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## THE COLORADO FUEL AND IRON COMPANY

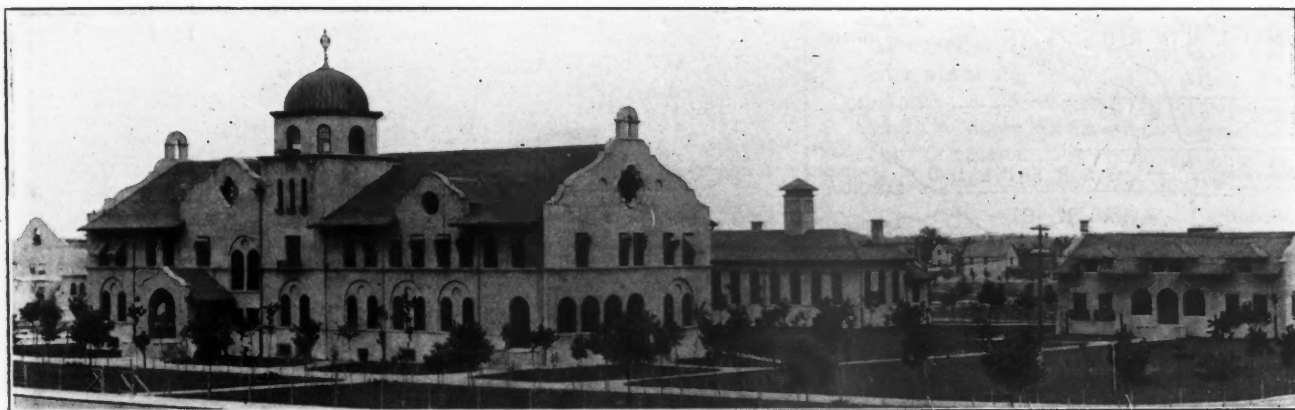
The History of the Development of a Great Steel Industry in the West

BY LAWRENCE LEWIS

Although the mining of the precious metals is generally supposed to overshadow all other industries in Colorado, one out of every ten persons in that State, it has been estimated, is dependent upon wages earned by persons in the service of the Colorado Fuel and Iron Company. This company, the largest industrial corporation west of Chicago, has coal and iron mines, quarries and coke ovens in various parts of Colorado, Wyoming, New Mexico and Utah, besides its great steel plant at Pueblo, Colorado. That this fuel

country for the reason that it has unlimited coal and iron at its very doors, and is down grade from all the points producing raw material. The products of its mills will enter into competition with the steel and iron mills of the world. The territory it controls can never be reached by Pittsburg, and Pueblo is the only great competitor of Pittsburg. The advantages offered by that city as a manufacturing point are remarkable; it is the center of a vast empire of consumers." In August, 1891, Jay Gould, while spending a few

producing a great variety of products for the entire far West, Northwest and Southwest. The present value (on paper) of the iron department equipment, after allowances for depreciation, etc., is stated in the company's annual report for the year ending June 30, 1906, as \$23,674,382.23; the total capital assets of the company are placed at \$39,755,100.90; the total current assets on June 30, 1906, are reported as \$14,092,152.16; and the total assets of the company on June 30, 1906, \$53,847,253.06.



GENERAL OFFICES AND HOSPITAL

and iron industry, which is constantly growing, and the market for which is being constantly extended, is not fortuitous but was foreseen and that its future is large is shown not only by its present prosperity, but also by predictions made years ago by two acknowledged authorities—one on the iron industry, the other on transportation.

### CARNEGIE'S PREDICTIONS.

Andrew Carnegie, at a dinner given in his honor some twelve years ago by the ironmasters of western Pennsylvania, responding to a toast on "The Iron Industry," said, as reported in the press despatches of the time: "Here in Pennsylvania we have about reached the limit of production, but daily the market is expanding and the increasing demand must be met. We need not fear further competition in the East, but there will be a plant erected in the West, at Pueblo, Colorado, I mean, that in twenty years will be larger than any two other plants in America. That city is destined to become the most important factor in the

