnel depends upon the size and length and upon local conditions. For a medium-sized tunnel through carboniferous sandstone the cost will be from \$3 to \$5 per cu.yd. solid, but in moderately soft rock such as slate and shale the above cost may be reduced from 10 to 25 per cent.

The power used for work of this class is compressed air. The advantages of this power are obvious; in case the tunnel to be driven is outside, the ventilation of the workings may be affected by the exhaust air from the drills. In mines where the workings are free from gas, airways in the tunnels are sometimes omitted and this method of ventilation substituted. In an ordinary tunnel 8x12 ft., two drills can be worked and the average progress of such drills driven through ordinary sandstone is from 15 to 25 yd., per month of 3 shifts per day.

METHOD OF BLASTING

In blasting rock, dynamite is generally used and is fired by electricity. In comparatively hard rock at least four holes on the bottom and three to blow down the top are required for a tunnel of 7x8 ft., but nine to twelve holes are necessary for an 8x12-ft. tunnel. When the tunnel rock dips toward the mouth of the tunnel, the top holes should be fired first and the bottom blasted afterward. The reverse should be the firing order when the rock dips away from the mouth. When the stratification of the rock is nearly vertical, a central group of converging holes should be fired first. In some cases the cleavage may exercise a greater influence than the dip; in such cases the position of the holes and the firing order should be determined without regard to the position of the dip.

There are comparatively few tunnels in the anthracite field that require timbering, as the majority have good sandstone roofs. But when tunnels are driven from the surface to the coal measures, they are generally timbered for a short distance from the mouth to keep the loose rock up, while retaining walls are also built at the mouth to keep the wash from coming down.

Tunnel timbering is similar to gangway timbering. It consists of a bottom sill, two legs and a collar, which are usually square. They are set from two to four feet apart and sheathed with a heavy plank and usually reinforced by fore-poling under the loose materials.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

The guides in a shaft may be bolted to the buntons by bolts with countersunk heads; but a better practice is to let them into gains cut on the buntons, for by this method heavier guides may be used and the bolts are subjected to less strain.

The stuffing boxes used in hoisting engines should be of the gland and screw-cap types as they make it impossible to cramp the gland in any way and so cut or bind the piston rods. Experience has shown that this type of stuffing box is also economical in the use of packing and is easily accessible.

The experience of diamond drillers shows that about 90 per cent. of the breakage of core-drill rods occurs at the joint. This is due to the fact that the diameter of the rod is reduced at this point to make a flush threaded connection. But if the ends of the rods are upset and of a uniform diameter throughout, the breakage of rods is practically unknown.

In mining bituminous coal the undercutting should be from 2½ to 5 ft., and when made with a miner's pick, it should be from 6 to 12 in. high at the face and about 1 in. wide, which is the breadth of the cutting point of the miner's pick, at the other end. In making a cut the miner should lie in a half recumbent attitude or flat on his side with his head close to the floor to enable him to see into the cut.

When the mouth of the slope is located at a considerable elevation above the nearest water-course, a gangway is usually opened out as soon as the slope has reached a depth corresponding to the lowest point on the outcrop of the seam and driven through to daylight, thus forming an open water-level drift. In making such connections, the common practice is to start the gangway from the surface as well as from the foot of the slope.

A dead hole is one which is drilled at right angles to the face of the working and has no undercut or mining to assist in the breaking of the coal. The charge in this hole is given no opportunity to blast out the coal, except as it may break off a small portion at the mouth of the hole. When such a hole is fired, the explosive force developed will sometimes blow out the tamping and produce what is called a blown-out shot. The effect is the same as if the shot was fired from a gun.

The quantity of water required by a diamond drill depends on the character of the rock and the condition of the bore. In case the hole does not leak, all the water forced into it returns to the surface

and may be used over again. In such cases from 250 to 350 gal. of water per 10-hour shift is sufficient. But if the hole leaks, 500 to 1000 gal. per 10-hour shift is necessary; all depends on the speed of the drill and the size of the hole. The larger the diameter of the hole the greater the quantity of feed water required.

Seams of coal dipping with the slope of the ground can generally be reached by tunnels of moderate length, but when the dip is away from the hill the length will be much greater, and unless several seams are to be developed it has seldom been found best to open in this way. Tunnel collieries can be more cheaply operated than either shaft or slope openings, as neither hoisting or pumping machinery is needed. But it must be remembered that when the coal above the water level is exhausted the tunnel becomes almost worthless, which is a serious offset to the advantages.

The principal economies resulting from the use of electricity are (1) reduced stand-by charges; (2) small loss in transmission; (3) high efficiency of the electric motor; (4) lower capital cost of producing and transmitting energy. The saving is especially noticeable where the workings are spread over a large area, as the whole of the steam plant can be concentrated at one point. The cost of electric power varies over wide limits and depends upon (1) the size of the undertaking; (2) capital outlay (influenced by locality); (3) cost of fuel and circulating water (if water power is not available); (4) load factor. Where electric driving has been adopted on an extensive scale, the load factor at the power-house is between 30 and 40 per cent.

An important matter to be considered in connection with air compressors is that of varying the power exerted in accordance with the demands for air, so as to maintain the air pressure as constant as possible. When the compressor is steam driven the speed of the machine can be varied automatically by a valve operated by slight variations in the air pressure, but when the compressor is driven at a constant speed other means are necessary. If the machine is belt-driven an automatic appliance should be fitted, operated by fluctuations in pressure to move the belt from a fast to a loose pulley. When electrically driven, the machine can be fitted with an automatic switch to stop and start it in accordance with the changes in pressure due to variation of demand.

If air is compressed in a single stroke from atmospheric pressure and a temperature of 60 deg. F. to a final pressure of 100 lb., the maximum temperature of 484 deg. F. may be developed. This temperature is unquestionably destructive to ordinary lubricants and oils of common quality are distilled into a solid, gritty, coke-like or gummy substance which creates friction in the moving parts of the machinery unless proper jacketing devices are employed to keep the parts cooled. The collection of such deposits in ports and valves may so obstruct and clog them as to cause leakage and throw an additional load on the compressor. If on the other hand, the same volume of air is compressed in the first cylinder to a pressure of say 25 lb., the maximum temperature that can be attained is only 233 deg. F., which temperature will not deposit or destroy the lubricating oils of good quality. This air, after passing through the intercooler, is brought back to the original temperature of 60 deg. F. and compressed in a two-stage compressor from 25 lb. to 100 lb. in the second cylinder; the highest temperature, attained in the second cylinder is about the same as that attained in the first cylinder.

All breathing apparatus for use in mines must be air tight as far as the passage of air from the outside to the inside is concerned. Such apparatus should be fitted out with emphatic, mechanical, warning instruments that will warn the wearer of the failure of oxygen before the percentage has fallen to a dangerous limit. This result is best obtained by arranging and working the apparatus so that it becomes filled with a mixture containing 60 to 70 per cent. of oxygen. Before the oxygen percentage has been reduced to the limit of safety the apparatus will then become so empty and respiration so impeded or impossible that the attention of the wearer cannot fail to be attracted mechanically. Any apparatus which permits the possibility of the user being unknowingly led into breathing a mixture containing less than 12 per cent. of oxygen must be looked upon as extremely dangerous. All breathing apparatus should also have attached a moderately distended bag to act as reservoir and as a buffer or cushion for the ebb and flow of inspiration and expiration. Such a bag must be so large that the deepest inspiration or expiration may be contained in it quite easily. The dead space in a respiration apparatus should not exceed 200 or 250 cubic centimeters.

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*Illustrated.

The Market for Lead

The reduction of 0.5c. per lb. in the price of lead last Saturday, following a reduction of the same amount about 10 weeks ago, evidences the wisdom of the American Smelting and Refining Company in not attempting to override the law of supply and demand, although its latest action was rather tardy. Even at 4.75c., New York, the price for the metal is high enough to yield a fair profit to the producers, notwithstanding that the cost of production has risen largely during the last six or seven years, perhaps more than in the case of any other of the principal metals, at least in one important district. Six or seven years ago pig lead could be produced in Southeastern Missouri on the basis of 2.25c. per lb., delivered at St. Louis. Since then the cost has increased immensely through large advances in the wages for labor and decrease in the efficiency of the men, but these and the other factors have hardly doubled the price. In the Cœur d'Alene the increase in the cost of production has been by no means so serious. Of course it is well known that these two districts furnish upward of 50 per cent. of the total domestic production and are the dominating agents in the market.

While there are no statistics of production available for the current year, it is to be supposed that the Cœur d'Alene, Southwestern Missouri and the other districts have been making their normal increase, there having been no set-backs in any of them, while on the other hand it is quite certain that consumption has not kept pace with production, as there have been considerable accumulations of unsold lead in almost all quarters. We understand that the market for white lead has suffered no diminution in activity, wherefore the falling off must have been in the demand for sheet lead, pipe, etc., which are used largely in the building and electrical trades. The reduction in price at the end of June failed to stimulate demand to any considerable extent, and since then outside refiners have been freely offering the metal at cut prices, without bringing about any large business. The larger part of the lead produced in the United States is still sold by contract at the settling price established by the American Smelting and Refining Company, but within the last two months several contracts expired and were not

renewed, and outside dealers, who conformed to the trust schedule when the market was strong and rising, have pursued a different policy since it turned the other way. Of course this has been instrumental in causing the recent reduction in price, but it is to be remarked that since the experience of the trust with a large accumulation of lead on its hands in 1901 it has uniformly pursued a wise policy in bowing to unfavorable conditions, and on the other hand has not exacted the last pound of flesh when it might have done so.

In the lead market the American Smelting and Refining Company has, during the last two or three years, acquired an important interest as a producer, through its subsidiary companies—the Federal Lead Company, the Federal Mining and Smelting Company, the Western Mining Company, etc.—but its larger interest is simply as a middleman, buying from the producers and selling to the manufacturers. We think there is no question that the practical control of the industry by the American Smelting and Refining Company has kept the price of lead during the last six or seven years above what otherwise it would probably have been, which has been to the advantage of the producers and through them to the miners who work for wages. On the other hand the manufacturers do not care very much; they would as lief see the price high as low; indeed, in some lines they prefer it to be high. The persons who are affected adversely are the ultimate consumers, the intangible fellows who can make their views evident only by ceasing to buy. It remains now to be seen whether the new price for lead will interest them.

There have been rumors of a plan to induce the outside producers of the Cœur d'Alene to agree to a limitation of production, which might not be difficult to consummate, inasmuch as there are only three of much importance, viz., the Bunker Hill & Sullivan, the Hecla, and the Hercules. If such a move has really been considered, the recent reduction in price must be interpreted as meaning that no agreement could be reached on the old price basis; possibly this explains the tardiness of the trust in making its latest reduction. However, there have been in the past such agreements with the Cœur d'Alene producers and there may be again.

We referred above to the continued good business on the part of the corrodors, who have not yet been compelled to reduce the price for white lead. However, this is a trade in which fluctuations in the price for the material play a smaller part than in many others. The larger part of the expense in painting is the labor. The job of painting a house may require 1000 lb. of white lead and the difference of 1c. per lb. will amount to only \$10, which would hardly deter a house owner if the painting were necessary, which periodically is the case. An interesting feature in the white-lead business is the plan of certain large interests, which of course will be followed by all, of selling after this year on the basis of net weight. This will necessitate a higher quotation for white lead in order to cover the cost of the package and will be a reason why the price for that substance will not go down in proportion with the price of pig lead.

The Mill Situation at Cripple Creek

It has been announced by the United States Reduction and Refining Company, with somewhat of a flourish of trumpets, that the sulphur penalty on all ore, whether shipped under contract or the "open rate," has been abolished. The sulphur limit was 3 per cent., with a penalty of 25 per cent. for each unit of excess, and it was further provided that the maximum penalty should not exceed \$2.50 per ton, and on ore of all grades. The abolition of the penalty is of benefit only to a few of the very deep mines, which have heavy sulphide ores, as the majority of the ores of Cripple Creek carry about 2 per cent. sulphur, and the move is in point of fact more of a "sop to Cerberus" than any great reduction in treatment charges.

Cyaniding seems to be victorious. The Homestake mill is making money on oxidized ore running from \$2 to \$2.50 per ton. The Anaconda mill, running mainly on oxidized ores, has been in successful operation for about two years. The Joe Dandy has just completed a 100-ton plant at the mine. The Wishbone mill, stamping in cyanide solution, is going to run at a capacity of 100 tons per day, which must, of course, be oxidized ores; but the adding of a roasting plant is contemplated. The W. P. H. mill, on Ironclad hill, is also a cyanide plant, and the Isabella has a 100-ton cyanide plant which

has run successfully for some time past. The Vindicator built an experimental cyanide plant to use the roasting process and treat sulpho-telluride ores, which is said to have been satisfactory; it is now stated that a new 250-ton plant will be built. It is rumored also that the Portland contemplates a mill of large capacity to treat low-grade ore. Stratton's Independence has two cyanide mills under construction, a wet process to treat dump ores and a dry process to treat high-grade mine ores.

It is a notorious fact that the Cripple Creek mine owners have been negligent in tackling the subject of ore treatment, preferring to sell their ores to the custom mills, instead of treating them on the ground; but the foregoing list of mills in operation and under construction will clearly show that the old policy is rapidly passing away, and it will be but a short time before the large producing mines will have their own reduction works. After all, the question of treatment charges on Cripple Creek ore is one that is in the producers' hands, if they choose to be enterprising. The chief thing for them to learn in building mills of their own is to employ proper metallurgical and engineering assistance and to shun the charlatan and "process" man. The silly idea that the ores could be treated only at valley points, and by the chlorination process, is exploded, and we look in the near future for each mine of importance to treat its own ores near the shaft mouth, thus bringing the practice of every other part of the world we are familiar with into successful use in the district; and the tribute formerly paid to custom mills and railroads will then accrue to the owners of the mines.

The Card System in Colorado

The card system for which Bulkley Wells, late adjutant general of Colorado, was largely responsible, has been abolished by its originator at the Smuggler Union mine. Also at the Liberty Bell mine, and throughout the San Juan region, this un-American, unreasonable and objectionable practice has been abolished. The Leadville mine owners gracefully and quietly allowed it to pass into oblivion about a year ago, but the mine owners of Cripple Creek, with their persistence in this now unnecessary and antiquated card

system, are very likely to force another crisis. During August notices were posted at the mines at Cripple Creek that the old cards had to be surrendered and new ones taken out before Sept. 1.

It is a well known fact that the card system did not fill the bill it was intended to, viz., that of preventing the men from affiliating with the Western Federation of Miners, and after presumably a fair trial of it the mine owners in most of the districts of Colorado which have been afflicted with labor troubles have now abandoned it, to the end that they might obtain the best class of miners to operate their properties. But in Cripple Creek the fight is still continued, and it is now stated that many of the best miners have refused to take out the new cards, and it is also said that the agents of the Mine-Owners' Association are trying to recruit labor in the Joplin district once more, where they are likely to be disappointed, inasmuch as the miners there now have different ideas from those of a few years ago, when they were famous as strike-breakers.

We deplore the inability of the Cripple Creek Mine Owners' Association to see its way to follow the more liberal policy displayed by its co-workers in the other great mining districts of Colorado. The safety of American industries is dependent upon the establishment of the principle of the open shop, and that is a principle which must work both ways.

Black Sand Mining

Apparently another failure is to be recorded in beach, or black sand, working for gold in California. The Point Sal Mining Company of San Luis Obispo county, organized to work the auriferous sands of the ocean beach at Point Sal, does not seem to have been successful in its efforts, as an assessment has been levied after a year or so of work. A newly devised and patented gold saver was tried, and expectations were high as to values to be recovered. That there is gold in the Point Sal sands there is no doubt, as there is in many other ocean beaches in California; but saving it profitably is another and serious question. There is hardly any mining proposition which appeals so strongly to men ignorant of mining, as a "black sand" mine, yet there are many more failures than successes, as in this instance.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Negative Results in Pyritic Smelting

Referring to the article by G. F. Beardsley in the JOURNAL of August 24, I wish to give the result of similar experiments in the smelting of raw copper nickel pyrrhotites, and the reasons for failure, which differ from those assigned by Mr. Beardsley.

In all of the experiments described by Mr. Beardsley, the furnace was running on a charge of roasted ore with 13 per cent. of coke and this was changed to a charge of raw ore with $3\frac{1}{2}$ to 6 per cent. of coke. Mr. Beardsley states that the tests lasted only from two to four hours, and the difficulties began to show within an hour after the change of charge. This is similar to my own experience, but I take an entirely different view of the cause of failure to effect concentration by oxidation of the sulphides. The 13 per cent. of fuel that was on the charge that preceded the raw charge was not entirely consumed when the raw charge got down to the smelting zone in the furnace, and the heat and reducing action of this remnant of fuel was sufficient to melt part of the sulphides and run them out as low-grade matte with the results as described.

If the furnace had been started on $3\frac{1}{2}$ per cent. of fuel instead of following a charge with 13 per cent. it would not have started with the sudden rush of low-grade matte as described; but would probably not have started at all. Like a horse left at the post, it could not be said of it that it "also ran." I have tried this variation and found the furnace was, so to speak, left at the post. This indicates to me that more than $3\frac{1}{2}$ to 6 per cent. of coke is necessary to smelt a charge of this character. In other words, the fusing point of the ore is higher than a charge of ore containing only copper, which would run on the percentage of fuel that a charge of nickel copper ore would not run on. The fact that the furnace almost stopped smelting and was rescued with difficulty as soon as the remnant of the 13 per cent. of fuel had burned out, proves that this is the true cause and not, as Mr. Beardsley states, the lower fusing point of the sulphides which he says liquated out, and left the furnace full of a skeleton of rock matter.

To illustrate the effect of fuel already in the furnace, I recall an annoying experience that happened in East Helena. An order had been given to the feeder on a furnace to reduce the amount of coke on

the charge. He misunderstood the order and did not put in any fuel, and several hours later it became apparent that something was amiss. Inquiry showed that about 10 tons of charge had been fed without fuel. Immediately an extra amount of fuel and matte was fed in and the blast increased, and the furnace pulled through without a freeze-up. This happened on a lead furnace where about 15 per cent. of coke was being used.

According to the analyses which Mr. Beardsley gives there is less than 20 per cent. of insoluble or rock matter in the ore and if the furnace practically quit smelting within such a short time as he describes, it is impossible that so much rock matter could accumulate in the shaft of the furnace unless the charge turned to rock in the furnace, which is not very likely.

I do not find anything to criticize in Mr. Beardsley's statement of facts or the results for I have been all over the same road, but I think the conclusions he draws from them are erroneous. The conclusion that I have come to, is that the fusing point of the ore is higher than a similar ore containing copper only. The charge must be fused or it will not smelt. If the necessary fuel to melt it is put on, it prevents oxidation; and without oxidation, concentration is impossible. Take off the fuel and the furnace stops, put it on and it prevents concentration.

As a choice between the devil and the deep sea, we smelt pile-roasted ore in the old fashioned way. If we could smelt the ores raw and produce a converting grade of matte, the slag losses would probably be too high to admit of it being done. The slag will carry about as much nickel as copper, irrespective of the fact that, if only copper were present, the metal loss would be one-half as much as the sum of the two. Smelting with a high degree of oxidation makes fouler slags on the same grade of matte than would be produced with more fuel and reduction.

HIRAM W. HIXON.

Victoria Mines, Ont., Aug. 29, 1907.

Some Metallurgical Vagaries

Regarding the metallurgical proposition which Mr. Woodbridge found on a property in the Southwest and described in the JOURNAL of Aug. 10, I met a man on a train a few days ago who has the Southwestern metallurgist beaten. He proposes to build a furnace that will use for fuel three parts crude oil and 17

parts water. This is mixed with the ore and away it goes. He generates such an intense heat with this fire that he has the other man discounted. He proposes to volatilize the metals, so that the least volatile will go into a receptacle by itself. When the heat is raised to such a point that it is the turn for another metal to come he closes the door and has it caught, just as we used to catch squirrels. Then he turns the draft into another chamber and catches that metal; then he closes the door, and so on *ad infinitum*. If the two men could get together, probably they could turn out something pretty good. All my man lacks is capital; he is now looking for capital to go into this proposition. He claims he can smelt any ore for 65c. a ton. Furthermore by his process he has smelted a ton of quartz ore in California and got 97 per cent. extraction of gold without using any flux. If any other man can beat this, he should come forward. C.

Tonopah, Nev., Aug. 20, 1907.

Compressed Air in Mining

With regard of the interesting article in your valued JOURNAL of May 4 on the subject of "Compressed Air in Mining," by J. H. Hart, it may interest some of your readers to know that I have recently submitted to the Mining Exploration Company, for which I am acting in consulting capacity, plans for utilizing air compressed by means of a falling column of water. We propose to use air so compressed direct in our blast furnace and converters, without the necessity of electric generators, motors, blowers or air-compressors. CLAUDE VAUTIN.

Santiago, Chile, July 10, 1907.

When the No. 9 style "K" Gates breaker was first designed, there was considerable doubt as to whether the machine was not of too large capacity for ordinary use. Many stone companies installed crushers of this size, however, even in places where a smaller size would have had sufficient capacity, because of its large receiving opening and consequently the reduced cost of quarrying. Until quite recently the capacity was commonly said to be limited only to the amount of stone that could be fed to it. But, owing to the increased demand for stone within the past few years, quarrying methods have improved and some of the owners have been able to keep the No. 9 constantly supplied.

The Lost Bullion Spanish Mine Fraud

SPECIAL CORRESPONDENCE

The extraordinary case in the United States Circuit Court at Denver known as the Lost Bullion Spanish mine has reached a verdict, and 11 defendants have been found guilty on three counts of having used the mails to fleece the flock of silly ones—the poor suckers, of whom it has been jocularly remarked, “a new crop is born every five minutes.” But these have to be protected against themselves, and the outcome of this trial will be alike a warning to them, and to those promoters who, the mining world over, are plying their predatory trade.

What strikes one who is not of a legal mind is the broad scope of justice of the laws of the United States, which allowed such a ridiculous swindle, based on such palpably non-existent values, to have been seriously considered *pro* and *con* for nearly a month by a learned judge and a jury of acumen and intelligence.

The evidence would be amusing, and might be classed under the head of “opera bouffe mining,” had not the end been so tragical, for the maximum sentence which can be imposed on the conspiracy conviction is a fine of \$10,000 and two years’ imprisonment, with no minimum; and for using the mails to defraud, the maximum is \$500 and 18 months’ imprisonment. And the tragedy is perhaps equally divided between the convicted men and the poor dupes who, perchance to augment a limited income, may have lost their all, and who alone are deserving of sympathy.

The most notable points brought out were that the judge, who, by the way, had long experience on the bench in Cripple Creek, and other mining centers, appeared to be the best mining man in the whole *entourage*, and promptly called down several witnesses for making absurd statements as to values. Also that Waldemar Lindgren, of the United States Geological Survey, whose standing and ability are too well known to need comment, deposed for the prosecution that the alleged mine was simply a natural limestone cave, containing no value whatever, whereas on the other hand a local “expert” testified that its value was \$31,000,000; but as this valuation was apparently based on three assays, its correctness is easily rated.

This same witness for the defense also made a statement that ore runing 40c. per ton could be mined and cyanided at a profit. Philip Argall, who is an acknowledged authority on cyaniding, was called in; rebuttal and testified that ore of such a grade could not be worked at a profit in the United States, and further showed the utter absurdity of making any estimate of value whatever on the three sam-

ples taken by the defense as a basis for the \$31,000,000 estimate.

Another mining engineer went so far as to state in his report that he considered the property worth no less than \$10,000,000. It would appear, however, that the only undisputed metallic value actually found in the cave was a bundle of baling wire! The convicted men, among whom are E. W. Sebben and David H. Lawrance, figuring as “mining engineers,” have been given 16 days to prepare their papers for appeal, and sentence has not yet been passed.

The Steel Corporation at Duluth

SPECIAL CORRESPONDENCE

The United States Steel Corporation, in the furtherance of its plans for steel works at Duluth, has incorporated the Interstate Transfer Railway, which is designed to connect the works with every railway reaching the head of Lake Superior, at some point outside of the present points of traffic congestion. It will cross into Wisconsin and extend to the southeast end of the Duluth-Superior harbor, affording sites for subsidiary manufacturing enterprises on a road which can deliver material without delay. This road is expected to cost in the neighborhood of \$1,500,000, exclusive of the right of way. The corporation has paid about \$500,000 for the site of its works at Duluth, which covers three miles of deep-water front situated along the harbor, and reached by a 21-ft. channel from Lake Superior. Its immediate plans for construction include two 50-ton blast-furnace units, with the necessary by-product ovens, open-hearth steel furnaces, billet and finishing mills for the furnaces.

So far the work has consisted in clearing the ground, surveying for railways and structures, testing foundations, planning dwellings, etc., and making plans for the works. There will be 100 dwellings, ranging in cost from \$1000 up to \$7000 each, and these are now in the hands of architects. There will be some 12 miles of trackage inside the works location, and the plant will be connected with the Mesabi range by direct tracks of the Duluth, Missabe & Northern road, which is also a Steel Corporation property.

The plans of the company are, of course, absolutely undetermined as to future extensions, but it is understood that the Duluth works will be extended to care for all business of the corporation that can be better handled from the head of Lake Superior than from Gary or other works. As the Northwest is the region where the great extension of railways is likely to be in future, and where there will be a great growth of manufacturing and building industry, the future of these works is considered by the officers of the

corporation very promising, and they may in time rival any plant it now has or is erecting. The site has been bought with the view of indefinite extension, including 1700 acres of available land, with a three-mile water front, as above mentioned.

Large Capacity Rivet Forges

The efficiency and consequent convenience of rivet-heating forges depends largely upon their capacity, ease of operation and portability. The depth of fire carried must be sufficient to keep the rivets hot for several minutes should the blast be stopped and the diameter of the bed of hot coals should be sufficient to enable more than one gang to be supplied with rivets, or such that the forge may be used for general repair work of a heavier nature. The forge described weighs but 135 lb. and the parts are readily detachable, being arranged so that they can be assembled in a few minutes. It is admirably adapted for use on tanks, stand pipes, steel buildings, bridges, in mines and for railroad and erecting detachments.

The Buffalo Forge Company, Buffalo, N. Y., makers of these forges, classify them Nos. 625, 625A, and 625B. They all measure 44 in. in height and are supplied with a fan 12 in. in diameter. The fan is operated by helical and spur cut gears running in an oil bath, inclosed in a dust and air tight case. The case may be removed from around the mechanism without disturbing the gears, as their bearings are in a frame entirely independent of the oil case. This design insures perfect alinement and operation of the gears at all times. In this machine no spiral gears are used as experiment has proven that they do not wear satisfactorily in service of this kind, though their use would reduce the cost. The pinion on the fan shaft is cut helical and so is the gear driving it, which insures smooth running, because three of the gear teeth are in mesh at one time.

The tuyere is placed in the bottom of the fire fan, which is 4 in. deep. The tuyere is in the shape of a ball enabling the blast to be thrown in any direction to maintain a large or small fire as desired for the work in hand. Yet should clinker form at this point a twist of the handle breaks it off and it drops against the clinker gate whence it may be removed at any time.

Nos. 625, 625A, and 625B have fire fans 18, 22 and 24 in. in diameter respectively.

The electrical utility of aluminum is at present confined almost entirely to bus-bars, high-tension overhead conductors and low voltage feeders, insulated with waterproof braid only.

New Publications

GEOLOGY OF OIL AND GAS FIELDS IN STEUBENVILLE, BURGETTSTOWN, AND CLAYSVILLE QUADRANGLES, OHIO, WEST VIRGINIA AND PENNSYLVANIA. By W. T. Griswold and M. J. Munn. U. S. Geological Survey, Bulletin No. 318. Pp. 196; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

SURFACE WATER SUPPLY OF GREAT LAKES AND ST. LAWRENCE RIVER DRAINAGES, 1906. By H. K. Barrows and A. H. Horton. U. S. Geological Survey, Water Supply and Irrigation Paper No. 206. Pp. 98; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

SURFACE WATER SUPPLY OF OHIO AND LOWER EASTERN MISSISSIPPI RIVER DRAINAGES, 1906. By M. R. Hall, N. C. Grover and A. H. Horton. U. S. Geological Survey, Water Supply and Irrigation Paper No. 205. Pp. 123; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

SURFACE WATER SUPPLY OF SOUTHERN ATLANTIC AND EASTERN GULF STATES, 1906. (SANTEE, SAVANNAH, OGEECHEE AND ALTAMAHA RIVERS AND EASTERN GULF OF MEXICO DRAINAGES.) By M. R. Hall. U. S. Geological Survey, Water Supply and Irrigation Paper No. 204. Pp. 110; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

SURFACE WATER SUPPLY OF MIDDLE ATLANTIC STATES, 1906. (SUSQUEHANNA, GUNPOWDER, PATAPSCO, POTOMAC, JAMES, ROANOKE AND YADKIN RIVER DRAINAGES.) By N. C. Grover. U. S. Geological Survey, Water Supply and Irrigation Paper No. 203. Pp. 100; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

SURFACE WATER SUPPLY OF NEW ENGLAND, 1906. (ATLANTIC COAST OF NEW ENGLAND DRAINAGE.) By H. K. Barrows. U. S. Geological Survey, Water Supply and Irrigation Paper No. 201. Pp. 120; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

DIE ENTSTEHUNG DER STEINKOHLE UND VERWANDTER BILDUNGEN EINSCHLIESSLICH DES PETROLEUMS. By H. Potonie. Pp. 45; illustrated. 6½x9½ in.; paper, 4 marks. Berlin, 1907: Gebrüder Borntraeger.

MINING LAWS OF THE STATE OF MONTANA. Compiled at the office of the Inspector of Mines from the Montana Codes and Session Laws of 1897, 1899, 1901, 1903, 1905, 1907. Pp. 60, 6x9 in., paper. Helena, Mont., 1907: Office of the Inspector of Mines.

This is a convenient compilation, giving the mining laws of Montana, with all amendments and alterations, including all changes made by the legislature at its last session. It will be of service to all who are engaged in mining in the State, or interested in its mining properties.

THE ORIGIN OF ORE DEPOSITS. By Etienne A. Ritter. Pp. 84; illustrated. 4½x6 in.; flexible cloth covers, \$1. Denver, Colo., 1907: *Ores and Metals* Publishing Company.

Contents. Formation of igneous rocks. Chemistry and metallurgy of igneous rocks. Relation of eruptive rocks to ore deposits. Fissures and their filling; veins and shoots. Origin of the solutions that deposit the ore. Formation of ore bodies by aqueous solutions. Role of metasomatism in the deposition of ore. Superficial alteration. Secondary enrichment. Index and glossary.

This is a condensed manual, published in pocket form, so that it can be conveniently carried anywhere. The nine chapters embody, in an elementary form, the most recent information on ore deposits and the latest theories on their formation, as elaborated in the more important articles published in the technical papers, by the American Institute of Mining Engineers and the United States Geological Survey.

Gold Dredging in Victoria *

By D. B. SELLERS

During 1906 a record was established in Victoria for working low-grade gravel at a profit. The Vaughan Bucket Dredging Company at Vaughan, in the Castlemaine district, treated 437,213 cu.yd. of gravel and extracted 914 oz. gold, valued at £3538. A dividend of £1000 was paid, out of this amount, on £3500 capital. In an aggregate period of 1354 weeks 36 bucket dredges recovered 30,759 oz. gold from 8,243,010 cu.yd. of material, taken from 333 acres. The yield averaged 1.8 grains per cubic yard.

The yield from 82 pump-hydraulic sluices for a total of 2270 weeks' work was 52,498 oz. gold from 8,803,261 cu.yd. material, an average of 2.86 grains per cu.yd. Values in tin were also obtained.

Six hydraulic-jet elevators put through 258,953 cu.yd. of alluvion in 140 weeks, recovering 2008 oz. gold, or 3.72 grains per cu.yd. The area treated was 11 acres. One rotary hydraulic plant, in operation only four weeks, treated 2053 cu.yd. of old mining débris and obtained 5.1 oz. gold.

The foregoing 125 plants treated in all 17,307,277 cu.yd. of material, and recovered 85,271 oz. gold from an area of 628.5 acres. The yield thus obtained averaged 2.36 grains per cu.yd. and 135.6 oz. gold

*From the "Annual Report," Department of Mines, for 1906.

per acre. Employment was given to 2667 men.

The total quantity of material treated during 1906 under the heading of dredge mining and hydraulic sluicing by gravitation was 17,786,543 cu.yd., as against 13,897,643 for 1905. The amount of gold obtained was 89,386 oz. and the yield per cu.yd. of material treated was 2.41 grains, compared with 2.59 for 1905. The number of men employed was 2813, and the total area treated 646½ acres.

A Combination Prospecting Drill

A new drill capable of handling cores, hollow rods, cable tools, or the combination of any two of these systems, is being manufactured by the Cyclone Drill Company, Orrville, Ohio.

This drill is designed for territories where conditions cannot well be met with one tool equipment or in territories where the formation is not known. The drilling elements, in themselves, are not new, but their combination in one machine, making it possible to operate any of the systems successfully, is novel and greatly aids the prospector.

Cases arise where it is desired to obtain cores of strata at depth and no importance is attached to the exact character of the overlying material. In such a case drilling may be started with the churn drill and continued to the point where a core is desired. Later the core attachment is brought into play and the core removed. The result is the same, but the cost is greatly reduced due to the difference in cost between churn and core drilling. Furthermore drilling in soft or badly broken material is more readily done with the churn drill and holes can be sunk very rapidly with this type.

The outfits are built in a number of sizes, styles and various equipments to meet many conditions.

Mineral Production of Arizona

We published recently a table of the returns made by the mines of Arizona to the Territorial assessors. The following condensed table shows the value, by counties, of the gross product for 1906 of the productive mines of the Territory:

COUNTY	GROSS VALUE
Cochise	\$25,083,166
Coconino	5,383
Gila	5,079,097
Graham	10,983,692
Maricopa	14,778
Mohave	641,710
Pima	1,151,613
Pinal	29,466
Santa Cruz	133,684
Yavapai	9,794,098
Yuma	284,594
Total	\$53,801,781

The total for Cochise county includes two mines which made no returns; they were assessed at their full value, \$17,500, under the law.

Personal

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

John B. Farrish, of Denver, Colo., is in Mexico on professional business.

L. B. Wilder is at present assayer and chemist for the States Mining Company, Lincoln, Utah.

Frank C. Loring, of Cobalt, Ont., has opened a branch office at No. 20 Adelaide street, Toronto.

H. V. Clement has returned to New York after some time in Mexico on professional business.

H. C. Enos has been examining property at Chalchihuites, State of Zacatecas, Mexico, for Los Angeles capital.

Lieutenant Colonel T. S. Parrott left London, England, en route to Johannesburg, South Africa, on August 31.

Thomas A. Russell, of Springfield, Mo., has been looking after his mining interests in the state of Oaxaca, Mexico.

Dr. John H. Banks, of Ricketts & Banks, New York, has returned from a professional trip to Prince William sound, Alaska.

Miss F. Newport, of Daylesford, Victoria, Australia, legal manager of the North Mikado Gold Mining Company, has resigned.

Percy E. Barbour, of Boston, has gone to the property of the Navajo Gold Mining Company, Bland, New Mexico, on professional business.

E. A. Nis, mine superintendent of the New York & Honduras Rosario Mining Company, has been appointed general superintendent of the same company.

J. R. Todd, president of the Quincy Mining Company, has visited the company's properties in the Lake Superior region and has returned to New York.

Robert Musgrave, general superintendent for the Tigre Mining Company, S. A., of Sonora, Mexico, will shortly take a vacation trip to Victoria, British Columbia.

M. S. Davys, a well known mine manager in the West Kootenay district of British Columbia, with his family left Nelson, B. C., last month to reside in England.

W. H. A. Fisher, of Boston, spent a few days in Butte, Montana, the latter part of August, after having attended the meeting of stockholders in the Barnes-King Company in Kendall.

T. H. Wilson, of London, England, chairman of the Tye Copper Company, and Trewartha James, of James Bros., are inspecting the company's property on Vancouver Island, British Columbia.

Emmet D. Boyle has left the North Rapidan Mining Company at Dayton, of

which he has been manager since 1902, and has opened offices as consulting and mechanical engineer in Reno, Nevada.

John H. Winder, for a number of years president of the Sunday Creek Coal Company of Ohio, has been appointed general manager of the Clinchfield Coal Corporations properties in southwest Virginia.

Patrick Fitzgerald, manager of the Lupita mines of the Mascota district of Jalisco, Mexico, has been appointed general manager of the Santo Domingo mines in the Hostotipaquillo district of Guadaluajara.

W. J. Elmendorf, engineer at the Arctic Chief copper mine near Whitehorse, Yukon Territory, Canada, is at his home in Spokane, Washington. He will return to Whitehorse for a few weeks before winter sets in.

Lucius W. Mayer, mining engineer with the American Smelters Securities Company, is spending several weeks in European mining centers investigating the various methods of mining as there carried on.

W. A. Simpson, who has bored gas and oil wells in Petrolia, Ontario, and other parts of Canada, has been engaged by the New Zealand government to take charge of the Taranaki Petroleum Company's works, Moturoa, New Zealand.

John L. Klindworth, chief draftsman of the steel works department of the Jones & Laughlin Steel Company, has resigned to take charge on September 16, of the rolling-mill engineering department of the Mesta Machine Company, Pittsburg.