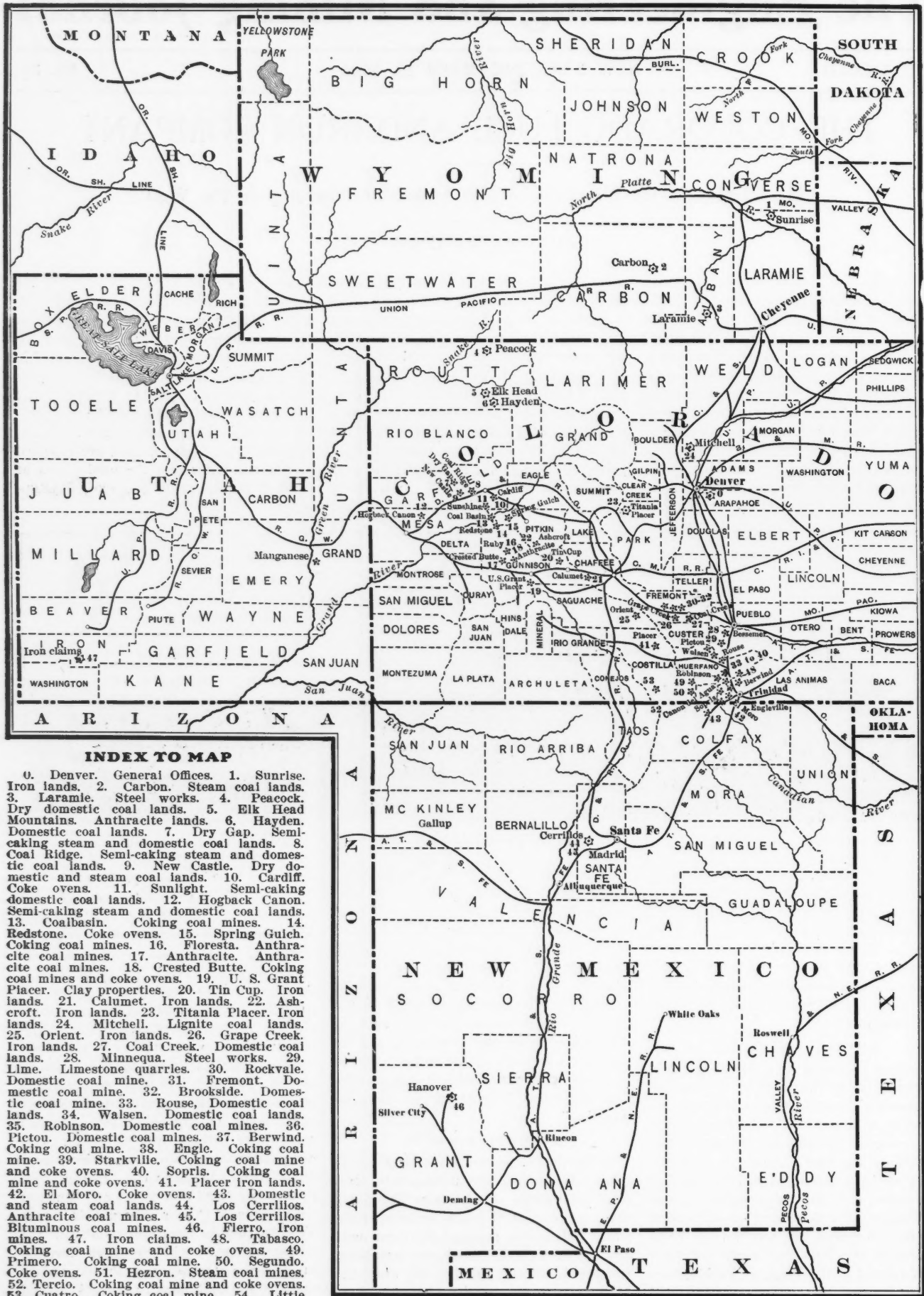
days in Pueblo, the terminus of his Missouri Pacific Railway, gave out the following authorized interview: "This is the Pittsburg of the West. It is destined to be the most important manufacturing city west of the Mississippi river. The products of the factories, which must be located here because of its being in the absolute center of an immense area of wealth-producing raw materials, will be shipped to all parts of the world. Pueblo in twenty-five years will be among the first half-dozen manufacturing cities in America."

### PREDICTIONS FULFILLED

At the time these predictions were made there was a small and unimportant steel plant at Pueblo, worth about \$3,000,000, the chief product of which was steel rails, which only partly supplied the local market. How well the prophecies are being fulfilled is shown by the fact that the Minnequa works of the Colorado Fuel and Iron Company is now one of the large iron and steel plants of America, employing between 4000 and 5000 men and

### HISTORICAL SKETCH

The history of the steel plant at Pueblo is that of the iron and steel industry west of Chicago. The Colorado Coal and Iron Company, a Colorado corporation of which first Gen. W. J. Palmer and later A. H. Danforth was president, built a small blast furnace, and began to produce pig iron during September, 1881. The first bessemer steel was "made" in the small converter the following April. A puddle mill, cut-nail mill, bolt mill, merchant mill and rail mill (all of small capacity) were added later. In November, 1889, a second small blast furnace was blown in. Ore came from iron mines at Orient, near Villa Grove, in Saguache county, fuel from a few small coal mines and banks of coke ovens in "the southern field," near Trinidad, and in Gunnison county on "the western slope." The extensive development of the steel plant at Pueblo and of the iron and fuel industry in the West did not, however, begin until after August, 1892, when John C. Osgood and Julian A. Kebler—who had come from Iowa



MAP OF THE PROPERTIES OF THE COLORADO FUEL AND IRON COMPANY

to Colorado in 1887, and who were at the head of the Colorado Fuel Company, the Grand River Coal and Coke Company and the Huerfano Land Association, took charge of the works at Pueblo. A merger of these last named companies, and of the Colorado Coal and Iron Company was effected, Oct. 21, 1892, under the name of "The Colorado Fuel and Iron Company." The fuel properties were extensively developed first, and upon the revival of business following the depression of 1893, the steel plant was improved and slightly enlarged. In November, 1892, a third small furnace was added. Rapid enlargements did not begin, however, until 1900, since when the original departments have been increased several

In spite of a protracted and very costly but conspicuously unsuccessful strike of coal miners during 1903-04, the company is now going ahead rapidly and the plant at Pueblo is being worked to its fullest capacity. Indeed industrial conditions at the properties of the company are on a peaceful and prosperous basis and during the past year no strikes or differences of any moment have occurred between employer and employees. All labor conditions have been and are quite satisfactory, except the general inadequacy of supply, amounting to a shortage of about 1000 men, to whom, if available, employment could be given at the present time. The employees have been working full time throughout the year and

miners, the production has steadily increased with a corresponding augmenting of the gross and net earnings to the maximum amount ever attained. The company has now been put upon a basis where a surplus of earnings is shown above all requirements for operating and fixed charges, taxes, sinking funds, rentals, etc., and, barring unforeseen contingencies, may be expected to show substantial increase in both gross and net earnings from operations with each succeeding year. The demand for Colorado Fuel and Iron Company's products is especially promising for the current year and, in the case of steel rails, which constitute an important part of them, the engagements made will absorb the present capacity of the works well into the year 1908.