Obituary

Mr. Bice, metallurgist at the Tasmanian Copper Company's works, Blinman, South Australia, was killed July 21 by a falling timber while superintending the erection of a new water-jacket furnace.

Bradford E. St. Charles, correspondent for the JOURNAL in the Butte district, died on September 2, at his home at Butte, Montana. He had been engaged in newspaper work in the vicinity for nearly 25 years, and was a member of the Woodmen of the World and a charter member of the local Newswriters' union.

George Brennen, geologist of the oilfields department of S. Pearson & Son, was found dead with a bullet hole through his heart in the roadway near the San Cristobal oilfield near Coatzacoalcos, Mexico, August 21. No motive has been suggested for the crime. Mr. Brennen came to the oilfields about a year ago directly from England as a member of Pearson's staff.

J. J. Phillips, prominent in coal operations in Cleveland, Ohio and organizer of the Phillips Coal and Coke Company, Cleveland, the Letcher Coke and Railway Company, Letcher county, Kentucky, and

other corporations, was shot at his home in East Cleveland on September 2. He died within a few hours, the police being of the opinion that his wounds were self inflicted, although Mr. Phillips, himself in an *ante mortem* statement said that burglars had fired the shot. Mr. Phillips was born in Danville, Penn., in 1858, coming to Cleveland in 1883 as manager of the Albright Coal Company. In 1888, with Congressman J. P. Burton and ex-Congressman Jacob A. Beidler he organized the Burton, Beidler & Phillips Coal Company, of which he was treasurer and general manager. He was actively identified with the Eastern Ohio Coal Company, the Panhandle Coal Company and the Trevorton Collieries Company, operating in the anthracite region. He was also prominently identified with other coal concerns, was a director in the Euclid Avenue Trust Company, vice-president of the Collinwood Savings and Banking Company.

Societies and Technical Schools

West Virginia State University—Dr. H. M. Payne, of Williamson, Mungo county, has been elected dean of the new department of mining engineering.

American Museum of Safety Devices and Industrial Hygiene—The offices of this department of the American Institute of Social Service, Josiah Strong, president, have been removed from the Charities building, New York, to the new quarters in the 39th street building.

American Electrochemical Society—The annual fall meeting of the society will be held during October in New York. The New York section, which has charge of all arrangements, will hold a preliminary meeting on September 7, at 8:30 p. m. at the Chemists' Club, No. 105 West 55th street, New York.

Rolla School of Mines—The executive committee of this institution at the regular monthly meeting, held in Joplin, chose Harold B. Litchman, of the National Tube Company, professor of mining engineering, and Donald Copeland, professor in the Michigan College of Mines, to fill the chair of metallurgy. Both are graduates of the Massachusetts Institute of Technology.

University of Illinois—The engineering experiment station has published Bulletin No. 13, "The Extension of the Dewey Decimal Classification Applied to Architecture and Building." This classification has been in use in the department of architecture for many years, but it has never before been published. It forms a supplement to the extended classification applied to the branches of engineering previously issued in Bulletin No. 9.

University of Alabama—The Department of Mining Engineering is making a collection of trade catalogs pertaining to

mine equipment and the equipment of mining laboratories. Plans for new buildings are under way and the department will soon be in the market for apparatus for an ore-dressing laboratory, a complete coal washing plant and a briquetting plant. All catalogs relating to mining and metallurgical machinery should be addressed to E. J. McCaustland, Tuscaloosa, Alabama.

American Society of Mechanical Engineers.—"On the Art of Cutting Metals" by Frederick W. Taylor, which was the presidential address presented at the last annual meeting of the American Society of Mechanical Engineers, has been reprinted and bound in cloth by the Society, price \$3. This or any other publication of the society may be had by addressing the secretary at No. 29 West 39th St., New York. It is not necessary to send orders through the members. None of the publications of the American Society of Mechanical Engineers are copyrighted.

Industrial

The Dearborn Drug and Chemical Company has completed a new plant of concrete at No. 1015 West Twenty-fifth street, Chicago.

The Boston Consolidated Copper Company's 3000-ton mill, which is nearing completion, will be equipped with Nissen gravity stamps, supplied by Fairbanks, Morse & Co., of Denver.

Bulletin No. 18 of the American Air Compressor Works, 26 Cortlandt street, New York, contains illustrations and descriptions of box bed-plate compressors and vacuum pumps manufactured by that firm.

The manufacturers of Powell steam engineering specialties plan to increase the capacity of their plant by the erection of new buildings on a plot of ground 37x100 ft. recently acquired and by an increase of 200 h.p. in the power plant.

The sixth section of the Utah Copper Company's concentrating mill at Gatfield has been turned out and the plant is now in condition to handle an output of 3000 tons of ore daily from Bingham.

Two Northern cranes, manufactured by the Northern Engineering Works, Detroit, Mich., have been installed in the Garfield plant of the Utah Copper Company. The cranes are: one of 15 tons capacity, three-motor electric type, 40-ft. span and the other of six tons capacity hand type.

The Bradley Pulverizer Company, No. 92 State street, Boston, Mass., has been awarded the contract for supplying Griffin mills for the equipment of the entire grinding plant of the 3000-bbl. portland cement works now being erected by the Ajax Portland Cement Company, Independence, Kansas.

The Richmond system of electric mine signals is being installed in the No. 5 shaft of the Mohawk copper mine and the

No. 2 shaft of the Ahmeek mine, both in the Lake Superior copper district. The same system has been in use in Ahmeek shaft, No. 1, for the past five months with entire satisfaction.

Fairbanks, Morse & Co., of Denver have placed on the market an air-hammer drill under the name of Sinclair drill, H. L. Sinclair being the patentee. This drill is equipped with air feed column, and is similar in construction to the standard Sinclair drill. It has demonstrated an average drilling capacity of 8 to 10 in. per minute in the hardest granite obtainable in Denver.

The D. T. Williams Valve Company, Cincinnati, Ohio, announces that it will be ready to make deliveries on lubricating devices about Oct. 15. The new Hunt street factory was destroyed by fire on Aug. 22. The lubricating department had been moved in and was the only department to suffer, patterns remaining intact at the Broadway plant. A lubricating department is being installed in temporary quarters until the plant can be rebuilt.

The Tintic Smelting Company is making good progress with the construction of its lead smelter in the Tintic district, Utah; the management expects to have the plant ready for commission by the end of the present year. The grading of the Eureka Railway, which is to connect the principal mines of the camp with the plant is completed; the ties for the entire road have arrived and the rails are expected during the present month. The locomotives to be used by this company have also been delivered.

The management of the Bingham-New Haven mine in Bingham, Utah, will inaugurate some important changes in its aerial tramway system. The upper terminal is to be moved from the upper to the lower tunnel through which the mine is to be operated in the future. This move will, in addition to cheapening the cost of production, make it unnecessary to maintain a boarding house as the lower tunnel portal is situated near the Highland Boy mine and employees will be free to live wherever they choose.

There seems to be an organized effort on the part of citizens on both sides of San Francisco bay to prevent the erection of the Guggenheim smelter at Point San Bruno, south of San Francisco. A large sum of money has already been spent in preparation for erecting the smelter. Much of the opposition comes from people entirely ignorant of the whole subject who object to the presence of a smelter on general principles. The wide expanse of the bay with its constantly changing tidal currents, would act as a condenser for the fumes but people on the opposite side, and 14 or 15 miles out of any possible line of smelter smoke, are making as much fuss over the matter as those near by. The company is keeping its own counsel as to its intentions.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Charles A. Schieren & Co., New York City. The Belt Book. Pp. 15, illustrated, paper, 7½x10 in.; August, 1907.

McLaughlin Manufacturing Company, West Berkeley, Cal. Steam Traction. Pp. 25, illustrated, paper, 6x8 in.

Krogh Manufacturing Company, San Francisco, Cal. Catalog No. 50. Centrifugal Pumps. Pp. 64, illustrated, paper, 6x9 in.

Mussens Limited, Montreal, Canada. Bulletin No. 17. Miscellaneous Mining Machinery and Tools. Pp. 8, illustrated, paper, 6x9 inches.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., Bulletin 59. Crane Controllers. Pp. 24, illustrated, paper, 4x8 inches.

H. W. Johns-Manville Company, 100 William street, New York. Vanda Sheet Packing. Folder and Insert, illustrated, paper, 3½x6 inches.

New York Engineering Company, 2 Rector street, New York. The Empire Hand Prospecting Drill. Pp. 48, illustrated, paper, 6½x10 in.

Weber Gas Engine Company, Kansas City, Mo. Catalog No. 22. High Grade Heavy Duty Power Plants. Pp. 18, illustrated, paper, 8x11 inches.

The Kennedy Valve Manufacturing Company, New York. Catalog and Price List of Valves, Hydrants, etc. Pp. 132, illustrated, indexed paper, 5x9 in.; 1907.

P. B. McCabe and Company, 404 Grosse Building, Los Angeles, Cal., New Standard Concentrator. Colored Map of the United States, illustrated, paper, 21x28 in.

The Allentown Rolling Mills, Allentown, Penn. Pump Data No. 15. The Aldrich Vertical Triplex Belt Pump. Pump Data No. 16. The Aldrich Vertical Triplex Electric Pump. Pump Data No. 17 and 18. The Aldrich Vertical Triplex Electric Pump. Pp. 8, illustrated, paper, 6x9 inches.

Construction News

Danville, Boyle County, Kentucky—A company composed of Burton H. Vance and associates has leased barytes lands east of Danville and will erect a mill to cost \$100,000. Burton H. Vance, Louisville, Kentucky, has charge of the construction and operations.

Mount Washington, Maryland—F. R. Van Antwerp, of Hornell, New York, has purchased the Bare Hill copper property and will install pumping plant, air compressors, hoists, and electrical equipment. F. R. Van Antwerp, Mount Washington, Maryland, is general manager.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

Sept. 4—The union miners at Angels have at last voted to end the strike which has been prevailing at the Calaveras county camp for some months. At a meeting of the union this week the members decided to return to work at the old wages and old hours. That is, they will work nine hours for \$3 per day. This has been the most costly strike which has occurred in this State for years among the miners. The Utica, Angels, Lightner and other producing mines have been closed down during this strike and the town became about half deserted. The result is a distinct triumph for the mine-owners, who decided to take a firm stand in the matter as the mines would not pay if shorter hours and higher wages prevailed. The settlement followed a general change in the union officers.

One of the most important mining strikes recorded in the vicinity of Nevada City for years, has recently been made in the Canada Hill Consolidated mine where at the 1400-ft. level the vein of pay ore has widened from an average thickness of less than a foot to 6 ft., and is holding its own toward the 1500-ft. level. This old mine, under the name of the Charonnat, yielded nearly \$400,000 to its original owners who lost the ledge at the 1300-ft. level, and then quit work, leaving it to their successors who regained it 20 ft. below where they stopped. About 2000 tons taken from the upper levels yielded at the time \$19 per ton and the ore below is expected to be as rich.

D. W. Stapping, of Denver, Colo., and J. H. Alling of this city have put up a concentrating machine on the ocean beach of Gold Bluff, Humboldt county, to work the black sands of that locality. This beach has been worked intermittently for many years and has yielded more gold than any similar locality in California. Probably, too, more kinds of gold-saving machines have been tried in the Gold Bluff black sands than anywhere else.

There is a revival of mining interest in the Brown's Valley region in Yuba county. The old Pennsylvania, Dannenbroje and Hawkeye mines, now owned by Chas. D. Lane, Geo. Allen and associates, are being extensively developed. A 10-stamp mill, with all necessary equipment, has recently been installed. The stamps are 1050 lb. each, and a 70-h.p. boiler and engine supplies the motive power. Prior to erecting the new plant the present owners put in three months' work developing and testing the Pennsylvania ledge, which they

had proceeded to open at points heretofore untouched. The results were extremely gratifying, returns by actual mill test showing the ledge to return from \$8 to \$10 per ton, taking it in its entire width, which runs from two to eight feet.

The Willow Creek mining district was organized recently by a meeting of 24 miners and prospectors who are interested in that section of Greenwater district and have their properties in the Willow Creek basin. The meeting was held at Willow Creek, the new town, and the following officers elected: President, J. A. Marshall; recording secretary, P. N. Rogers; district recorder, Mike Henry. The boundaries of the Willow Creek district are south to Sheep creek, east to the Daggett road, north as far as Oddie's wash, and west to Death valley. It includes the old Willow Creek region and the new goldfields, but does not take in Rhodes Spring, where recent discoveries of gold ore are reported.

The register and receiver of the Sacramento Land Office have received a notification from the Secretary of the Interior withdrawing from agricultural entry about 25 townships in the western end of Fresno county, covering practically the entire Coalinga oil fields. A large part of this land was withdrawn from entry several years ago and again released within the last few months. This second withdrawal is to hold good pending examination by the Geological Survey to determine whether it is mineral in character.

The old silver camp of Panamint, idle for 30 years or more, is about to resume ore shipments. The ore shoots were never worked out or exhausted. Although they had yielded millions, recent investigations show that the real development of the ore deposits had been scarcely commenced. There was more ore, of higher value, in sight when the camp was abandoned than at any time during its greatest money-making period. It has been found that none of the old Panamint claims was even patented so that most of them were open to location. Applications for patents had been made, but the patents were never issued. All the proved ground has been taken up and the camp is no place for poor men.

The Tonopah & Tidewater Railroad announces an extension of its line as far as Death Valley Junction, its traffic operative to that point on Sept. 1. The line will then be open from Ludlow. The intermediate stations will be Shoshone, out 96 miles from Ludlow, and Evelyn, out 109

miles from Ludlow. All freight and passengers for the towns of Greenwater, Willow Creek and adjacent places will be routed to Death Valley Junction. Automobile service between Zabriskie and Greenwater will be discontinued and a new auto line will be opened between Death Valley Junction and Greenwater.

Salt Lake City

Sept. 5—Work on the foundations for the additional buildings to be erected at the Garfield smelter of the American Smelting and Refining Company, is progressing at a satisfactory rate. It has been stated by the management that the new equipment will be ready for commission soon after the first of January next. The plant with its present units has capacity for the treatment of about 1200 tons of ore daily. Double this amount will be treated when the additional units are ready for commission.

A great deal of activity is being displayed in the coal districts of southern and eastern Utah. Several new companies have been formed within the past few months and some of them will be ready to produce fuel before winter.

Suit has been instituted in the Federal court here against the Pittsburg-Salt Lake Oil Company, which owns producing wells and a refinery at Spring Valley, Wyoming, as well as a large area of asphaltum lands in eastern Utah. Officers of the corporation have also been named as defendants. W. W. Wantland, a Salt Lake mining operator, is plaintiff who asks judgment for the value of more than a million shares of stock which he claims he was to have received as consideration for turning over certain lands and options on lands to the company.

The ore and bullion settlements reported by Salt Lake banks last week amounted to a total of \$724,000.

The unsatisfactory transportation service accorded Bingham producers by the Rio Grande Western Railroad Company, may compel the Yampa Smelting Company to reduce its output temporarily. In the meantime, the construction of a new aerial tramway between the mine and smelter is progressing.

There appears to be little indication of labor trouble in any of the Utah mining camps. The agitation noticed in Bingham recently has subsided, owing, no doubt, to the ultimatum given a committee representing the miners not long ago to the effect that no consideration would be given any proposition to raise wages dur-

ing the present chaotic condition of the copper market.

Bisbee, Arizona

Sept. 5—Ore was shipped last week for the first time out of the Denn mine of the Shattuck-Pattison syndicate, of Duluth, Minn. The mine has been under development about two years. While ore is being shipped the property is in no condition to make steady shipments and is not expected to do so. What is going forward is ore that has accumulated in course of development. Denn shaft is 1100 ft. deep, and drifts are to be sent out to catch ore that is expected there under present bodies. The shaft itself has been in ore for some distance. This mine lies in a part of the Bisbee district that was supposed up to a short time ago to be outside the zone of enrichment, but drilling for the Junction mine brought out the fact that the fault along which mineralization had taken place pitched to the northeast and that, at depth, a lot more ground than was supposed was possible mineral-bearing rock.

Hoatson shaft of the Superior & Pittsburg Mining Company cut a goodly body of ore in making a station on the 1200-ft. level; this ore will be shipped soon.

At Clifton the Clifton & Northern railway, a standard-gage line, is being built to handle the product of the New England group of new mines to the reduction works. The New England is a property whose development, under present ownership, began about a year ago and it is now mining ore.

The Old Dominion is to add still another large furnace to its smelting works and is to greatly increase its dust-chamber capacity. This will give the company six blast furnaces and will materially increase its copper-making capacity. It is now receiving sulphide ores from many outside sources, Nacosari and Cananea concentrates, Shattuck ore to the extent of 200 tons per day, some Copper Queen ores and considerable from the various mines of the Globe district. The one great difficulty of smelting at Globe has always been the lack of sulphides and the preponderance of extremely silicious ores, some of these running into almost pure chrysocolla. With the coming in of sulphides in lower levels of the Dominion and the search of the new Globe Consolidated for sulphides in the underlying diorite this condition will change for the better.

In the Kelvin country, which is practically a westerly extension of the Globe district, there is more of a boom than Arizona has seen since the excitement in Bisbee when northerners went there, five years ago. The Ray Mining Company has 500 employees, where a year ago there were none, and the town has increased in a few months from perhaps 100 people to more than 1000. Railway connection to the camp will be completed in a week by

the building of a line to connect with the Phoenix & Eastern at Kelvin, on the Gila river. Three large companies are developing mines in the low-grade concentrating ore of the district, the Ray, the Calumet-Kelvin and the Arizona-Hercules. The former is working at various points on its large area and has eight small hoists and four drill plants in operation while a large amount of tunneling is in progress to develop orebodies. The K-C company is sinking a main shaft and has about 1200 ft. of drifting on its 200-ft. level.

The Mascot Copper Company, composed of Salt Lake people, has taken a number of claims under bond in the Dos Cabezas district, and expects to pay about \$500,000 for them. Development will begin at once; in fact machinery is on the ground.

Ever since the Calumet & Arizona Company went into the Mammoth district, north of Benson, and took the Scanlon-Clark group, there has been much interest in that region. A group of Minneapolis men are developing a prospect on the other side of the hills there and now an English syndicate has taken for \$100,000 the Table Mountain group and is to develop at once. The Sibley Company is operating in the district and it is understood that the El Paso & Southwestern road will build north from Benson to the region if these mines prove up.

The Belen Copper Company, with mines near Nacosari, is constructing a smelter and will blow it in during September. The company will then cease its shipments of copper, gold and silver ores across country 60 miles to the railroad. The new line of the Southern Pacific, running southwesterly from Nacosari, will pass within 20 miles of Belen. Bismuth is found in the Belen and some has been mined and shipped, but on account of the combination in the foreign bismuth market it is a difficult mineral to undertake alone.