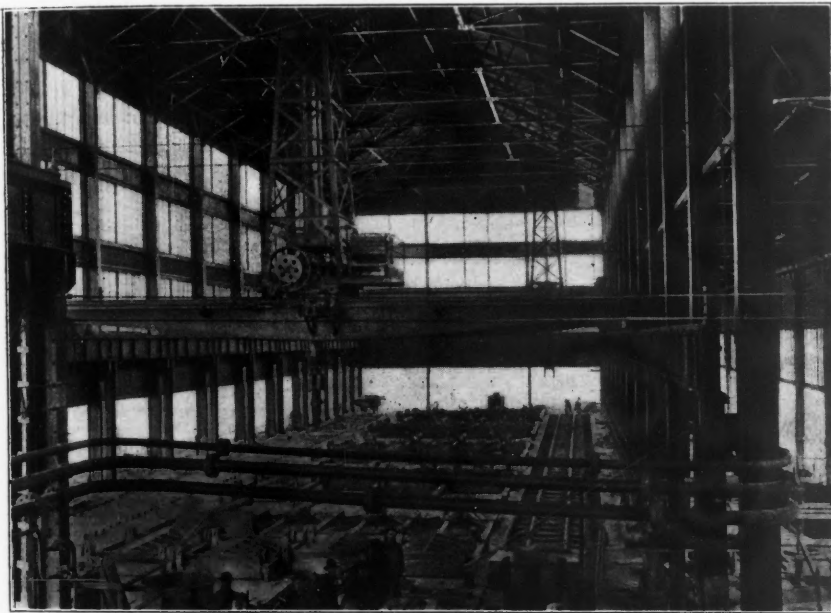
A tract over one mile long and 0.5 mile wide is now covered by mills and trackage of the company's Minnequa works at Pueblo, Colorado, and an even larger area, including sites for new blast furnaces, extensions of present departments and sites for new mills and ground for storage, is surrounded by the mill fence.

The system of ore handling at the steel works and the blast-furnace department; the bessemer-steel department and rail mill; and the open-hearth steel department will be described at considerable length in other articles of this series. A brief description of the other departments at the plant follows:

#### PLANT EQUIPMENT

*Forty-inch Blooming Mill*—The 2 high 40-in. blooming mill, in which open-hearth steel ingots are reduced to 4-in. billets, is driven by a 55x60-in. McIntosh and Hemphill double reversing engine coupled direct to the mill. The mill is installed in a building 300x54 ft. Two shears, one hydraulic and one driven by a vertical engine, cut the product. The five-pit heating furnaces for this blooming mill are each provided with four pits for four 18x20-in. ingots. The furnaces are served by two 5-ton Morgan automatic charging and drawing cranes which take the ingots from the pits to an electric ingot tilting car which takes them to the approach table to the blooming mill. A roller conveyor, about 900 ft. long, distributes the blooms and billets to the rod mill and storage yard.

*Rod Mill*—The double Garret rod mill is practically of the standard type, differing only in the location of some of the rolls. The 16-in. continuous mill and the 14-in. train are driven by a 40 and 72x60-in. tandem compound engine. The three 10-in. trains of each mill are driven by a 38 and 70x48-in. and a 27 and 46x42-in. cross-compound Porter-Allen engine. Four automatic, gravity, end-discharge Laughlin furnaces heat the billets in 6-ft. lengths. As in all other departments of the plant, all engines and rolls in the rod mill are covered by electric overhead traveling cranes. The main building of



40-IN. BLOOMING MILL

times in size and almost completely rebuilt and many new mills added. In the summer of 1903 J. C. Osgood, J. A. Kebler, and their associates relinquished the ownership and management of the company in favor of George J. Gould, John D. Rockefeller, and their associates. Thereupon the board of directors elected Frank J. Hearne, of Denver, formerly of Pittsburg, ex-president of the National Tube Company, president and chairman of the board of directors of the Colorado Fuel and Iron Company, which positions he has since held. J. B. McKennan, who has worked his way up from the position of draftsman during the twelve years he has been at the plant, and who has been its head since 1900, is now manager of the Minnequa works. J. A. Durfee, formerly general superintendent of the Tennessee Coal and Iron Company's plant, at Ensley, Ala., is assistant manager. J. D. Gilchrist is manager of the iron mines department, with headquarters in Denver. John T. Kebler is general manager of the fuel department, with headquarters in Denver.

are apparently in a condition of quiet and peaceful contentment.

#### CAPITALIZATION

The capital stock of the company was increased in October, 1904, from \$40,000,000 to \$46,200,000 to provide, among other things, for improvements made shortly thereafter at the Minnequa works and for an adequate working capital. Under authorization of the board of directors the president of the company, a few months ago, made arrangements with bankers for underwriting additional securities originally offered to stockholders, by the provisions of which contract the company, on Aug. 8, 1906, came into possession of \$4,160,000 which is being and will be used for reimbursement of the treasury for capital expenditures already made, for further expenditures of the same character for work now under contract, and for new construction under consideration.

Following the arduous, though successful, financial rehabilitation of the company, and the exhausting effects of a prolonged and bitterly contested conflict with its coal

the rod mill is 137 ft. 6 in. wide by 534 ft. long. The furnace building is 90x126 feet.

**Wire Mill**—The wire mill is one of the largest and most complete in America, being thoroughly equipped in every detail to manufacture all sorts, shapes and sizes of wire and wire product. There are 360 blocks in the wire-drawing department; 280 machines in the nail department with an approximate total capacity of 6000 kegs in 24 hours; 81 machines in the barb-wire department with an approximate total capacity of 150 tons in 24 hours. The wire mill is fully equipped with cleaning, annealing, painting and dipping departments, repair shops, independent electric plant, rumbling department and other accessories. For supplying the wire mill and other departments with kegs, the company has a cooperage shop with a capacity of 5000 to 8000 kegs every 10 hours. Staves and headings come from sawmills, etc., operated by an auxiliary company on its timber lands near Little Rock.

chine and boiler shops, blacksmith shop, roll, pattern and carpenter shops. Contracts have recently been let for additions and improvements by which the production of the bolt and spike factories will be about doubled. No. 2 rod mill (heretofore unfinished) has been equipped with suitable hot beds and converted into a rolling mill for the economical and increased production of rounds and squares for subsequent manufacture into bolts and spikes. The doubling of the open-hearth plant, and the additions to the rail mill, both now under way, are spoken of in other articles.

CAPACITY

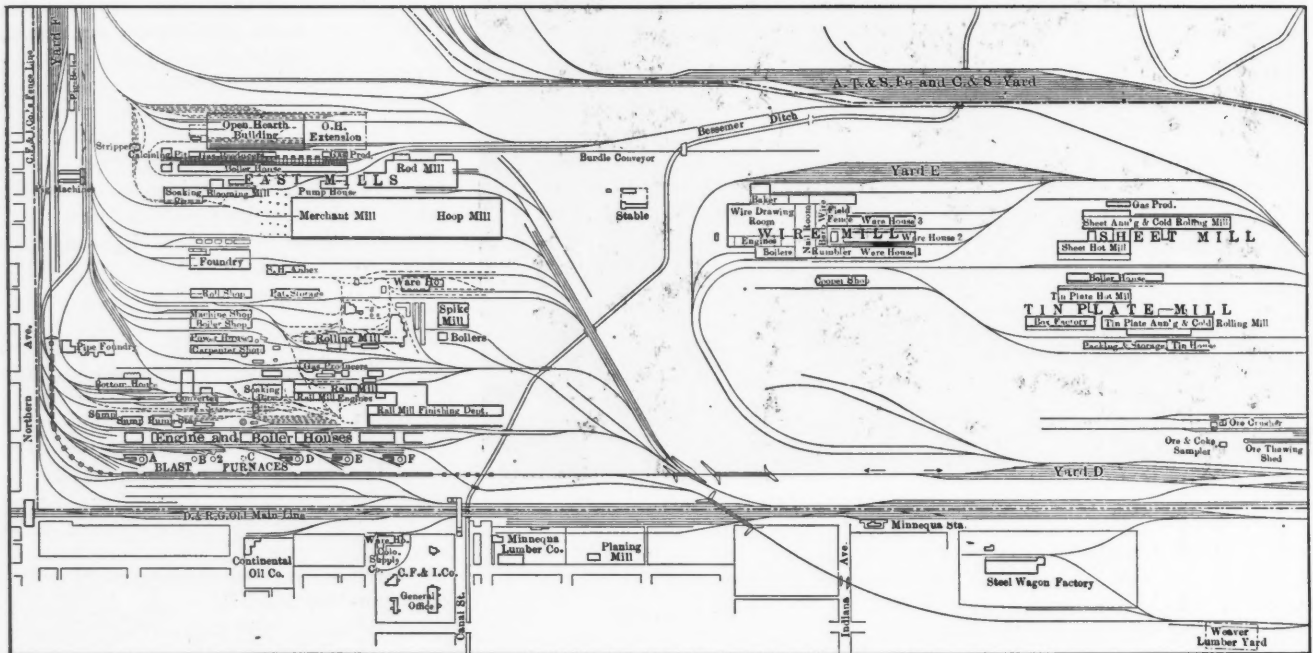
The approximate daily capacity of the several departments now in operation, including additions nearly completed, is as follows: Blast furnaces, including furnace "F" now being completed, 2000 tons; bessemer-steel department, 2000 tons; open-hearth steel department, 1500 tons;

Coal Mining Mortality

It is the general impression, says D. W. Williams, American consul at Cardiff, Wales, that the death rate is lower in the British than in the American mines. This is true if the rate be based on the number employed, but such a comparison is not quite fair, because it takes into account only one of the three elements in the problem. The following comparison, using the last complete statistics, those of 1904, tends to show that the British death rate is, in fact, higher than the American:

	America.	United Kingdom.
Tons of coal produced.....	352,310,427	232,428,272
Miners employed.....	594,768	833,629
Number of tons per miner..	593	279
Average number of days... ..	202	262
Average daily tonnage per miner.....	2.93	1.07
Number of miners killed...	1,006	1,024
Death rate per 1,000 men....	1.69	1.24
Death rate per 1,000,000 tons	2.85	4.44

If the comparison is stopped at this point, one element remains unconsidered,



PLAN OF MINNEQUA WORKS, PUEBLO, COLO.