The Apache mine, near Hachita, which now belongs chiefly to Bisbee promoters, is looking well, and the shaft is down nearly 300 ft. At that depth it is proposed to drive for the ore shoot that is supposed to be there.

Contracts have been let by the Southern Pacific Railway Company for the construction of its lines down the Gila river. When these are completed the main line of travel west from El Paso will not be via Tucson, as now, but down the Gila to a connection with the present main line near Gila Bend, in western Arizona. The line will leave the present road by the Globe, Gila Valley & Northern, trains running to San Carlos, which is part way up to Globe on that line and then over the road now under contract through Florence and Maricopa to the present main line again. This will put Florence on the main line and Phoenix close to it. Much better grades and more productive country will be traversed. The change is one of the

most important that has been undertaken by any railway in the Southwest and is equaled only by the Belen cutoff of the Santa Fe and its proposed similar change through central Arizona.

The Fay-Cananea Copper Company, which has been developing in the Azul mountains, near Cananea, has cut ore of good grade in its tunnels, in a vein 12 ft. wide said to assay more than 20 per cent. copper. Four shafts are being sunk and considerable other development is under way on the extensive land holdings of the company.

In the Paradise district the Royal Highness group has cut high-grade lead-silver-copper ore running up to \$100 on the foot-wall. It is a rather narrow seam so far.

Denver

Sept. 6—Men are at work day and night clearing away the debris of the late fire at the Golden Cycle mill at Colorado City, and every effort is being made to have the big plant in operation again at an early date. That the Golden Cycle mill was an unqualified success goes without saying, and further proves that the cyanide process is all that its advocates claimed for it, and very probably not a little of the healthy rivalry of the "Mill Trust," using the chlorination process, was due to the old-time fight of cyanide versus chlorination. Be that as it may, however, reports were prevalent in Cripple Creek that the United States Reduction and Refining Company had purchased the plant, with the intention of using it in connection with its other mills. The following interview given to a correspondent of the *Denver Post*, by Harvey H. McGarry, general manager of the Golden Cycle Company, is significant. He said, "I was approached about ten days ago by a man who asked if I would sell the Golden Cycle plant, intimating that I could procure a most favorable consideration. I told him the company would not sell at any price, that we were perfectly satisfied with the results from the independent mill business, and that we knew of no other business that would suit us so well or pay greater profits on the money invested. The man left without divulging his identity, or that of his backers."

Duluth

Sept. 7—The Duluth, Missabe & Northern road is now moving at the rate of 500,000 gross tons a month, pretty close to its expectations of the spring, and considerably above either of the other two lines.

Considerable exploration and development is under way on the old Penokee range, west of the Montreal river, as far as Mellen, Wis. Oglebay, Norton & Co., the Ashland Iron and Steel Company and other interests are sinking shafts and

driving for ore. Conditions are such that ore, which a few years ago would have been frowned on, is now greeted with joy, and this may bring into the field areas that were formerly not regarded with favor. Reports from Felch mountain, Menominee region, indicate that mines will be opened there before long. The explorations on the Cuyuna range and the activity in options, etc., in Otter Tail county, Minn., are to be explained by the same change in conditions.

Exploration on the Mesabi range is active. One drilling firm is operating about 50 machines there, and the mining companies are doing more on their own account than in former years. There are about 20 deep diamond-drilling machines operating in the Menominee range by contract firms, besides some by mining companies, and some drilling is under way on the Gogebic and Marquette ranges. The Vermillion shows little life, either in drilling or exploration by shaft, though the work of the Shagawa Iron Company, in section 30-63-11 is getting some results at about 500 ft. depth.

Indianapolis

Sept. 8—Coal-mining industry in Daviess and Pike counties is being revived. Two years ago this field was regarded as one of the best producers in the State, but the industry was permitted to decline until now. Several new veins of fine quality have been discovered and a number of new companies have been organized to develop the field. The Mandaback Coal Company, a new concern, is the first to break ground. This company has its home office in Petersburg. Railroad companies and foreign capitalist have become interested and the business has taken on quite an impetus. It is thought 400 men will be employed in a short time.

Toronto

Sept. 6—There is further litigation over the affairs of the Cobalt Lake Mining Company, whose title to the bed of Cobalt lake was attacked some time ago by the Florence Mining Company on the ground of previous discovery. Last April, while the suit was pending, an act was passed by the Ontario legislature confirming the title of the Cobalt Lake Company. This had the effect of suspending legal proceedings until it was seen whether the Canadian government, which possesses the power to veto provincial legislation, would exercise it on the ground that the act was *ultra vires*. So far no such action has been taken. Now another action is brought against the directors of the company by James J. McConvey, of Toronto, who asks for the appointment of a receiver, for an account of the dealings by defendants with the company's assets, for an order canceling all stock not paid for at par issued to directors or promoters, and for damages for issuing stock at

a discount and for improperly procuring the passage of the act validating the company's title. The plaintiff claims that this act, by implying the invalidity of the title and the validity of the adverse claims, has depreciated the value of the shares, and that a balance of \$2,540,000 is due by the defendants on stock issued below par to themselves or others. The directors against whom the suit is brought are Sir H. M. Pellatt and Brittan Osler, Toronto; Thos. Birkelt and G. F. Henderson, Ottawa; D. C. Rochester, Cobalt, and J. H. Avery and Raymond Mancha, Detroit.

Some further important gold discoveries are reported in the Abitibi district where it is estimated, there are about 3000 prospectors at work. W. H. Trickett, an English mining expert, who represents the financial house of Bewick, Moring & Co., London, and has been pursuing investigations in northern Ontario for two years, has discovered a large gold area among the islands of Upper Abitibi lake where he has staked seven 40-acre locations. Mr. Trickett has brought to Toronto a number of samples illustrating the value of the properties, the best of which shows 178 oz. gold and 3.64 oz. silver to the ton. He has a force of men engaged in stripping and will erect a 20-stamp mill as soon as possible. The Upper Abitibi lake is situated about 20 miles to the northwest of McDougall's chute, a point on the Timiskaming & Northern Ontario railway, 100 miles north of Cobalt, and transportation will be attended with great difficulties until the railway is pushed farther north.

London

Aug. 28—Dolcoath mine has now issued its report. During the first six months of the year the rock crushed was 51,243 tons, the concentrates sold were 799 tons and the slimes 64 tons. The average price of the concentrates was £123 and that of the slimes £89. The amount of rock crushed was about 1000 tons more than during the previous half-year, and the amount of concentrates and slimes was 30 tons less. On the other hand, the prices of the concentrates were £7 higher and of the slimes £8 higher than in the previous half-year. The net profits were £41,421, which is practically equal to those of the previous two half-years. The receipts were £105,815 and the working expense £58,975. A dividend at the rate of 20 per cent. per annum amounting to £33,804, is being paid and £15,000 added to the reserve fund.

The present prosperity enjoyed by the iron and steel trades in Great Britain is well exemplified by the reports just issued by Guest, Keen & Nettlefolds, and of Bolckow, Vaughan & Co. The first named company, which among other things owns the famous Dowlais works, has made a profit for the year ended June 30, of £470,511. Out of this, the ordinary shares receive a dividend at the rate of 10 per cent.,

and £150,000 is placed to reserve. Bolckow, Vaughan & Co. show a profit of £607,323 and a dividend of 10 per cent. is paid.

Johannesburg

Aug. 12.—Nearly one thousand white men have been laid off at Kimberley. All kinds of rumors are afloat regarding this move of DeBeers Mines. There can be no doubt that the diamond market is in a very unsatisfactory state, and that the big reserve of diamonds is not being sold as rapidly as usual. It is stated that the Premier Diamond mine on the Transvaal has flooded the market with an inferior grade of diamonds, and that this explains the glut in the market. It is reckoned that the diamond market will remain unsatisfactory for ten months or a year. Affairs at Kimberley are dull.

The Government in Cape Colony has discharged a large number of men. Both from Kimberley and other parts of Cape Colony many of the unemployed have come to Johannesburg, as there is no other place for them to go to. The influx of unemployed only adds to the distress and the problem how to even keep these men alive grows more pressing.

The acute distress has not so far affected the gold output. The returns for July show a return to the pre-strike basis. The Boer press makes caustic comments on the large output and the prevailing distress. The explanation is that the action of the Boer party on the labor question has brought about such a feeling of uncertainty that all expansion has stopped, and capital has ceased to flow into the country. Were it not for the £2,000,000 turned out every month by the mining industry, a large proportion of which is spent in the country, the state of affairs in South Africa would be hopeless.

During the strike many of the companies, in order to keep the stamps at work, stopped sorting. The July returns show that the mines are about normal again as far as the sorting is concerned. The excellent showing of the Luipaard's Vlei estate, as regards tons crushed per stamp per 24 hours is worthy of note, namely 8.5 tons, probably the highest figure ever obtained by a gravity stamp on ore of this character, anywhere in the world. The Luipaard's Vlei estate has very heavy stamps and tube mills. On the mines where tube mills are at work the tonnages have gone up a great deal.

The labor returns show that on July 31 there were 51,441 coolies available for the mines in the Transvaal. There is still a feeling of uncertainty as regards the fate of the Chinese. The Government has brought in a bill to allow the coolies in South Africa to finish their periods of service, that is, three years each. The bill means that it will be 1910 before all the coolies in South Africa are sent back to China.

Mining News from All Parts of the World

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

THE CURRENT HISTORY OF MINING

Arizona

YAVAPAI COUNTY

Consolidated Arizona Smelting Company—This company, at Humboldt, has closed the reverberatory furnaces for repairs. The management states that in about a month work will be resumed.

Gladstone—This mine resumed operations on Sept. 1 after two months of necessary repair work.

Yaeger Cañon Copper Company—This company has started its mill, after a shut-down of several months. During this time large bodies of ore were blocked out, enough it is said to keep the mill running for many months.

California

BUTTE COUNTY

Garibaldi—From this mine near Enterprise, which has a 5-stamp mill, very high-grade sulphides are being taken.

McGibbons and Matheson—Geo. H. Sissons has taken options on both these mines near Magalia.

CALAVERAS COUNTY

Hedrick—Joseph King has taken an option in this mine on the gravel channel at the edge of the townsite of San Andreas. It is to be prospected for a Los Angeles company with a view to purchase.

EL DORADO COUNTY

Cedarburg—This old mine at Spanish Dry Diggings is about to be reopened after over 30 years' idleness. When worked it yielded the finest specimens of leaf gold, in pockets, ever seen in this State.

Gold Bug—An Oakland company is opening this hydraulic mine.

Jones Hill—At this mine, near Georgetown, W. S. Kerr, owner, drift work will proceed after months of prospecting. The old tailings are also to be worked over.

Lucky Mariou—This mine, near Greenwood, idle for 10 years, may be opened by St. Louis men, who are having it examined.

INYO COUNTY

Wild Rose Cañon—J. Grundy and others have made a rich strike at this place, in which the ore streak runs high in silver.

Trojan—This mine at Ballarat is shipping \$50 ore to the smelter at Needles.

MADERA COUNTY

Minaret Mining and Milling Company—This company is doing necessary work at its claims in the Minarets. These mines in the high mountain range, are far from transportation facilities, and have never been productive as yet.

MODOC COUNTY

North Star—A rich vein has been struck in the main tunnel of this mine, Fort Bidwell. The ledge is small but of high grade. The ore is being piled up awaiting the erection of a mill.

NEVADA COUNTY

Aurora Development Company—This company, H. B. Skewes superintendent, is sinking a shaft on its claims at Randolph flat, and has encountered a 2-ft. ledge.

Banner—It took 38 consecutive days to take all the water out of this mine down to the 900 level, the deepest point. Drifts will now be run both ways.

Horseshoe Mining Company—This company has purchased the Phoenix property south of Nevada City and will work it extensively in conjunction with the Eclipse. The mine is equipped with pumping and hoisting works. W. B. Simmons is superintendent.

Ironclad Mining Company—This company has decided to put up a 10-stamp mill, new pumps, etc., and to enlarge the shaft at Rough and Ready, to three compartments.

Niagara Mining Company—In this mine near Newtown, quartz assaying \$40 per ton has been found at a depth of 200 ft.

PLACER COUNTY

Carlisle—At this mine north of Cisco, Lee Butt has 25 men at work, building a flume to carry water to the mill.

Forest Hill Divide—Los Angeles men have secured 1300 acres of drift gravel ground north of Forest Hill, including the Buckeye, Slope, Blackhawk, Brown, Rose-dale and Pacific mines.

Iron Mine—L. C. Trent has started work on a new shaft at this property, and is hopeful of finding a body of copper ore.

Southern Cross—Ten stamps are being added to the 10-stamp mill of this mine near Towle. R. J. Turnbull is superintendent.

PLUMAS COUNTY

Consolidated Copper-Gold Mines Company—This company of Reno, Nev.,

operating on a group of 32 claims at Genesee, has ordered from the Nevada Machinery and Supply Company a 500-h.p. power plant. The power is to be generated by a tangential wheel to which will be belted an eight-drill air-compressor of the Leyner 2-stage type, also a 100-kw. generator for light and power purposes. Arthur Philbrick is president of the company, and John S. E. Howk, secretary and treasurer.

SHASTA COUNTY

Gold Leaf—At this mine, Lower Springs, 78 men are at work mining and putting in the new electric road for hauling ore to Middle Creek station.

Sugar Loaf—The drilling machinery for this mine near Copley has arrived. Filluns & Grotefend have 40 men at work.

SIERRA COUNTY

Alleghany Gravel Mining Company—This company's dam in Kanaka creek is being raised 10 ft. to give more room to store tailings.

Oriental—Work has been resumed in the lower levels of this mine near Alleghany, the power line having been repaired. The mine has been closed since last fall.

Young America—A rich gravel strike has been made in this mine at Forest owned by J. W. Morrell.

SISKIYOU COUNTY

Advance—This mine, which is a producer of specimen rock, is turning out paying quartz of average value.

Highland—At this mine near Etna mills, a new ledge has been struck. More stamps are to be added to the mill.

Quartz Hill—At this mine on Scott river, owned by the Portland Mining Company, the decomposed quartz on the surface is being washed off by a stream from a hydraulic giant, and the nuggets recovered.

TUOLUMNE COUNTY

Confidence—In this mine at Confidence, the vein has been cut in four places, averaging about 4 ft. of good value.

Colorado

LAKE COUNTY—LEADVILLE

Crecentia—An entirely new ore shoot has been cut in this property, Rock Hill, and to develop it the Delaware shaft to the southeast is being sunk. The shaft

is down 600 ft. and is in the lime. At the Alhambra prospecting work is being carried on at the 500-ft. level in lime porphyry, where occasionally good pockets of ore are found.

Crown Point—This property is under lease to Casey & Nelson. Work is being carried on at the 400-ft. level and daily shipments of 25 tons are being made of argentiferous iron ore.

Down Town Section—All of the properties in this section are turning out the usual amount of ore, with the Coronado and Penrose shipping 350 tons daily. At the drill hole on Thirteenth street, the drill is passing out of the lake bedding, about 500 ft., and entering the porphyry.

Garbutt—Work of sinking another lift on this shaft, Breece hill, has been started and will go down 100 ft., making the shaft 600 ft. deep. The lessees have been shipping considerable copper ore from the lower level but it dipped rapidly to the north, hence the necessity of sinking.

Hopkins—Work on the new vein exposed by the recent rock slide, shows the vein to be in place running high in lead and silver. After clearing the debris away and opening the new vein the lessees ran into an old tunnel, a good body of ore being exposed at the breast carrying lead and silver. Old timers state that this tunnel was opened as early as 1870, but was abandoned owing to the absence of smelters in the neighborhood.

Long & Derry—Work has been resumed on this property, Iowa gulch, this time by the Nil Desperandum people who operated on lower Rock hill.

M. N. Shaft—This is a fraction of a claim located in the heart of the Breece hill territory owned by the Ibex Mining Company. Early in the spring a new shaft was started to be sunk to the Yak tunnel a distance of 1200 ft. This work has been completed and furnishes an outlet for a large tract of ground.

Mammoth—The work carried on in this property, Big Evans gulch, during the last two months has at last resulted in finding the orebody. The ore is a clean lead sulphide and carries 21 oz. silver and 43 per cent. lead. On the west side in an upraise from the 600-foot level the body of ore was also caught. Both ore shoots are being developed.

Rock Hill Merger—A deal was recently completed by which several practical miners have secured a lease on the Ben Burb, Ore City, Great O'Sullivan, Raven and Only Chance. The properties will be worked from one shaft. Enough work has been done on all the claims to prove the value of the ground and from all of them considerable ore has been taken at different times. From the Ben Burb and Raven some carbonate ore is being shipped. John Champion, superintendent of the Yak tunnel, is at the head of the enterprise.

Yak Tunnel—The old South Mike shaft is being equipped for the purpose of working the Bulldozer and Mayday claims and other ground to the south of the tunnel. To the west of the tunnel on Rock hill, the company is installing an electric plant in the Hope and Swamp Angel ground.

Indiana

CLAY COUNTY

Coal Discovery—A rich vein of coal has been discovered near Middlebury, Clay county, a field famous for its block-coal output. The new vein is from 9 to 15 ft.

GREEN COUNTY

Latta Creek—The men at this mine, near Jasonville, on August 29 quit work rather than comply with a rule in regard to the removal of slate. The mine is owned by John R. Walsh's Southern Indiana Coal Company, and with the 400 men employed produced more coal than any other individual mine in the State.

VIGO COUNTY

Vandalia Coal Company—With a view of testing the newly enacted law requiring wash houses and lockers for miners, President Hewett of the company submitted to arrest charged with having violated the Bland Wash House Law.

Kentucky

BELL COUNTY

Excelsior Coal Company—This company, formerly the Chenoa Coal Mining Company owning leases on 800 acres of coal land near Middlesboro, has completed its \$30,000 plant and will transfer a large part of the Excelsior mine equipment to the new operation.

Maryland

ALEGHANY COUNTY

George's Creek Basin Coal Company—This company, formerly the Cumberland Basin Coal Company, will develop coal mines at Short Gap. Operations will begin in September with S. E. Orebaugh, Frostburg, Maryland, in charge.

Michigan

HOUGHTON COUNTY—COPPER

Ahmeek—No. 2 shaft is being equipped with Richmond electric mine signals.

Seneca—Surface work has been begun on this property, cutting a road and clearing ground preparatory to diamond drilling.

Superior—No. 1 shaft of the property is about halfway between the sixth and seventh levels. On the drift from the sixth level fine mass and barrel copper has been encountered.

Tamarack—Work on the re-timbering of No. 1 shaft of this property has begun

preparatory to resuming operations. The shaft has been closed for more than 18 months because of fire underground.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Ore Shipments—Shipments of ore from mines for the week ended Aug. 22 were as follows: To smelters, 90 tons; to Nevada-Goldfield works, 2177; to Western Ore Purchasing Company, Columbia, 750; to Combination mill, 400; total, 3417 tons.