Plans have also been drawn and buildings and machinery partly erected for a bar mill, a 12- and 14-in. merchant mill, a twin hoop and cotton tie mill, a tin-plate and sheet mill. Construction work on these mills has, however, been suspended for the time.

LESSER DEPARTMENTS

In addition to the new mills described above, the Minnequa works includes a merchant iron department comprising 9-, 12- and 20-in. mills for miscellaneous shapes, and comparatively light tonnage; spike, bolt, and nut factories complete in all details; iron, steel and brass foundry; cast-iron pipe foundry, complete electric-power plant for supplying all departments except the wire mill, and one of the most extensive shop systems of any steel works in the country—consisting of foundry, ma-

rail mill, 1500 tons; 40-in. blooming mill, 1200 to 2000 tons; rod mills, 600 tons; wire plant, 700 tons; 9-, 12- and 20-in. mills, from 200 to 250 tons, varying with the size and section; cast-iron pipe foundry, about 40 tons; bolt and nut factory, 30 tons; spike factory, 120 tons.

The largest cargo of iron ore thus far carried by a single vessel on the Great Lakes was loaded on the steamship "Henry W. Rogers" at Escanaba, Mich., Sept. 18; the cargo amounted to 15,081 net tons. The vessel draws 21½ ft. of water.

The Government of Chile has commissioned Charles Vatier, a French engineer, to take measures to promote the emigration to Chile of European artisans, miners, and metal workers.

for the American tonnage exceeded the British by almost 100,000,000 tons. To produce the American tonnage would require 1,262,761 British miners, while to produce it in 202 days would require 1,637,838 British miners. The employment of that number of British miners, estimating at their own death rate, would cost about 2035 lives, or at the rate of about 5.77 lives per 1,000,000 tons mined, which is higher than the American death rate.

Putting the matter in another form, the British death rate is reduced 1.33 lives per 1,000,000 tons by producing coal at a slower speed, and the American death rate is increased by 1.22 lives per 1,000,000 tons by the higher intensity of production; but to balance this loss in part the Americans have the use of 1,042,070 men for employment in other industries.

# SHAFT SINKING THROUGH WATER-BEARING FORMATIONS—III

An Example of Modern Methods and Appliances Employed in German Mines

BY E. MACKAY HERIOT\*

(Continued from page 1161)

### HANDLING OF IRON LINING

The segments of the tubings are moved to the landing stage by aid of crow-bars. From here we lowered them down the shaft one after another according to number, one to two, two to three, nine to ten, and so on. They are fastened to the hoisting rope by two shackles, one of which is made fast to the ring above the hook. (Fig. 16 b and c.) At the pit bottom the segment is suspended some inches above its final position, its flanges are then

the case, it should be righted as follows: The pin is first taken out of the top hole of the vertical flange, and a screw of the latter fastened, then the corner screw of the horizontal flange of the higher segment is screwed down. If this is not sufficient a few knocks with a large hammer will suffice. The front or back faces of the tubing do not give the lines of position. Curves cut on the horizontal flanges make a correct circle around the ring. By driving in the top ends, these

convelage is out of plumb exceptions may be made, which will be mentioned later on. In series No. 1, many screws were broken, but none in No. 2. When erecting a ring, the first segment should be set 90 or 180 deg. from the first one of the foregoing rings. Beginning on the north, the first segment of the second ring would be placed on the south; that of the third on the west; and that of the fourth on the east; etc. The main idea is that the last pieces of the two adjacent rings do not come together. Here we may also make exceptions when the convelage is out of plumb. We had neglected to plumb the rings 1 to 10 and in No. 11 we found an error. The shaft was 25 mm. too wide on the northwest, and 25 mm. too narrow on the southeast.

In order to rectify this difference the screws of the vertical and horizontal flanges on the southeast were fastened



FIG. 16 A

cleaned, and it is pushed into place. In each of the corner holes of the horizontal flange is placed the crook of an iron rod, which, when the segment is lowered, fits into the corresponding hole of the lower ring. In order to gain time, the shackle in the ring is unscrewed and loosened from the other one, when a signal is at once given to join on another segment.

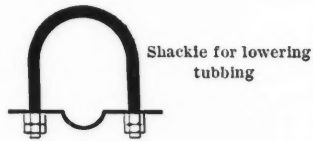


FIG. 16 C

The lead packing on the horizontal flange is rolled out only as fast as is necessary for the next segment; this is done so as to insure keeping the flange and packing clean. At first, only four holes are punched in the packing, two for the crooks to grip into and two for screws to hold the lead in place. As soon as the segment rests on the flange a pin is driven in each of the two corner holes of the horizontal flange and one into the corner hole of the vertical. These pins give the segment a proper fit.