NYE COUNTY—REVEILLE

Oil Shale—A large deposit of oil shale has been discovered near the old Reveille township. The shale supports combustion and in laboratory tests it yields a good grade of petroleum.

NYE COUNTY—SOUTH KLONDYKE

New Klondyke—Developments in this mine are attracting a lot of attention. The returns from the recent shipment of 16 tons of ore to the smelters averaged \$97.82 per ton. The bulk was in silver, the gold value amounting to \$3.40 per ton only. There was also 2 per cent. of lead.

Stormy Night—The shaft is down 95 ft. and is following the vein on good ore. This mine is owned by "Diamondfield" Jack Davis and Jim Butler, the "Father" of Tonopah. A large amount of development work is being done. Messrs. Butler and Davis are having a town site prepared.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments of ore from Tonopah for the week ended Aug. 22 were: Tonopah Company, 917 tons; Tonopah Extension, 190; Midway, 143; Montana-Tonopah, 87; Jim Butler, 22; total, 1359 tons. The Tonopah Company sent 3140 tons and the Belmont 1090 tons to the mills. Shipments from Goldfield were 800 tons and from South Klondike 17 tons, making a total of 2176 tons over the Tonopah Railroad for the week.

WHITE PINE COUNTY—ROSEBUD

Brown Palace—A shipment of high-grade ore, amounting to 8 tons, has been made to Salt Lake. The ore was taken from the outcrop chiefly.

Dreamland—The vein has been followed for 100 ft. and is developing well.

Golden Triangle—The shaft has been sunk to 70 ft.; at that depth the vein is over 4 ft. in width. The management has let new contracts for sinking and for lateral work.

White Alps—A rich vein carrying silver has been cut in the main shaft.

New Mexico

SIERRA COUNTY

Caballos Mountains—The Victoria Chief

Mining Company is still making improvements and employs about 80 men under the direction of Superintendent Weston, who took charge in June. About \$20,000 has already been expended on the wagon road from the mines to Cutter, through Palomas gap, and several thousands more will be needed before it can be used for traction-engine haulage. Considerable development work is now being done on the claims and one adit is 650 ft. long. One carload of copper ore was shipped recently, but much exploration must be done before the projected smelter would have a chance of success.

Hermosa Camp—The buyer of the Ocean Wave group will erect a 10-stamp mill as soon as mine developments will render it profitable.

Hillsboro District—A wagon road is being built between the Snake and Eureka mines by the Sierra Consolidated Gold Company.

SOCORRO COUNTY

Magdalena District—The Tri-Bulion Company has finally decided to locate its smelter at Cañon City, Colo., instead of Albuquerque, N. M., as first planned. Cañon City has moderate-priced fuel, is classed as a Colorado common point, both for zinc ore and spelter, and already possesses a colony of skilled zinc smelters who are employed in the Empire Zinc and United States Reduction smelters.

The Graphic Company has been prospecting its new zinc strike below the level of the Waldo adit and has not yet bottomed the ore. The Empire Zinc Company has bought the Daisy claim outright and has taken a lease and bond for \$30,000 on the Lilly group from L. R. Babcock, of Kelley, and Geo. L. Brooks, of Albuquerque. The Magdalena Development Company has cut over 16 ft. of zinc ore, in its lower adit, at a much higher geological horizon than is usual in the camp for large orebodies.

Water Cañon District—In Water cañon, just over the Magdalena range to the southeast of Kelly, an option on a large group of claims has been given to Ohio parties. Considerable silver-lead ore was mined here in former days, but below the water level the ores were sulphides of zinc and copper, with gold.

Oregon

BAKER COUNTY

Eagle Mountain—The company has taken out from tunnel No. 1 samples of the richest ore in place in that property. The machine drills are working day and night and are making 8 to 10 ft. a day.

Golden Star—Manager J. W. Messner, of this group in the Camp Carson district, reports that 20 men are driving tunnels and up-raises. The ore is silver, lead and gray copper, silver predominating. The mine carries two grades of shipping ore and a grade of milling ore.

Jem—This mine in the Susanville district has struck 7 ft. of ore—galena, copper and silver. The Chatanooga mine, an adjoining property, also made a strike and the Compton mine has erected a sawmill which is taking care of the timbers for the neighboring mines.

Red Boy—All machinery for deep sinking is on the ground. The mine will soon be operated by electric power.

Uncle Dan—This mine, owned by the Dan Gold Mining Company, James A. Barry, superintendent, expects to begin deep sinking with electric machinery.

LANE COUNTY—BOHEMIA DISTRICT

Golden Slipper—The contractors have completed their contract in the Dewey tunnel leaving a rich body of ore 5 ft. wide in the face.

Monday—Herbert Leigh, of Eugene, Ore., has succeeded in securing options on several groups of mines near this property. He intends to put the Monday mill in operation in the near future. There is a 20-stamp mill driven by steam power. It has not been operated for a few years.

Vesuvius—The tunnel is showing good ore with values increasing; 1000 ft. of heavy rails will be put down as it progresses.

Pennsylvania

ANTHRACITE COAL

Jeddo No. 4—A new slope is being sunk at the eastern border of Harleigh by G. B. Markle & Co. It will probably be used to haul coal from the new stripping recently begun by Contractor Fred Cuyle.

South Dakota

LAWRENCE COUNTY

Gilt-Edge Maid—The company has succeeded in raising \$15,000 and the mill will be improved before it resumes mining. This is the last property affected by the eight-hour trouble, that is still idle.

Golden Crest—The quarter million bond issue is being floated successfully and the work of enlarging the mill to 200 tons is to start.

Reliance—Development of the Brandt ore shoot has opened up a large body 20 ft. thick and 30 ft. wide, the top layer of which runs \$24 per ton.

Washington Consolidated—For a consideration of nearly a quarter million this ground in the Galena district has been purchased by Duluth and Minnesota men. Extensive work on the deep mining scale, by operating at a depth of over 1000 ft., will be undertaken. Geo. Houston and J. T. Flint, made a careful examination of the property and advised the purchase from J. J. Schlawig. It is probable that the old Richmond and Sitting Bull properties, long in litigation, will be included in the deal. This is one of a series of big deals in this district, now in progress.

Welcome District—The several phonolyte dikes are to be systematically developed. Rich float found here for years has been traced to a ledge running through Mineral hill. In 1893 the Inter-Ocean claim produced a wagon load of gold ore which took the prize at the Columbian Exposition for the richest rock on exhibit.

PENNINGTON COUNTY

Crouch Railroad—Extension work westward to commence in a few days, will afford transportation for a number of iron properties that have been little developed for lack of facilities.

Dorothy & Pettigrew—Air drills have been started in both tunnels and a force of miners is pushing work to the ore ledge.

Golden West—President Charles E. Curtiss, of Chicago, is at Rochford to superintend the installing of new machinery to enlarge to 200 tons the amalgamation plant for an all-winter run. Heretofore it has been operated only in the summer months.

Grand View—The Richards, father and sons, will install a new steam hoist and proceed to develop their new strike. High-grade ore has been encountered on this property situated near Pactola.

Ivanhoe—A new 100-ton Wilfley mill is to be installed together with a 20-tank cyanide plant.

Niagara—Double shifts have been put on to complete the air connections; the shaft will be sunk deeper.

Wealthy—Colonel Clark will resume operation with a large force of miners this month. The strike of copper on the adjoining Dakota-Calumet, has led to the resumption, as copper shows in a 14-ft. ledge. Colonel Clark purchased this property from V. T. Price and others.

Texas

FAYETTE COUNTY

Big Four Coal Mining Company—This company of Ledbetter, in which Brenham capital is interested, has begun operations on its lignite fields. Machinery has been installed and all of the output is said to have been sold for months ahead. R. E. Pennington, of Brenham, is president of the company.

HOUSTON COUNTY

Houston County Coal and Manufacturing Company—The output of the lignite mines of this company will be increased to 250 tons per day. The capacity of the Bear Grass mine in Leon county, producing 150 tons daily, will also be increased.

Utah

JUAB COUNTY

Little Chief—The new management of this mine has decided to continue the sinking of the shaft to the 2000-ft. level.

Tintic Smelting Company—This com-

pany's lead smelter in the Tintic district is expected to be ready for operation soon after the beginning of 1907.

Uncle Sam Consolidated—This company will pay a dividend of 3c. a share during September. The company owns one-half the stock of the May Day Mining Company.

SUMMIT COUNTY

Treasure Hill—A fund has been provided to carry on the development of this property. It is said that a deal for consolidation with the Creole mine is practically closed.

TOOELE COUNTY

Cliff Mining Company—This company, operating at Ophir, is shipping to the Salt Lake smelters at the rate of 60 tons of ore daily.

West Virginia

NICHOLAS COUNTY

Laurel Manufacturing Company—This company will develop coal mines near Richwood and build 100 coke ovens. It plans to mine for coke manufacture only.

Canada

ALBERTA

Pacific Coal Company—This company, Lewis Stockett, Banff, general manager, has let a contract for the erection of 240 coke ovens at the colliery at Hosmer, Crow's Nest Pass district.

BRITISH COLUMBIA

The output of ore from the mines of the Kootenay and Boundary districts for eight months to August 31 is shown by published tonnage returns to have been approximately 1,955,000 tons. Boundary copper mines have produced about 785,000 tons and Kootenay mines the remaining 270,000 tons. Included in the latter is the production of Rossland mines about 180,000 tons. By far the greater part of the production was copper-gold ore. Boundary smelters treated nearly 800,000 tons (including a few thousand tons from mines in the northern part of the State of Washington); the Trail smelter 155,000 tons, part silver-lead, but mostly copper ore; Nelson 12,000 tons and Marysville 21,000, both silver-lead ore and concentrates; and the Le Roi Mining Company's works at Northport, Wash., 64,000 tons, chiefly from the company's mines at Rossland.

ONTARIO—COBALT DISTRICT

Cobalt Ore Shipments—Shipments of ore from Cobalt for the week ending August 31 were as follows. Buffalo, 100,000 lb.; Coniagas, 160,500; Kerr lake (Jacobs) 61,000; Nipissing, 65,140; Thewey, 65,000; total 451,640 pounds.

Colonial—This mine, which was closed down since the beginning of the strike, has resumed operations. Three drills are running.

Edison—At this property, which has hitherto been regarded as a cobalt proposition only, a 10-in. vein carrying much silver has been struck at the 150-ft. level.

Hazel-Jule—At this property, Sasaginaga lake, camp buildings to accommodate 100 men have been completed and 1500 ft. of trenching done. Seven good veins have been found, one recently discovered being a 20-in. calcite vein with good silver contents. D. M. Gilpin is in charge.

Ontario-Quebec—Shaft No. 2 is down 55 ft. on the junction of two good veins which are improving with depth. About 15 men under superintendent A. Le Blanc are at work and a plant has been ordered.

Right of Way—Operations were suspended recently on account of delays in the delivery of machinery, but the plant is now partially running. The new shaft is down 57 ft. and will be sunk 50 ft. further.

Rothschild—A new vein has been found with several good-sized silver nuggets, and it is thought probable that work will be resumed.

Mexico

JALISCO

Amparo—Ferdinand Sustersic, general manager, has been importing Japanese labor, because of the scarcity of native labor, and has applied to the government of Jalisco for a concession of 3000 l. of water per second from the Ameca river, between Japanilla and Lagunillas, below the town of Ameca, for an electric plant to furnish power for the company's mines and mills about 30 miles distant.

Bolaños—Independence Grove, of Guadalajara, who has for several years been engaged in opening up the Bolaños mines near the line between Jalisco and Zacatecas, has, with Geo. J. Atkins, of Lancaster, Penn., organized the Rosario Mining Company, with \$1,500,000 capital, for working the properties on a larger scale. The group consists of the Bolaños, Condessa, Providencia, Zuloaga and Rosario. A concentrating plant, with possibly a magnetic separator, is planned, all to be under the management of J. H. Spence, with Mr. Grove as resident director.

Hostotipaquilla—The Virginia & Mexico Mining and Smelting Company, of Richmond, Va., which several months ago bought the America, Cabrera and Peralta mines, has started operations. The Maduro Mining Company, of Chicago, H. M. McIntosh, Chicago, president, and Wm. H. Lees, Guadalajara, general manager, has purchased of Carlos Romero for \$25,000 the Buena Vista, adjoining the old San José de Ventanas, and the old workings are being cleaned out under the direction of L. M. Fonts, who is also in charge of the San José de Ventanas, in which he has recently interested capital.

El Tigre—The Kansas City company

known as the Lucky Tiger Mining Company has obtained possession of El Tigre mine by the unanimous decision of the supreme court sustaining the contention against the Enseñada Mining Company. This terminates the fight started by B. F. Graham and associates in the latter company over two years ago. The company will at once proceed to develop the property.

Australia

NEW SOUTH WALES

Cobar—An important copper strike has been made in the Great South Peak mine, one of the groups owned by the Great Cobar, Ltd., of London. A crosscut at the 113-ft. level cut a strong, well defined copper lode 10 ft. in width. The mine is situated south of the Great Peak, which also belongs to the Great Cobar, Ltd. The discovery indicates that the ore channel, so well defined in the southern slopes of the Peak, does not die out when that big hill merges on to the flat country stretching away to the Queen Bee copper mine.

The location is a lucky hit, because there is nothing whatever on the surface to guide the prospector in searching for the southerly extension of the Great Peak lode.

Broken Hill Proprietary Company—Cable advices relating to the results of work during the half year ended May 31 are just to hand. The profit was £308,238. The output was 2,695,800 oz. of fine silver and 29,427 tons of pig lead. The average prices obtained were 33.7d. per ounce of fine silver and £18 6s. 5d. per ton of lead. The profit for the half year was equal to £1 os. 9d. per ton of ore treated as compared with £1 1s. 1d. per ton during the previous half year. The working costs were increased owing to the higher wages and rise in the price for water. The increase in wages was equal to 2s. 2d. per ton of ore treated. Developments in the lower levels are estimated to have disclosed 245,000 tons of ore during the half year, while 290,000 tons were raised.

QUEENSLAND

Mount Morgan—This property within a few years will be chiefly a copper proposition. The rich oxidized gold ore at the surface open-cut workings is being rapidly worked out at depth; the ore is a solid copper sulphide. A subsidiary company called the Electrolytic Copper Refinery Company has been formed by the directors to erect a plant with the view of refining the copper at the mine. Later a manufacturing plant will be erected for making sheet goods, pipes, bars and other copper articles. B. Magnus, formerly of the Anaconda electrolytic-works staff, at Butte, Mont., has been engaged to design and erect the Mount Morgan refinery. The plant will be in full operation next year.

Metal, Mineral, Coal and Stock Markets

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

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 11—The coal trade in the East shows decided strength and prices are easily maintained. Pennsylvania coals are exceedingly strong owing to the fact that Pocahontas, New River and other West Virginia coals are practically out of the market; consequently consumers are forced to take Pennsylvania and Maryland coals and the market for these grades has stiffened. The increase in the price of small sizes of anthracite has also tended to strengthen bituminous steam coal and consumers of hard coal are turning their attention to soft coal.

In the West the markets maintain a firm tone and considerable tonnage is being taken. There is quite a heavy tonnage at the head of the Lakes and no late rush is expected to upper Lake points.

The South continues active and reports state that nearly every ton is taken up as soon as mined. Alabama mines are hampered by lack of labor and could probably give employment to 5000 miners and laborers.

President Baer's answer to the complaint against the Temple Iron Company has called out a good deal of discussion. Its general tone recalls some of Mr. Baer's utterances at the time of the anthracite strike; the resemblance is too marked to make the answer at all popular, though it may be technically correct. Comment on the anthracite situation, however, requires more space than is available in this column. Whatever the true situation may be, proof of an actual combination will be very hard to secure.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Aug. 31, were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	2,877,223	3,758,183	I. 880,930
Bituminous.....	20,984,834	25,599,696	I. 4,614,862
Coke.....	8,375,392	9,326,687	I. 951,295
Total.....	32,237,449	38,684,536	I. 6,447,087

The total increase in tonnage this year was 20 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to Sept. 7 were 690,262 tons.

Anthracite coal shipments in August are reported at 5,716,552 long tons, being 316,041 tons more than in August, 1906. For the eight months ended Aug. 31 the ship-

ments, by companies, were as follows, in long tons:

	1906.		1907.	
	Tons.	Per Ct.	Tons.	Per Ct.
Reading.....	7,279,392	20.3	9,106,769	20.6
Lehigh Valley....	6,370,296	17.8	7,612,807	17.2
N. J. Central.....	4,394,979	12.3	5,785,407	13.1
Lackawanna.....	6,013,391	16.8	6,904,349	15.7
Del. & Hudson....	3,547,590	9.9	4,344,552	9.8
Pennsylvania....	3,031,835	8.5	3,851,991	8.7
Erie.....	3,561,714	10.0	4,782,998	10.8
N. Y., Ont. & W...	1,565,563	4.4	1,814,409	4.1
Total.....	35,767,760	100.0	44,203,282	100.0

All the companies showed increases; the total gain being 8,435,522 tons, or 23.6 per cent. The light tonnage in 1906 was, of course, due to the suspension in April and May of that year.

The Monongahela River Consolidated Coal and Coke Company reports the following coal shipments for the nine months of its fiscal year ended July 31:

	1906.	1907.	Changes.
By river.....	3,383,920	3,744,182	I. 360,862
By rail.....	1,390,526	1,442,478	I. 51,952
Total.....	4,773,846	5,186,660	I. 412,814

The net earnings for the nine months this year were \$1,751,213; charges \$1,072,079, leaving \$679,134 surplus.

Shipments of anthracite coal from Buffalo by Lake for the seven months ended July 31 were 1,921,005 tons.

The report of the New York, Ontario & Western Railroad Company for the fiscal year ended July 31, 1907, shows that the earnings from the transportation of coal were \$3,653,143, compared with \$3,070,385 in the previous year, an increase of \$582,758, or 19 per cent. The number of gross tons of coal transported from the Scranton Division (exclusive of supply coal for company's use) was 2,502,989, an increase of 216,552, or 95 per cent.

New York

ANTHRACITE

Sept. 11—There is a fairly strong demand for prepared sizes, but the greatest activity is still among the smaller grades of steam coal. With these the supply is decidedly short and the demand continues strong. Tidewater shipments are rather light and all-rail business is quite good for this time of the year. Prices are quoted as follows: Broken, \$4.65; egg, stove and chestnut, \$4.90; pea, \$3.25; buckwheat, \$2.75; rice, \$2.15@2.25; barley, \$1.75@1.85; all f.o.b. New York harbor.

BITUMINOUS

Trade in New York harbor is good and the demand is strong, especially for the

better grades of coal; fine coal and the poorer grades for steam purposes are in fair demand, but consumers prefer to pay the higher price asked for the best grades. Prices range from \$2.65 to about \$2.80 for fair quality and the best wide-seam coal brings as much as \$3 f.o.b. New York harbor.