To gain room for the last segment, the adjoining ones must be left without screws and set back. It is then pushed behind the tubing and brought forward into place. Before the screws can be made fast, the ring must be set horizontally. If, for instance, one piece is higher than the next one, which is very often

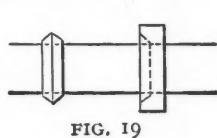


FIG. 19



FIG. 23

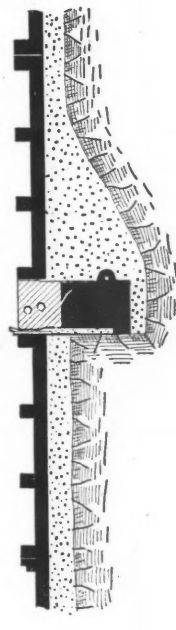


FIG. 20

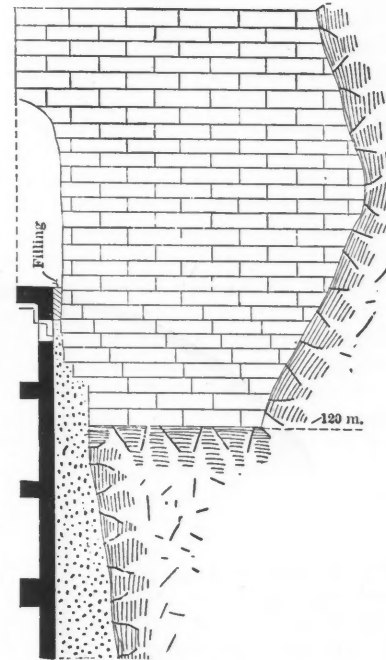


FIG. 21

curves come together. The pins are left in the top holes until the next ring has been erected. For every series of ring two sizes of screws are used. Those for series No. 1 were 200 mm. for the horizontal flange of the wedge-crib and ring, the rest being 225 mm. long. The diameter is 32 mm., and that of the holes 36 mm. Thus there remains a free space of 2 mm. all around. With each screw two lead and two case-hardened cast-iron rings are used. When screwing fast, the lead ring is, on the one side, jammed into the conus of the iron ring, and on the other side into the holes of the flange, making them water-tight. (See Fig. 19.) The screws are tightened first with ratchet spanners, then with a klep 1 m. long and finally with one 1.5 m. long. Two men are necessary to each screw. The vertical flanges must be all screwed together before the horizontal ones. Where the

first, and props were set between the iron and the side of the shaft on the northwest. For some of the vertical flanges of ring No. 16, the lead was tapered down. On the wide side the thin ends were put upward and at the narrow part downward. However, ring No. 16 was still 25 mm. too wide on the northwest, ring No. 17 being a few mm. nearer. Ring No. 18, the last of series 2, was 32 mm. too narrow on the southeast.

For the concrete behind wedge-crib No. 2, and the following two rings, a fast binding cement was used, but for all the other rings and those of series 1, a portland cement was employed. The mixture for ring No. 5 and upward was eight wheelbarrows of gravel, two wheelbarrows of sand and one barrel of cement.

Most of the rings have five holes to let the water escape. Where no water was encountered these holes were at once

\*Mining engineer, Posadas, Cordoba, Spain.

closed with pitch-pine pegs. If a water-carrying stratum is present, pieces of bricks are used instead of concrete. The bricks are laid against the stratification in question and carried up to the next holes.

Behind ring No. 6 there are two important water-bearing layers. Here we used the broken bricks right around the shaft to a height of 400 mm. and built a chimney of broken bricks to the next upper holes. Where even minute quantities of water are present, broken bricks should be used. A small chimney to allow the water to escape through the next hole is all that is necessary. Behind the first three rings we were able to tamp the beton, but afterward it was not possible, because the launder had to be taken out and the space behind the convelage was at once filled up with water. Tamping the

had to be built on a rib of ring No. 18. For the fixed center a bearer was wedged in between the tubbings with an upright piece of timber in the middle, which was cut off on a level with the top of the wedge-crib. The exact center is given by a nail. At various places the bed of the wedge-crib is composed of soft clay, and we had to drive piles into it to make it firmer. It would have been better to have put a layer of concrete on the bed and waited a day or so.

Under the segments, thin poplar boards were laid. The leveling in front is done by driving pitch-pine wedges between poplar wood and iron. (See Fig. 20.) After the ring is laid the space between the poplar and iron is filled with wedges. These latter must not be driven in, but only put in place carefully, otherwise, this

sulted from two causes: The side of the shaft was found to be very dry in that quarter, and thus the concrete had been tamped harder than where the shaft was wet; it is also not unlikely that the wedge-crib may have given way on account of the loose bed. When controlling the rings we always found differences, but no ring was more than 15 mm. out of plumb, the last one being only 9 mm. out. In a segment of ring No. 9, there was a crack: the piece was at once returned to the iron works and exchanged for a new one, but in order not to lose any time, ring No. 10 was put in the place of ring No. 9. On account of the bucket guide-bearers some difficulties were encountered in the erection of the upper rings, the last one taking 3 hr., without the screwing together. The ordinary time was 1.5 hr. With the

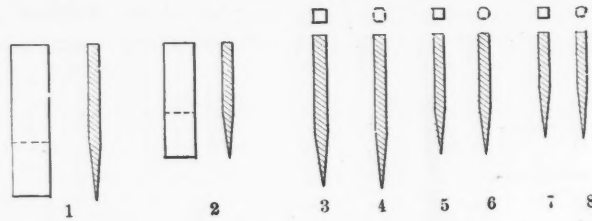


FIG. 22

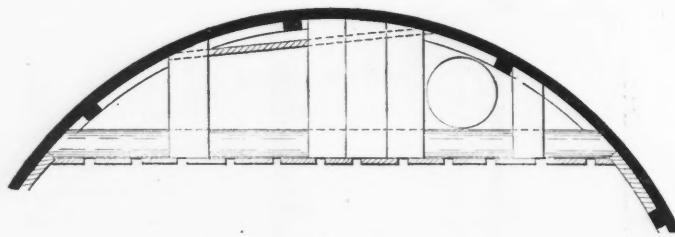


FIG. 24

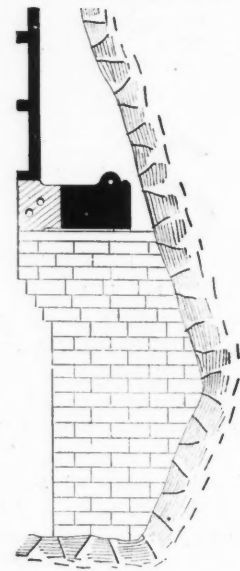


FIG. 26

beton in water would mean separating the sand and gravel from the cement.