Along the Sound the trade is calling for considerable coal, but there seems to have been little or no attempt to put in winter stocks in this territory. Transportation from mines to tide is good, cars running through in about schedule time. Car supply, however, shows a tendency to fall off recently and producers are beginning to report a shortage.

In the far East consumers are taking on considerable quantities of coal and the activity which has been apparent for some time does not seem to have abated to any extent. Vessels are in good demand, but are not any too plentiful, and freight rates are still maintained at their former high level; it is almost impossible to obtain a concession of even 5c. per ton to the far East. Freight rates are quoted as follows: From Philadelphia to Boston, Salem and Portland, \$1.10; to Providence, New Bedford and the Sound, 90c.; to Lynn and Bangor, \$1.25; to Gardiner, \$1.30@1.35; towages where usual.

Birmingham

Sept. 9—Coal operations in Alabama continue active. Considerable development throughout the coal-bearing districts in the State is being pushed, all efforts being made to get the mines in operation before the winter business fairly starts. The Birmingham Iron Company is opening two mines at Mulgay, in the western part of Jefferson county and according to a report made by two of the State mine inspectors, the mines promise to be the best equipped in Alabama. Two seams of coal will be worked in the two shafts, one seam being down about 200 ft. and the other more than 450 ft. The Alabama Consolidated Coal and Iron Company is making improvements at its mines while the Tennessee Coal, Iron and Railroad Company is doing considerable developing in the coalfields.

Coke is improving in demand and fairly good prices obtain. Positively no apprehension is felt because of the declining iron market. It is believed that the iron production will be kept at the top

notch despite the falling off in the demand.

Chicago

Sept. 9—Strength continues in the local coal market. All grades of coal, Western and Eastern, except screenings, are in good demand. Steam users and retailers are laying in stocks of Western coals, both in the city and country. Most of the shipments to the city have a quick passage to the consumers' bins, and there is practically no demurrage coal on tracks, either Western or Eastern. In the cases of some Eastern coals, indeed, scarcity of supplies is reported. All indications are for a continuation of the strength now manifest.

The demand and market prices of Western lump are steadily advancing, the present quotations running \$1.95@2.65. Run-of-mine from Illinois and Indiana mines brings \$1.60@2.10 on the great bulk of coal sold, and screenings are weak at \$1.10@1.50.

Eastern coals are in general scarce and the market continues strong. Hocking is in active demand at \$3.30, the September price; Youghiogeny is selling well at \$3.20 for ¾-inch and smokeless brings \$4.05 for lump and \$3.35 for run-of-mine, circular prices. Pittsburg No. 8 brings \$2.90 for 1¼-inch. Other Eastern coals are strong.

Anthracite sales are languishing somewhat under the coming of the September prices and no cold weather in sight yet. Sales generally are reported light.

Cleveland

Sept. 10—The coal market is quiet and is displaying a better tone. This is due to the heavy increase in lake shipments and the practical working off of the surplus supply in the city. Cash price of 50c. a ton at the mines still obtains for Ohio slack. The regular price of \$5.50 per gross ton for anthracite egg, stove and chestnut is now in force, the graded discount scale having expired Sept. 1. Prominent operators in the city are of the opinion that the price will be maintained through to next April.

The Chamber of Commerce reports receipts at Cleveland in August as follows: Anthracite, 9698 tons; bituminous coal, 685,109; coke, 92,557; total, 787,364 tons, all by rail. Shipments by rail were 230 tons anthracite, 9980 tons bituminous and 4437 tons coke; by lake, 482,685 tons bituminous coal.

Indianapolis

Sept. 9—The Indiana Railroad Commission has sustained the complaint against the Baltimore & Ohio and the Southern Indiana railroads and has ordered those roads to restore the old 50c. rate on coal from the Linton fields to the United States Cement plant at Lehman,

Ind. The roads raised the rate from 50c. to 75c. per ton recently.

A fine point has been raised at the Latta's Creek mine, where the men quit the mine and removed all their tools. This method of going out, they declare, is not a strike; but the operators have long contended that the stampede strikes, which the fine clause in the agreement was expected to prevent, cost them more than an advance of 5 or 10c. a ton in the rate of mining. They propose to resist strenuously any step by the miners which will tend to nullify the clause.

Complaint is made against the miners at the New Summit mine, near Linton, that the men are not doing sufficient work. The men paid a fine of \$1 a day for the eight days they were out on an unauthorized strike, and since then they are accused of "soldiering," so that the output of the mine was lessened one-third. The men did not earn as much money, but they hoped by the sacrifice to force the discharge of the mine boss, against whom they went on strike. The loss to the company in trade at this time is a big item and the matter is to be taken up by the board.

Pittsburg

Sept. 10—The market continues fairly active, with regular quotations on the basis of \$1.15@1.20 for mine-run coal at the mine, these prices being shaded in favorable contracts.

Connellsville Coke—While there has been an improvement in the labor supply and quite an increase in production, the market is, if anything, stronger than it was. Very little prompt coke is available and what is offered is bringing good figures, \$2.75@3 for furnace, and \$3.25@3.50 for 72-hour foundry. There is very little inquiry for contract coke, but in one instance a consumer was quoted \$3 for a very good grade of Connellsville furnace coke for delivery over the fourth quarter. The *Courier* in its summary gives the production for the week in both the upper and lower Connellsville fields at 425,411 tons, an increase of about 25,000 tons for the week. The shipments aggregated 14,688 cars, distributed as follows: to Pittsburg, 4845 cars; to points west of Connellsville, 8478 cars; to points east of Connellsville, 1365 cars.

Foreign Coal Trade

Shipments of coal from Nova Scotia mines for the seven months ended July 31 are reported as follows, in long tons:

	1906.	1907.	Changes.
Dominion.....	1,748,887	1,745,194	D. 3,693
N. S. Steel.....	335,725	323,290	D. 12,435
Cumberland.....	251,382	213,584	D. 37,798
Acadia.....	145,303	172,974	I. 27,671
Intercolonial.....	163,720	155,816	D. 7,904
Inverness.....	92,160	130,997	I. 38,837
Total.....	2,737,177	2,741,855	I. 4,678

There was a large increase in the July

tonnage this year, which offset the decreases of previous months.

Iron Trade Review

New York, Sept. 11—No special change is to be reported in the iron and steel markets this week. The disposition on the part of buyers to hold off still continues, and new orders are conspicuous by their absence in most branches of the trade. The revival which was anticipated with the opening of September is not yet apparent. Notwithstanding the lower level at which pig iron is offered, sales have not been large, and have been confined chiefly to small orders for material needed to keep foundries going. Basic iron has rather taken the lead in current business, but that has not been active. There are reports of sales of Southern foundry at low prices, but they cannot be confirmed.

In finished material the situation is quiet also. Negotiations are in progress for some large lots of structural steel, but they have not resulted in contracts up to the present time. Mills are still busy on outstanding contracts; but some are beginning to be a little anxious for the future, and are looking ahead for new business. The plate mills seem to be the best supplied with work at present.

The rail situation is not cleared up yet. The leading railroad companies still adhere to their demand for amended specifications, and the rail-makers are not inclined to concede the point without an increase in price. A large tonnage is being held back until the question is decided. It is understood that a conference is to be held in New York this week, at which the whole matter will be discussed. It is impossible to say, however, whether any agreement will be reached. There have been reports that the Baltimore & Ohio had given way and ordered 60,000 tons, without insisting on new conditions; but this is doubtful.

Canadian Rail Contracts—On Aug. 29 the Canadian government awarded a contract for the supply of 18,000 tons of 80-lb. steel rails, for the eastern division of the Grand Trunk Pacific railway, to the Dominion Iron and Steel Company, Sydney, Cape Breton, at about \$33.50 per ton, delivery to be made at Quebec. A contract for a similar quantity of rails, at \$34 per ton, was given to the Algoma Steel Company, Sault Ste. Marie, Ontario, for delivery at Fort William, Ontario.

Newfoundland Iron Ore—At a recent meeting of the directors of the Dominion Iron and Steel Company, it was decided to undertake the further development of the company's iron ore areas at Wabana, Newfoundland, for the sale and export of ore abroad in addition to supplying the Sydney steel plant. It was also resolved to push the development of all coal areas so as to render the company independent

of other companies as regards fuel supply as soon as possible.

Baltimore

Sept. 10—Exports from this port for the past week included 3203 tons steel rails and 218 tons splice-bars to Colon, Panama.

Imports for the week included 500 tons of spiegeleisen and 649 tons ferromanganese. Receipts of iron ore were 4100 tons from Cuba, and 5100 tons from Nicolaieff, Russia; 9200 tons in all. Three cargoes, 14,003 tons, of iron pyrites arrived from Huelva, Spain.

Birmingham

Sept. 9—The Southern pig-iron market is still dull and inclined to show weakness. There has been no further reduction in quotations and the manufacturers assert that there are no reasons why they should show alarm and that prices will hold at the new level until the end of the year, at least. The production continues quite healthy and the furnace companies are working hard to make deliveries on old orders. The shipments are equal to the production, which means there is no accumulation. Some inquiry is being received here for iron to be delivered during the first half of the coming year, but little of this is resulting in orders. Raw material supplies are easier and the work at the ore mines is being kept up with the intention of keeping all bins well filled. The home consumption is heavy, great activity being noted among the cast-iron manufacturers. Machine shops and foundries appear to have many orders on hand.

Steel rods, wire and nails are improving and better prices are said to be near at hand. The Tennessee Coal, Iron and Railroad Company is pushing the work on the new steel plant and announces the completion of five open-hearth furnaces. The furnaces will be started up in the near future. All the steel being manufactured in the Birmingham district is finding a ready demand with good prices prevailing.

Two of the rolling mills in the immediate Birmingham district are in full operation. The finished iron and steel is being shipped almost as quickly as it is produced. Good prices obtain in this product. Labor is scarce at iron and steel plants in this State.

Chicago

Sept. 9—The iron market continues very quiet, but there are signs of increasing interest in the contract business that heretofore has been almost nothing. Inquiries and actual orders show that melters are coming to realize that the bottom has not dropped out of the market. For the last quarter requirements orders are still numerous, though the tonnage of each order is small. In the disposition of most

buyers to provide only for immediate needs is apparent the spirit of the last three months—quick delivery being demanded together with willingness to pay the market price, provided the shipment can be delivered in time.

Prices for spot delivery are representative of only the small lots needed to fulfill contract requirements. Southern No. 2 for last-quarter delivery is bringing \$18.50 @19 Birmingham (\$22.85@23.35 Chicago) on most sales. There are reports of lower prices, but they do not seem to be substantiated. Northern is quoted on sales for the last quarter at \$23.50, with very little in the market.

Coke is firm at \$5.90 for 72-hour Connellsville and \$5.65 for West Virginia 72-hour.

Cleveland

Sept. 10—Despite the curtailment of operations on the docks at the upper lake ports during the early part of August, the shipments of those ports exceeded 6,000,000 tons of iron ore during the month. This was rendered possible by the fact that Duluth, Two Harbors, Escanaba and Superior put on double working shifts following the breaking of the strike, and utilized every effort to load the waiting ore boats. Heaviest receipts in Cleveland were during the latter part of the month, when the movement was again well under way. Wild tonnage for small cargoes is in greater demand, and vessel owners expect an active market from the middle of September on. Rates at present are holding steady.

The pig-iron market is not displaying as much strength this week, with sales of foundry grades at recessions. Some inquiry is noticed in the market for delivery for the first quarter of 1908. Deliveries for the last half of the current year are quoted as follows: Bessemer \$23.15@23.25; No. 1 foundry \$23@23.50; No. 2 foundry, \$22.50@23; No. 3 foundry, \$22@22.50; No. 2 Southern, \$22.85@23.35; gray forge, 21.50@21.75, Cleveland.

The Chamber of Commerce reports receipts at Cleveland in August as follows: Pig iron, blooms, etc., 81,489 tons; other iron and castings, 47,536; manufactured iron and steel, 68,329; total, 197,354 tons. Shipments were 41,439 tons pig; 73,818 other iron; 38,314 manufactured iron and steel; total, 153,571 tons. Receipts of iron ore by lake were 1,014,830 tons; shipments by rail, 738,321 tons.

Philadelphia

Sept. 12—There is a good deal to be heard in the offices as to the present condition and probable future course of pig iron, but nothing tangible can be said as to prices. Requirements for the fourth quarter, which ought to be placed now or soon, are not being covered to any extent. A few days will develop what

ever demand will be presented. It is impossible to quote actual selling prices this week, in view of the unsettled conditions. Basic is an exception. The drop it encountered drew out a few large buyers and sales have been made. No. 2 X foundry has also been purchased, but in a small way. The mills are not buying forge this week.

Steel Billets—A fair amount of business has been done but most interest centers in the prices at which new business will be done toward the latter end of the month. Billets will be needed in large lots, but manufacturers or their representatives are not making any predictions as to prices, except as to forging billets which are exceptionally strong.

Bars—The 1.85c. base price for refined bars is the rule and the volume of business is good at all mills throughout our territory. Cheaper scrap is having no effect. The store demand for bars has picked up very much since Sept. 1.

Sheets—The retail requirements are increasing and city and country stores are doing an excellent business in all kinds. Stock is being purposely accumulated at one or two mills. Prices are firm and consumers take on the output of light sheets as fast as produced.

Pipes and Tubes—The retail selling prices continue at the top notch, and while present demand is not active, the consumption of supplies is heavy. Prices are firm.

Plates—Mills have booked a few large orders within a week for railroad terminal work and country and city bridge work. The mills are working full time and the management says a large amount of new orders will soon be entered.

Structural Material—Nearly all our current business is in small lots, but the aggregate is encouraging. Municipalities and county authorities are doing a good deal of small bridge work. Strong prices of course prevail for small orders. Large orders are to be placed in a few days and terms have been practically made calling for upward of 25,000 tons.

Steel Rails—The steel rail makers in this district say that there will be no further delay in fixing up the tangle in steel rails and that orders for more than 750,000 tons will be the result of the understanding to be arrived at shortly.

Scrap—The scrap market after settling down to a lower level of values is now presenting some life. The larger scrap buyers are not in the market and they decline to entertain proposals from the scrap dealers at this time.

Pittsburg

Sept. 10—There is no material change in the iron and steel market situation. The local trade continues to maintain that

there is a better sentiment, but it certainly has not borne fruit in heavier buying, as there is a dullness in all lines, amounting almost to stagnation. Reports from other districts do not indicate that there has been an improvement even in sentiment. The Eastern blast furnaces, for instance, continue to offer pig iron for delivery at Pittsburg, although no market can be found for it.

On old contracts specifications keep up fairly well and deliveries are well taken. In many cases mills are still far behind in deliveries. This is particularly true of billets, shipments on many contracts being far behind, with consumers endeavoring to buy additional tonnage elsewhere. The large plate mills, making heavy plates for structural, ship and car purposes, are still well filled with business, but the smaller mills, making light and narrow plates, are already getting less business than they can handle.

In some optimistic quarters predictions are made of a general buying movement about the middle of next month; but, generally speaking, there is nothing on which to base predictions, and the rank and file of the trade are quietly awaiting developments.

Pig Iron—There are several reports of sales of from 1000 to 1500 tons of bessemer having been made at \$21.50, Valley, 50c. under what has been the recognized market. While these reports are not absolutely confirmed, it is recognized that it is only the scarcity of bessemer ores which would prevent a material decline, as all grades of pig iron are more or less weak. In foundry pig there is more inquiry, and larger lots are asked for; but it is far from certain that these inquiries are serious, and some of the furnaces are evidently not naming their inside prices, believing that the time is not yet ripe for trying to force sales. Detached furnaces, east of Pittsburg, are quoting \$22.25@22.45, delivered Pittsburg, on No. 2, and it is believed that they would do \$22 on a firm offer. The Valley furnaces are quoting \$21.50@22, Valley, on early delivery, but it is believed they would do \$21 or less, furnace, on a round tonnage for fourth quarter. Forge is weak at about \$1 below foundry. There is no inquiry for basic, and it is uncertain what price could be done. As low as \$20.25, f.o.b. Lake Erie furnace, has been quoted without attracting business.

Steel—As noted, deliveries on old contracts are very poor. In several instances less than 15 per cent. of steel specified for third quarter has been delivered to date, and there is no material improvement in deliveries. Nevertheless, the mills which are delinquent would probably name still lower prices for fourth quarter and apparently are looking for quite a sudden falling off in demand. For prompt delivery, bessemer billets are about \$29.50, delivered Pittsburg, and open-hearth

\$31.50, Pittsburg. For deliveries over the fourth quarter 50c. less than these prices could be done.

Sheets—New business has become rather light, and none of the mills is far behind in deliveries of black, while in galvanized sheets they are still considerably behind. Demand for heavy-gage sheets and light plates has become quite unsatisfactory, mills not getting in enough tonnage to run full. Prices are unchanged at 2.60c. for black and 3.75c. for galvanized, No. 28 gage.

Ferro-Manganese—The market is very quiet and prices are not over firm. Prompt carloads are quoted at about \$62, delivered Pittsburg, fourth quarter being about \$60, Pittsburg.

Cartagena, Spain

Aug 24.—Messrs Barrington & Holt report as follows: The local market is distinctly quiet, and there is but little demand for ore of any class, either for prompt or forward delivery; but the general opinion is that later on, when ore freights are easier, there will be a renewed demand and at better prices than lately offered. Exports for the week were 1000 tons to Marseilles and 6100 to Great Britain; 7100 tons in all.

For iron ores prices are a little lower; they are, f.o.b. shipping port: Ordinary 50 per cent. ore 9s.@9s. 3d.; special low phosphorus, 10s.; specular ore, 55 per cent., 12s. For manganiferous ores, same delivery, No. 3 ore, 35 per cent. iron and 12 manganese, is 13s. 9d.; no higher grades on the market.

Pyrites—The price of iron pyrites, 40 per cent. iron and 43 sulphur, 11s. 9d. per ton, f.o.b. shipping port.

London

Aug. 31.—The past year has been an excellent one for English iron companies. Most of these companies report for fiscal years ending between March 31 and June 30. The *Economist* has compiled the statements of 11 large companies, which may be considered representative, for the year last closed. The net profits of these eleven companies for 1906-7 amounted to £1,949,628, as compared with £1,538,688 in the previous year, thus showing an increase of £410,940, or 26.4 per cent. When it is remembered that the year 1905-6 showed a very striking advance on its predecessor, and that wages and fuel increased greatly in cost during 1906-7, the latest results indicate a very high degree of prosperity in the British iron and steel industries, and favorable conditions for those financially interested in them. The total dividends paid amounted to £901,262 in 1906, and £1,193,967 in 1907; an increase of £292,705, or over 32 per cent.

A substantial increase in profits was secured by a large majority of the companies, the chief exceptions being R. & W.