Series 2, including the wedge-crib and 18 rings, took 12 working days to put in; however, the wedge-crib and the first rings alone took four days. The other 16 rings were set up in 16 days. The average is not bad, when it is taken into consideration that the work was near to the men. In the concrete 209 bbl. of cement were used for a mixture filling 451 buckets. This gives an average of 24 buckets per ring, ring No. 1 being excepted.

#### ALIGNING SHAFT LINING

At the finish of series 2, we found the shaft not only 30 mm. out of plumb, but 50 mm. twisted around. By the aid of wedge-crib No. 1 we were in a position to correct this mistake. (See Fig. 20.) The joint between the wedge-crib No. 1 and ring No. 18 was to have been packed with 2 picotage. On this account there were no holes on the top of ring No. 18, and the latter was also strengthened with vertical ribs under the flange.

To erect wedge-crib No. 1, a platform

wedge-crib was erected in the same way as the one already described. For the beton of series 1, the mixtures were as follows: Under the wedge-crib, three wheelbarrows of sand to 1 bbl. of cement; between wedge-crib and side of shaft, five wheelbarrows of sand to 1 bbl. of cement; for rings 1 to 3, five wheelbarrows of sand to 1 bbl. of cement and three wheelbarrows of gravel; for ring No. 4 and upward, two wheelbarrows of sand, eight wheelbarrows of gravel and 1 bbl. of cement were used.

The concrete behind the wedge-crib and the first two rings was tamped. This could not be done any further because the launder had been taken out. As the sides of the shaft were too dry we moistened the beton. With the aid of a chain connected to one of the chains of the suspended platform, the bucket could be turned upside down, pouring its contents onto the boards, when they were well watered.

Ring No. 4 was 15 mm. too narrow on the southwest side. This may have re-

exception of the last ring, no blocks were necessary for putting in the rings, every thing being done with the winding rope. Nearing the bucket guide-bearers, we used the rope without the guides. (See Fig. 21.)

To obtain the necessary room for the last ring and the picotage we had to remove 200 mm. of the masonry for 1 m. around the shaft. The top of the ring reached only 10 cm. in the masonry above the overlapping. The lead packing of the vertical flanges of the top ring was set so that it did not protrude at the back, but fitted exactly.

Behind the ring, 160 mm. was kept free of beton, which space was between 40 and 100 mm. broad, and was left for the picotage. The method of wedging was briefly as follows: the space was filled with pieces of poplar boards, taking care to place the cross-grain vertically. In this space the pitch-pine wedges were driven. First, large, flat wedges were used, then smaller ones of the same kind. After no more of these could be driven in, the largest square sectional wedges were taken, fol-

lowing which 8-cornered wedges of the same size were used and so on, until the smallest 8-cornered wedges could no longer be driven in, when the picotage was finished. A sketch, (Fig. 22), gives the different kinds and sizes of wedges used, and the numbers show how they were taken. The holes for the wedges are made by steel needles, which are hammered in with 3-lb. hammers and forced out with pieces of round steel 0.5 m. long. (Fig.

We then commenced to sink the pump and the suspended platform and to sump the water, considering it best not to put in the ladder way at that time, so as to have the shaft free. All the packings were stemmed and such screws as let the water through made water-proof by adding another lead ring. The packing between the flange was allowed to project outside (toward the shaft) 1 cm. This was hammered against the iron and stemmed into

carried on similarly to that already described, only here the smallest wedges alone were used. All the holes in the convelage were corked and wedged, and the water being shut in, began to give pressure behind the iron lining. After making the tubbings water-proof we erected a platform on a rib of ring No. 18 and wedged the joint between the two series for another 16 hr. By constant re-wedging the joint increased from 10 to 40 mm. In the meantime, the picotage in the masonry was leaking, and had to be taken in hand. The first time, the needles were blunt, but with sharp ones we were able to hammer in wedges for another five shifts of 8 hr. each. As soon as this was finished the launder was again put on top. The pipes of the old pump were taken out, and the pump itself hoisted to the guide-bearers. We then lowered the suspended platform, put in the air tubes and sollars, and had another look at the flanges of the tubbings. As a rule, during the shift two sollars were erected and boarded in, two zinc-coated air tubes conected, and five rings controlled. We had to work another 2½ shifts at the picotage between the first and second series.

Fig. 24 shows a sollar in the convelage. The bearer rests on one of the tubing ribs and is wedged in between the flanges. As in the masonry and temporary shaft lining, the sollars are 4.5 m. apart. The guide-bearers had to be taken out and replaced by new ones. These are specially constructed for the convelage, and consist of two main bearers which are secured underneath a rib of ring No. 3, series 1. The four square timbers, to which the guide ropes are fastened are placed underneath the main bearers and secured to them by bolts. Fig. 25 shows the construction.