Hawthorne, Leslie & Co., and the Steel Company of Scotland.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Sept. 11.

At all United States Ports in July and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1907..	\$ 7,478,366	\$ 3,390,962	Exp. \$ 4,087,404
" 1906..	1,302,248	9,834,333	Imp. 8,532,085
Year 1907..	43,779,098	24,859,609	Exp. 18,919,489
" 1906..	32,912,962	72,372,111	Imp. 39,459,149
Silver:			
July 1907..	5,955,052	3,361,100	Exp. 2,593,952
" 1906..	4,360,628	3,277,706	" 1,082,922
Year 1907..	35,174,251	25,756,711	" 9,417,540
" 1906..	37,797,855	26,954,534	" 10,843,321

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Sept. 7 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 155,000	\$ 319,104	\$ 1,557,847	\$ 64,853
1907.....	32,501,587	7,392,236	35,399,789	1,603,326
1906.....	5,952,743	49,599,427	40,402,511	1,492,662
1905.....	38,280,843	1,301,324	22,860,993	2,505,491

Exports of gold for the week were chiefly to France; of silver to London. Imports for the week, both gold and silver, were from Mexico, Central America and South America.

The joint statement of all the banks in the New York Clearing House for the week ending Sept. 7, shows loans \$1,088,597,200, an increase of \$611,800; deposits, \$1,046,485,000, a decrease of \$170,800, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	\$169,341,600	\$200,317,400
Legal tenders.....	77,634,000	68,676,200
Total cash.....	\$246,975,600	\$268,993,600
Surplus.....		\$ 7,372,350
Deficit.....	\$ 6,577,925	

The surplus over legal requirements shows a decrease of \$1,384,100, as compared with the previous week this year.

Specie holdings of the leading banks of the world, Sept. 7 are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York.....			\$200,317,400
England.....	\$190,818,995		190,818,995
France.....	559,019,420	\$193,940,560	752,959,980
Germany.....	168,500,000	46,700,000	215,200,000
Spain.....	77,590,000	129,620,000	207,210,000
Netherlands.....	30,168,500	27,940,000	58,108,500
Belgium.....	15,820,000	7,910,000	23,730,000
Italy.....	171,445,000	24,918,500	196,363,500
Russia.....	586,165,000	34,450,000	620,615,000
Aust.-Hungary.....	226,250,000	60,550,000	286,800,000
Sweden.....	21,250,000		21,250,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables of the *Commercial and Financial Chronicle* of New York.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to Aug. 29:

	1906.	1907.	Changes.
India.....	£ 11,759,543	£8,086,834	D. £ 3,672,709
China.....	280,700	.....	D. 280,700
Straits.....	1,750	598,700	I. 596,950
Total.....	£ 12,041,993	£8,685,534	D. £ 3,356,459

Receipts for the week were £1000 from the West Indies; £144,000 in bars and £142,000 in Mexican dollars from New York; a total of £287,000. Exports were £1000 to Egypt; £149,500 in bars and £69,000 in Mexican dollars to India; £219,500 in all.

Indian exchange has been weaker, and the average price paid for the Council bills offered in London was 15.97d. per rupee. The demand for silver in London on Indian account has been good.

The Treasury Department estimate of the money in the United States on Sept. 1 is as follows:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury).....	\$ 201,267,465	\$ 560,356,994
Gold certificates.....	83,083,260	627,905,609
Silver dollars.....	8,339,162	82,114,368
Silver certificates.....	11,505,829	460,505,171
Subsidiary silver.....	8,385,569	123,118,909
Treasury notes of 1890.....	9,089	5,777,961
U. S. notes.....	4,179,244	342,501,772
Nat. Bank notes.....	17,135,485	586,920,836
Total.....	\$333,855,053	\$2,789,201,620

Population of the United States, Sept. 1, 1907, estimated at 86,311,000; circulation per capita, \$32.32. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the treasury as assets of the Government does not include deposits of public money in national-bank depositories to the credit of the treasurer of the United States. The total in circulation shows an increase of \$7,878,060 over Aug. 1; and of \$22,288,321 over Sept. 1, 1907. A revised estimate by the Director of the Mint of the stock of gold coin was adopted in the statement for Aug. 1, 1907. There was a reduction of \$135,000,000 in the amount.

Transvaal gold output for August is reported at 555,027 oz. fine, the highest monthly production on record, and 22,316 oz. more than in July. For the eight months ended Aug. 31 the total output was 3,657,357 oz. in 1906 and 4,226,470 oz. in 1907, an increase of 569,113 oz. The gold reported this year was \$87,361,135 in value.

The silver market has been quiet, without any special features, and in the absence of any India orders the tendency has been toward a slight decline.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.52½	\$0.54½
Peruvian soles and Chilean.....	0.48	0.50
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.80	3.86
Spanish 25 pesetas.....	4.78	4.80

SILVER AND STERLING EXCHANGE.

Sept.	Sterling Exchange.	Silver.		Sept.	Sterling Exchange.	Silver.	
		New York, Centa.	London, Pence.			New York, Centa.	London, Pence.
5	4.8620	68½	31 1/8	9	4.8610	68½	31 1/8
6	4.8620	68½	31 1/8	10	4.8605	68½	31 1/8
7	4.8620	68½	31 1/8	11	4.8600	67½	31 1/8

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Sept.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
5	17½	17	72½	36½	5.25	5.35	5.20
6	@17	@17½	73½	37	5.25	@5.40	@5.25
7	@17½	@17	.....	37	4.75	@5.35	@5.20
9	17	16½	72½	37½	4.75	5.25	5.10
10	@17½	@16½	70½	37½	4.75	@5.27½	@5.12½
11	@17½	@16	68½	36½	4.75	5.25	5.10

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b.'s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper—The market is in a very unsatisfactory condition. Domestic consumers are buying only retail quantities for immediate shipment, and there has been no large business doing for home trade.

Orders from Europe also have been falling off in volume, though some little business is doing there from day to day at steadily declining prices. The close is weak at 16¾@17¼c. for lake; 16@16½c. for electrolytic in cakes, wirebars or ingots, and 15¾@16c. for casting copper.

The standard market in London declined steadily from day to day, but Wednesday there was a very serious break which bordered on demoralization, when prices touched £67 10s. for spot and £67 15s. for three months. At the second call bear covering of large proportions saved the day, and prices at the close are firmer at £68 10s. for spot and £69 for three months.

Refined and manufactured sorts are quoted: English tough, £68; best selected, £75; strong sheets, £81.

The lower prices do not appear to present sufficient inducement for manufacturers to come into the market as yet for any large quantities. The prevailing want of confidence in the future is strongly in

evidence, even though it does not seem to be wholly justified by the actual conditions. Business is largely in suspense for the present until there is a more settled feeling.

Exports of copper from New York for the week are reported at 1244 long tons. Our correspondent reports the exports from Baltimore for the week at 561 tons fine copper.

Copper Sheets—The base price of copper sheets is now quoted at 24c. per lb.

Copper Wire—The price of copper wire remains the same as last week. The base price for No. 0000 to No. 8 is 20¼@21¼c. per lb.

Tin—The market in London is easing off, and generally speaking has a rather unstable appearance. The close is cabled as easy at £166 for spot and £165 5s. for three months. The demand from consumers is light and prices are being shaded for the little business which is offered. The market at the close is quoted 36½@36¾ cents.

Lead—On Friday last the American Smelting and Refining Company reduced its price to 4.75, f.o.b. New York. Outside brands can be bought at a discount still.

The London market shows a great deal of strength, which is rather surprising, in face of the weakness prevailing in all other metals. The reports indicate small shipments from Australia and a scarcity of spot supplies, which has helped to bring about an advance to £19 17s. 6d. for Spanish and £20 for English lead.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Aug. 24: The local price for pig lead on wharf for the past week has been 91.25 reales per quintal, which, with exchange at 28.63 pesetas per £1, is equivalent to £17 16s. 9d. per ton of 2240 lb., Cartagena; silver being quoted at 14.50 reales per ounce. Exports for the week were 512 tons argentiferous and 150 tons desilverized lead to London; 245 tons argentiferous and 66 tons desilverized to Marseilles; 973 tons in all.

Spelter—The market shows a great deal of weakness. Buyers are few and far between, and smelters are trying to force their accumulations on the market. The close is weak at 5.25@5.27½ New York and 5.10@5.12½ St. Louis.

The London market continues to decline, and the close is cabled at £20 15s. for good ordinaries and £21 for specials.

Zinc Sheets—The base price is now \$7.75 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru, in 60-lb. cases for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.50c. per 100 lb.

Silesian Spelter Market—Under date of Aug. 28 Paul Speier reports from Breslau that little improvement is to be looked for

in the spelter situation. The consumers continue to hold back from the market and show signs of recovering confidence for the future. Prices of Silesian spelter are 43.50@45 marks per kg. (4.71@4.86c. per lb.) according to size and condition of order. Zinc sheets are quoted at 53@56 marks per 100 kg. (5.72@6.05 per lb.) at Upper Silesian shipping points. For zinc dust prices have yielded somewhat. On lots of 10 tons 44.25@44.50 marks per 100 kg. f.o.b. Stettin (4.78@4.80c per lb.) were quoted including barrels.

Exports and imports of zinc and zinc products from Germany for the seven months ended in July were as follows in metric tons:

	Imports.		Exports.	
	1906.	1907.	1906.	1907.
Spelter.....	19,778	18,211	34,983	36,472
Zinc sheets.....	42	74	8,808	10,825
Zinc scrap.....	1,324	656	2,867	4,017
Zinc ore.....	102,346	101,312	24,765	18,880
Zinc-dust.....	530	.....	1,313	.....
Zinc oxide.....	3,582	.....	10,715	.....
Lithophone.....	916	1,266	4,402	5,245

The changes this year have not been large or important.

Antimony—Advices by cable state that there is a scarcity of crude antimony in English and Continental markets, and that an advance is likely. Local dealers are advised from abroad not to sell without confirmation of prices. Recently there have been several inquiries for the crude metal emanating from abroad which would seem to confirm this report. Quotations are 10@10³/₄c. for Cookson's, 9c. for Hallitt's, and 8¹/₂@9¹/₂c. for ordinary brands.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and term of order. For small quantities prices are 50@65c., same delivery.

Quicksilver—Current prices in New York are \$40 per flask of 75 lb. for large quantities and \$41 for smaller orders. San Francisco orders are \$37.50@38.50 per flask, according to quantities, for domestic orders, and \$36.50@37 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Platinum—The market is in rather peculiar shape at present and producers are unable to forecast the probable turn in prices. The demand continues good but there seems to be an unsettled condition. Prices have, however, not changed from last week and are quoted as follows: Ordinary metal, \$28.50; hard metal, \$31; and scrap, \$23@24 per troy ounce.

Imports and Exports of Metals

Tin—Imports of tin into the United States for the seven months ending July 31, were as follows, in long tons:

	1906.	1907.	Changes.
Straits.....	8,871	8,802	D. 69
Australia.....	606	508	D. 98
Great Britain.....	15,498	14,320	D. 1,178
Holland.....	292	776	I. 484
Other Europe.....	963	611	D. 352
Other countries.....	36	58	I. 22
Total.....	26,266	25,075	D. 1,191

The total decrease in the imports this year was 4.5 per cent.

Copper—Exports of copper from the United States for the seven months ended July 31 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each.

	1906.	1907.	Changes.
Great Britain.....	13,809	9,820	D. 3,989
Belgium.....	1,390	676	D. 714
France.....	20,411	16,477	D. 3,934
Italy.....	4,460	4,942	I. 482
Germany and Holland.....	66,475	54,445	D. 12,030
Russia.....	1,550	1,526	D. 24
Other Europe.....	6,719	5,721	D. 998
Canada.....	806	885	I. 79
China.....	1,602	.....	D. 1,602
Other countries.....	183	193	I. 60
Total metal.....	117,355	94,685	D. 22,670
In ores and matte.....	3,860	3,511	D. 349
Total.....	121,215	98,196	D. 23,019

The total decrease was 19 per cent. The actual quantity of ores and matte exported this year was 53,731 tons, of which 43,594 tons were to Canada, 9,843 tons to Mexico, 294 tons to Europe.

Imports into the United States of copper and copper material for the seven months ended July 31, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico.....	21,420	10,681	32,101
Canada.....	7,675	3,259	10,934
Great Britain.....	10,105	.....	10,105
Japan.....	.....	6,411	6,411
South America.....	.....	2,155	2,155
Other countries.....	13,393	1,546	14,939
Total imports.....	59,004	17,641	76,645
Re-exports.....	154	.....	154
Net imports.....	58,850	17,641	76,491
Net imports, 1906.....	44,698	12,835	57,533

The total increase in the net imports was 18,958 tons, or 33 per cent. The actual tonnage of ores and matte imported this year from Mexico was 62,350 tons; from Canada and Newfoundland, 83,376; from South America, 15,227; from other countries, 27,628 tons.

The exports and net imports compare as follows with the seven months:

	1906.	1907.	Changes.
Exports.....	121,215	98,196	D. 23,019
Net imports.....	57,533	76,491	D. 18,958
Excess, exports.....	63,682	21,705	D. 41,977

This shows a decrease this year of 65.9 per cent. in the excess of exports.

Lead—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the seven months ended July 31, in short tons of 2000 lb. each:

	1906.	1907.	Changes.
Lead, metallic.....	8,370	7,197	D. 1,173
Lead in ores and base bullion.....	47,237	35,664	D. 11,573
Total imports.....	55,607	42,861	D. 12,746
Re-exports.....	29,074	26,061	D. 3,013
Net imports.....	26,533	16,800	D. 9,733

Of the imports this year 30,885 tons were from Mexico, and 4570 tons from Canada. Exports of domestic lead were 57 tons in 1906, and 27 tons in 1907; a decrease of 30 tons.

Spelter—Exports of spelter, zinc dross and zinc ores from the United States for the seven months ending July 31 are reported as below, zinc ore being in long tons, the others in short tons:

	1906.	1907.	Changes.
Spelter.....	2,961	383	D. 2,568
Zinc dross.....	8,178	7,475	D. 703
Zinc ores.....	18,364	11,121	D. 7,243

Imports of spelter for the seven months were 2082 short tons in 1906, and 522 tons in 1907; a decrease of 1560 tons. Imports of zinc ore reported this year were 6279 tons calamine in July; previous to July 1 these imports were not reported.

Antimony—Imports of antimony into the United States for the seven months ended July 31, were as follows, in pounds:

	1906.	1907.	Changes.
Metal and regulus.....	4,351,214	5,141,911	I. 790,697
Antimony ore.....	974,948	1,882,783	I. 907,835

There was a large increase in metal and a still larger one, proportionately, in ore.

Nickel—Imports of nickel ore and matte into the United States for the seven months ended July 31, were 8525 tons in 1906, and 9537 tons, containing 11,167,735 lb. metal in 1907. The metal contents were not reported last year.

Exports of nickel, nickel oxide and nickel matte for the seven months were 6,931,506 lb. in 1906, and 5,992,148 lb. in 1907; a decrease of 939,358 lb. this year.

Quicksilver—Exports of quicksilver from the United States for the seven months ended July 31, were 303,559 lb. in 1906, and 310,936 lb. in 1907; an increase of 7377 lb. this year.

Platinum—Imports of platinum into the United States for the seven months ended July 31, were 6594 lb. in 1906, and 3527 lb. in 1907; a decrease of 3067 lb. this year.

Aluminum—Exports of aluminum from the United States for the seven months ended July 31, were valued at \$137,353 in 1906, and \$208,534 in 1907; an increase of \$71,181 this year.

Missouri Ore Market

Joplin, Mo., Sept. 7—The highest price reported paid for zinc ore was \$45 per ton, on an assay base ranging from \$38@43 per ton of 60 per cent. zinc. The average price was \$39.98.

The highest price reported paid for lead was \$61 per ton, ranging down to \$56 for the bulk of the week's settlements. Week-end offers were lower, ranging from \$50@54 per ton. The average price was \$59.62.

The movement to restrict the output began in earnest last night and tonight, by the closing down of a number of the larger producing mills of the district—mills included in the beginning of the movement that were required to run a part of this week to fill advance sales of ore. In

the clean-up the output, instead of being restricted, was increased. It is estimated by producers that the mills now shut down will restrict the output from 40 to 50 per cent., but the smelter agencies place the decrease at from 20 to 25 per cent. of the average output, or from 1000 to 1200 tons weekly. It is possible that a mean between the two is the actual condition. The heavy decline in pig lead will have a strong bearing on the closing-down situation, as this decline will change a number of mills from the credit to the debit side. Few, if any, of the free ore mines immediately around Joplin will join in the restriction movement, as these can still show a respectable profit, but present conditions leave a profit margin for only the very richest of the mines of the sheet-ground section of the district.

Following are the shipments of zinc and of lead from the various camps reporting sales for the week ending Sept. 7:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	3,409,270	508,100	\$86,839
Joplin.....	2,366,780	183,460	56,498
Prosperity.....	323,460	565,210	23,748
Duenweg.....	847,320	159,300	22,572
Granby.....	1,325,000	115,000	18,000
Alba-Neck City.....	607,350	.....	13,361
Galena.....	450,370	48,330	10,858
Aurora.....	468,840	20,000	10,425
Oronogo.....	249,910	38,090	6,590
Spurgeon.....	60,430	111,470	4,440
Badger.....	181,610	4,330	4,121
Sarcozie.....	127,170	.....	2,606
Zincite.....	91,700	4,980	2,070
Playter.....	63,830	3,730	1,427
Stott City.....	53,310	.....	1,092
Totals.....	10,626,450	1,760,000	\$264,647

36 weeks.....423,970,000 65,608,410 \$12,223,493
 Zinc value, the week, \$212,123; 36 weeks, \$9,754,009
 Lead value, the week, 52,524; 36 weeks, \$2,469,484

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January...	47.38	45.84	January...	75.20	83.83
February...	47.37	47.11	February...	72.83	84.68
March.....	42.68	48.66	March.....	73.73	82.75
April.....	44.63	48.24	April.....	75.13	79.76
May.....	40.51	45.98	May.....	78.40	79.86
June.....	43.83	44.82	June.....	80.96	73.66
July.....	43.26	45.79	July.....	74.31	68.18
August.....	43.56	43.22	August.....	75.36	59.54
September.	42.58	.....	September.	79.64	.....
October.....	41.65	.....	October.....	79.84	.....
November..	44.13	.....	November..	81.98	.....
December..	43.68	.....	December..	81.89	.....
Year.....	43.24	.....	Year.....	77.40	.....

Chemicals

New York, Sept. 11—The market shows no special features and is neither strong nor weak, except in metallic salts, which are dependent upon the price of metals.

Copper Sulphate—The demand among large consumers has fallen off to such an extent and the price of copper metal is so uncertain that the market for copper sulphate has reacted and carload lots are now being offered at \$6.50 per 100 lb. Smaller lots bring \$6.75, according to seller and terms of sale.

Exports of copper sulphate from the United States for the seven months ended

July 31 were 18,090,024 lb. in 1906 and 6,048,430 lb. in 1907, a decrease of 12,041,594 lb. this year.

Nitrate of Soda—The market is strong and business is good, with prices holding firm. For spot delivery 96 per cent. is quoted at 2.52½c. and 95 per cent. at 2.45c. For 1908 delivery these grades are practically the same, while for 1909 delivery 2.40c. is quoted for 95 per cent. grade.

Messrs. Mortimer & Wisner, of New York, report statistics of nitrate in the United States on Sept. 1 as follows, in long tons:

	1906.	1907.	Changes.
Stocks, Jan. 1.....	13,100	13,050	D. 50
Imports, 8 mos.....	181,780	221,345	D. 20,635
Total supplies.....	194,880	234,395	D. 20,685
Deliveries, 8 mos.....	192,280	229,850	D. 10,360
Stocks, Sept. 1.....	2,600	4,545	D. 10,325
Afloat for U. S. ports.....	90,000	100,000	I. 40,000

Imports are all from the west coast of South America. The quantity afloat includes all cargoes due to arrive at U. S. ports before Dec. 15.

Imports of heavy chemicals into the United States for the seven months ended July 31 are reported as follows, in pounds:

	1906.	1907.	Changes.
Bleaching powder	63,968,952	67,837,765	I. 3,868,813
Potash salts.....	141,363,368	139,218,338	D. 2,145,030
Soda salts.....	12,523,199	12,626,022	I. 102,823

Exports of acetate of lime for the seven months were 36,553,102 lb. in 1906 and 52,224,044 lb. in 1907, an increase of 15,670,942 lb. this year.

Phosphates — Exports of phosphates from the United States for the seven months ended July 31 were, in long tons:

	1906.	1907.	Changes.
Crude and rock.....	585,481	588,291	I. 2,810
All other.....	13,652	18,010	I. 4,358
Total.....	599,133	606,301	I. 7,168

The larger exports this year were 170,687 tons to Germany; 107,625 to Great Britain; 88,759 to France; 52,237 to Italy.

Sulphur—Imports of sulphur and pyrites into the United States for the seven months ended July 31 were, in long tons:

	1906.	1907.	Changes.
Sulphur.....	56,087	10,295	D. 45,792
Pyrites.....	323,137	357,694	I. 34,557

The decrease in sulphur imports is due to the utilization of Louisiana sulphur in place of the Sicilian product. Estimating sulphur contents of pyrites, the total imports of sulphur were 185,342 tons in 1906 and 153,373 tons in 1907, a decrease of 31,969 tons.

Mining Stocks

New York, Sept. 11—The stock markets continue weak and prices were depressed nearly all week, reaching the climax today when the prices broke several points, due in all probability to the action of the board of directors of the Calumet & Hecla Company in reducing the divi-

dend of that stock from \$20 to \$15. This is the second cut in dividends recorded in Michigan stocks, the Quincy company having taken the first step in this direction. Amalgamated Copper broke \$4½, closing at \$66¾, a loss of more than \$7 for the week. American Smelting common advanced to \$101¾, only to lose this gain, closing at \$96¾. United States Steel common closed at \$31¾ and the preferred at \$94¾; Newhouse at \$9¾; Tennessee copper at \$34½; and Utah copper at \$24½.

The curb reflected the weakness of mining stocks on the Exchange, and many stocks showed a decided shrinkage in value. Nipissing sold down to \$7½; Butte Coalition to \$18, Nevada Consolidated to \$10¾, Cumberland-Ely, to \$6¾ and Greene-Cananea was very weak, selling down to \$10 at the close.

The success of the sale of New York city bonds was expected to stimulate the stock market, but failed to do so today.

Boston

Sept. 10 — The copper-share market closed demoralized tonight. The continued weakness of the metal, or rather lack of recovery, added to the fact that the Calumet & Hecla management has seen fit to reduce the quarterly dividend rate which has been in vogue almost a year, and the likelihood of further cuts by other companies has wrought havoc in market prices. There was a period last week when prices showed a hardening tendency and the small investor was apparent, but this has been all lost and more, too. Six dividends have thus far been announced since the break in the metal and two of them, Quincy and Calumet & Hecla, have reduced their rates. North Butte, Butte Coalition, Calumet & Arizona and Copper Range maintained their usual dividend rates.

Calumet & Hecla is off over \$25 for the week, selling below \$700. The directors declared \$15 today for the quarter, against \$20 the previous three quarters. Copper Range declared the regular \$2 dividend, but even then the stock is off \$7 to \$60.12½. North Butte is likewise off \$9.75 to \$56. The selling of this and other Cole-Ryan stocks has raised many questions, as they are recognized as Standard Oil propositions. Butte Coalition is off \$2.25 to \$17.87½ and Greene-Cananea \$4.50 to \$10. Already curtailment of production has been ordered by the Amalgamated people. Utah Consolidated is off \$4.50 to \$40. The directors are expected to meet for dividend action shortly, although no change is now expected in the rate.

Amalgamated is off \$7.12½ to \$66.50; Old Dominion has lost \$5.25 to \$25.50; Osceola, \$13 to \$97; Quincy, \$7.50 to \$85, ex-dividend; Tamarack, \$7 to \$70, and Wolverine \$3 to \$139. The latter company is the next one which, it is expected,

will reduce its dividend rate. Other dividends declared, and without change, are the Champion Copper Company, which has declared three \$1 dividends, making \$10 this year, or about the same as for 1906, and the St. Mary's Mineral Land Company, which has declared a regular \$1 quarterly dividend. Calumet & Arizona has had a \$23 decline, touching \$132. This is the most serious decline to be recorded for the week. Mohawk is off \$6.50 to \$64; Shannon, \$2.75 to \$12; Trinity, \$2.25 to \$15; La Salle, \$2 to \$11; Isle Royale, 1.25 to \$15.75; Franklin, \$1.50 to \$9.75; Arizona Commercial, \$2.25 to \$15.50; Atlantic, \$2.50 to \$11.25; Boston Consolidated, \$2.12½ to \$19; Centennial, \$1.50 to \$21; Michigan, \$1 to \$11; and United States Smelting, \$1 to \$39.50.

STOCK QUOTATIONS

NEW YORK Sept. 10		BOSTON Sept. 10	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	¾	Adventure.....	2½
Am. Nev. M. & P. Co.	¾	Allouez.....	34
Amalgamated.....	66½	Am. Zinc.....	29½
Anaconda.....	43¼	Arcadian.....	11
Balakiala.....	7	Atlantic.....	11½
British Col. Cop.	7	Bingham.....	11
Buffalo Cobalt.....	2	Boston Con.....	19
Butte & London.....	18	Calumet & Ariz.*	132
Butte Coalition.....	18	Calumet & Hecla.	699
Butte Cop. & Zinc.	18	Centennial.....	21½
Cobalt Contact.....	1½	Con. Mercur.....	38
Colonial Silver.....	1½	Copper Range*..	60½
Cum. Ely Mining.....	9	Daly-West.....	13½
Davis Daly.....	7	Franklin.....	10
Dominion Cop.....	3½	Greene-Can.....	10
El Rayo.....	3¾	Isle Royal.....	15½
Foster Cobalt.....	70	La Salle.....	11
Furnace Creek.....	¾	Mass.....	11
Giroux Mine.....	6½	Michigan.....	11
Gold Hill.....	1½	Mohawk.....	64
Granby, Nev.....	1½	Mont. C. & C. (new)	2½
Greene Gold.....	1½	Nevada.....	10½
Greene G. & S.....	1½	North Butte*..	56
Greenw'r & D. Val.	75	Old Colony.....	25½
Guanajuato.....	3½	Old Dominion.....	97
Guggen. Exp.....	180	Osceola.....	97
Hanapah.....	35	Parrot*.....	14½
McKinley Dar.....	¾	Phoenix.....	85
Micmac.....	3¾	Quincy*.....	85
Mines Co. of Am.....	1½	Rhode Island.....	4
Mitchell Mining.....	1½	Santa Fe.....	12
Mont. Sho. C. (New)	6	Shannon.....	12
Nev. Utah M. & S.....	4½	Tamarack.....	70
Newhouse M. & S.....	9¾	Trinity.....	15
Nipissing Mines.....	7¾	United Cop., com.	9¼
Old Hundred.....	2½	U. S. Oil.....	40
Silver Queen.....	95	U. S. Smg. & Ref.	39¾
Stewart.....	1¾	U. S. Sm. & Re., pd.	40
Tennessee Cop'r.	34½	Utah Copper.....	5½
Union Copper.....	1	Victoria.....	7
Utah Apex.....	5½	Washington.....	7
West Columbus.....	11	Wolverine.....	139
		Wyandotte.....	139

N. Y. INDUSTRIAL

Am. Agri. Chem.....	96¾
Am. Smelt. & Ref.	99¾
Am. Sm. & Ref., pf.	23¾
Bethlehem Steel.....	51½
Colo. Fuel & Iron.....	77
Federal M. & S., pf.	47¾
Inter. Salt.....	438
National Lead.....	31½
National Lead, pf.	94¾
Pittsburg Coal.....	31½
Republic I. & S.....	94¾
Republic I. & S., pf.	31½
Sloss-Sheffield.....	94¾
Standard Oil.....	31½
Tenn. C. & I.....	94¾
U. S. Red. & Ref.....	31½
U. S. Steel.....	94¾
U. S. Steel, pf.....	31½
Va. Car. Chem.....	94¾
Va. I. Coal & Coke	31½

ST. LOUIS Sept. 7

N. of Com.	Hgh.	Low.
Adams.....	40	30
Am. Nettle.....	04	03
Center Cr'k.....	2.30	2.00
Cent. C. & C.....	67.00	67.00
C. C. & C. pd.....	79.00	78.00
Cent. Oil.....	115.00	110.00
Columbia.....	4.00	2.50
Con. Coal.....	28.00	25.00
Doe Run.....	140.00	130.00
Gra. Bimet.....	37	30
St. Joe.....	16.00	14.00

*Ex. Div. †Ex. Rights.

BOSTON CURB

Ahmeek.....	.....
Ariz. Com.....	.....
Black Mt.....	4½
East Butte.....	6½
Hancock Con.....	7
Keweenaw.....	7
Majestic.....	2½
Raven.....	1½
Shawmut.....	43
Superior.....	11½
Superior & Pitts.	11½
Troy Man.....	1½

LONDON Sept. 11

Name of Com.	Clg.
Dolores.....	£1 5s 0d
Stratton's Ind.....	0 2 6
Camp Bird.....	0 19 0
Esperanza.....	2 1 3
Tomboy.....	1 7 6
El Oro.....	1 5 0
Oroville.....	0 16 3
Somera.....	0 15 0
Utah Apex.....	0 15 0
Ariz. Cop., pd.....	3 3 1
Ariz. Cop., def.....	3 2 3

Cabled through Hayden, Stone & Co., N. Y.

S. FRANCISCO Sept. 4

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher.....	.23
Best & Belcher.....	.30
Caledonia.....	.31
Chollar.....	.35
Con. Cal. & Va.....	.35
Crown Point.....	.35
Exchequer.....	.30
Gould & Curry.....	.30
Hale & Norcross.....	1.25
Mexican.....	1.37
Ophir.....	1.05
Overman.....	1.15
Potosi.....	.16
Savage.....	.93
Sierra Nevada.....	.45
Union.....	.05
Utah.....	1.22
Yellow Jacket.....	1.22
TONOPAH STOCKS	
Golden Anchor.....	.11
McNamara.....	.25
Montana-Pitts. ex.	.06
North Star.....	.20
Rescue.....	.11
GOLDFIELD STOCKS	
Black Ants.....	.05
Blue Bull.....	.32
Columbia Mt.....	.47
Comb. Frac.....	2.07
Conquerer.....	.12
Daisy.....	1.52
Florence.....	4.40
Frances-Mohawk.....	1.00
Goldfield Con.....	7.42
Grandma.....	.17
Great Bend.....	.62
Red Hills.....	.56
St. Ives.....	.80
BULLFROG STOCKS	
Amethyst.....	.20
Bonnie Claire.....	.38
Mayflower Con.....	.33
Montgomery Mt.....	.10
Original.....	.05
MANHAT'N STOCKS	
Gold Wedge.....	.06
Manhattan Mg.....	.06
Pine Nut.....	.06
Ruby Wonder.....	.06
Stray Dog.....	.21
Yellow Horse.....	.03

NEVADA Sept. 11

Name of Comp.	Clg.
TONOPAH STOCKS	
Tono'h Mine of N.....	11.37½
Tonopah Exten.....	1.87½
Montana Tonop'h.....	2.95
Belmont.....	2.75
Tonopah Midway.....	.80
West End Con.....	.75
Jim Butler.....	.85
GOLDFIELD STOCKS	
Sandstorm.....	.51
Kendall.....	.24
Red Top.....	3.60
Jumbo.....	3.50
Goldfield Mining.....	1.50
Dia' d'field B. B. C.	.26
Atlanta.....	.52
Mohawk.....	17.50
Silver Pick.....	.57
Laguna.....	1.50
BULLFROG STOCKS	
Mont. Shoshone C.....	6.50
Tramps Con.....	37½
Gold Bar.....	.60
Bullfrog Mining.....	.10
Bullfrog Nat. B.....	.19
Homestake Con.....	.....
MANHAT'N STOCKS	
Manhattan Con.....	.40
Manhat'n Dexter.....	.11
Jumping Jack.....	.14
Stray Dog.....	.17
Indian Camp.....	.08
COLO. SPRINGS Sept. 7	
Name of Comp.	Clg.
Acacia.....	8
Black Bell.....	8
C. C. Con.....	4½
Dante.....	6
Doctor Jack Pot.....	50
Elkton.....	38
El Paso.....	38
Findlay.....	.....
Gold Dollar.....	7
Gold Sovereign.....	3¾
Isabella.....	21
Index.....	.....
Jennie Sample.....	4½
Jerry Johnson.....	5
Mary McKinney.....	41¾
Pharmacist.....	.....
Portland.....	108
Un. Gold Mines.....	6
Vindicator.....	17
Work.....	17

New Dividends

Company.	Pay-able.	Rate.	Amt.
Am. Sm'g & Ref. Co., com.	Oct. 1	\$2.00	1,000,000
Am. Sm'g & Ref. Co., pd.	Oct. 1	1.75	875,000
Bald Butte.....	Oct. 1	0.04	10,000
Bunker Hill & Sullivan.....	Sept. 4	0.60	180,000
Calumet & Arizona.....	Sept. 21	5.00	1,000,000
Calumet & Hecla.....	Sept. 28	15.00	1,500,000
Champion, Mich.....	Sept. 9	3.00	300,000
Copper Range Con.....	Oct. 1	2.00	767,562
Doe Run.....	Sept. 15	0.50	29,531
Federal Smg., com.....	Sept. 16	3.00	180,000
Federal Smg., pd.....	Sept. 16	1.75	210,000
Gen. Chemical, pd.....	Oct. 1	1.50	150,000
Granby Con.....	Sept. 30	3.00	405,000
Guggenheim Expl.....	Oct. 1	2.50	262,500
Mines Co. of Am.....	Sept. 25	0.02	40,000
National Lead, com.....	Oct. 1	1.25	186,318
National Lead, pd.....	Sept. 16	1.75	260,820
N. Y. & Hond. Rosario.....	Sept. 21	0.10	15,000
Pioneer, Alaska.....	Oct. 10	3.00	150,000
St. Joseph.....	Sept. 20	0.15	150,000
Tezuitlan.....	Oct. 1	2.00	20,000
U. S. Reduction & Ref., pd.	Oct. 1	1.50	59,187
United Verde.....	Sept. 4	0.75	225,000

Assessments

Company.	Delinq.	Sale.	Amt.
Belcher, Nev.....	Sept. 18	Oct. 9	\$0.10
Bullion, Nev.....	Sept. 12	Oct. 4	0.05
Caledonia.....	Sept. 12	Oct. 2	0.10
Chollar, Nev.....	Aug. 19	Sept. 12	0.10
Confidence, Nev.....	Aug. 27	Sept. 17	0.20
Con. Imperial.....	Aug. 27	Sept. 19	0.01
Emerald, Utah.....	Aug. 15	Sept. 7	0.01½
Etna-King, Cal.....	Sept. 15	Oct. 15	0.02
Gould & Curry.....	Aug. 14	Sept. 10	0.10
Grand Pacific, Cal.....	Aug. 10	Oct. 2	0.02
Hellos, Cal.....	Sept. 17	Oct. 15	0.02
Mt. Diablo, Nev.....	Aug. 20	Sept. 16	0.20
Nassau Cop., Cal.....	Sept. 16	Oct. 14	0.10
N. Y. Bonanza, Utah	Sept. 2	Sept. 23	0.02
Placer Queen, Cal.....	Sept. 16	Oct. 7	0.00½
Royal Metals, Nev.....	Aug. 29	Sept. 13	0.02
Sailor Consul., Cal.....	Sept. 10	Oct. 7	0.01
Sheba G. & S., Utah	July 30	Nov. 2	0.10
Sierra Nevada, Nev.	Sept. 4	Sept. 25	0.10
Wabash, Utah.....	Sept. 9	Oct. 1	0.05
Yellow Jacket, Nev.	Sept. 23	Oct. 30	0.15

Monthly Average Prices of Metals

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January.....	65.288	68.673	30.113	31.769
February.....	66.108	68.835	30.464	31.852
March.....	64.597	67.519	29.854	31.325
April.....	64.765	65.462	29.934	30.253
May.....	66.976	65.981	30.968	30.471
June.....	66.394	67.090	30.185	30.893
July.....	65.105	68.144	30.113	31.366
August.....	65.949	68.745	30.529	31.637
September.....	67.927	.....	31.437	.....
October.....	69.523	.....	32.148	.....
November.....	70.813	.....	32.671	.....
December.....	69.050	.....	32.003	.....
Year.....	66.791	.....	30.868	.....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

Month.	NEW YORK.		LONDON.	
	Electrolytic	Lake.	1906.	1907.
January.....	18.310	24.404	18.419	24.825
February.....	17.869	24.869	18.116	25.236
March.....	18.361	25.065	18.641	25.560
April.....	18.375	24.224	18.688	25.260
May.....	18.475	24.048	18.724	25.072
June.....	18.442	22.665	18.719	24.140
July.....	18.190	21.190	18.585	21.923
August.....	18.390	18.356	18.706	19.255
September.....	19.033	.....	19.328	.....
October.....	21.203	.....	21.722	.....
November.....	21.833	.....	22.398	.....
December.....	22.885	.....	23.350	.....
Year.....	19.278	.....	19.616	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January.....	36.390	41.548	July.....	37.275	41.091
February.....	36.403	42.102	August.....	40.606	3