On June 7, sinking was resumed. The rock was very soft and the eastern half of the shaft, as already noted, passed through a rupture zone. During this series the sump was blasted only three times. Most of the work was done by pick and shovel alone.

SIZE OF TEMPORARY LINING

From the wedge-crib downward the temporary shaft was gradually brought to its normal dimensions, the diameters of the rings of the temporary lining being 4900, 5200, and 5500 mm. for rings Nos. 1, 2, and 3 respectively, the last being of normal size.

Before the lining boards had been put in behind the rings 1 to 2, some of the rock gave way under one of the wedge-crib segments, and caused an inflow of water amounting to 60 liters per minute; however, it afterward decreased to 15 liters per minute. The opinion prevailed that this water did not come from behind the wedge-crib, but found its way out of the country rock just below the convelage. During sinking, several water-bearing formations were encountered, but only

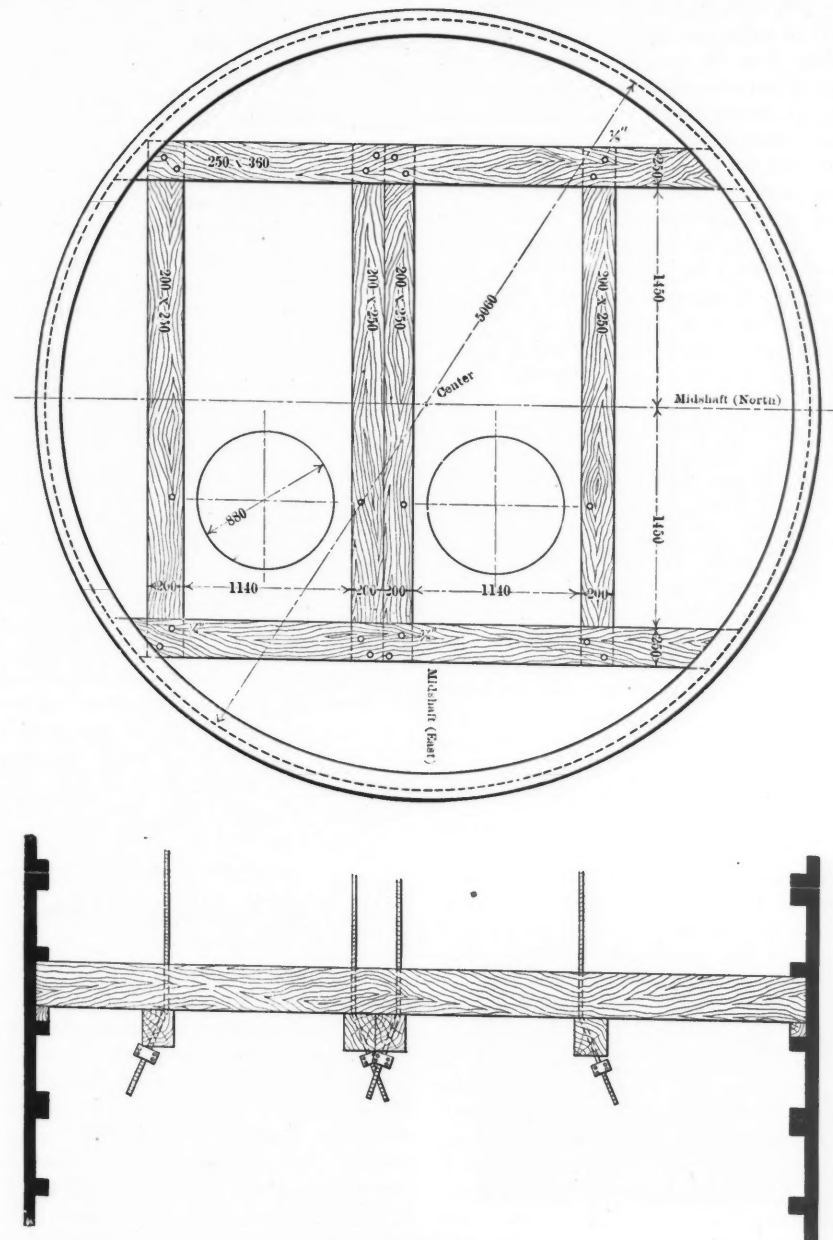


FIG. 25

23.) These fit in the holes of the needles and by turning backward and forward, loosen them. It is important that the needles should be kept sharp. For the larger wedges, longer and thicker needles are used than for the thinner ones. We spent 4 shifts at the picotage.

In order to find out the leakages in the shaft, the convelage must be kept as dry as possible. For this reason a launder was placed on the picotage, the water being allowed to run off from time to time.

the joint. Leakages are generally accounted for when the packing in the screws and joints is not satisfactory, or where there are holes in the convelage. A short time after the iron work has been put in, leakages are easily seen, because the iron in such places is covered with a white precipitate. During one shift about six rings can be stemmed.

The temporary picotage of the joint between ring No. 18, series 2, and wedge-crib No. 1 lasted 16 hr. This work was

brought about 60 liters per minute to the shaft. On ring No. 5 we put a launder and conveyed the water through pipes to the pit bottom; 15 m. deeper, below another water-bearing stratum, a second launder was placed.

#### USE OF BUCKETS IN HANDLING WATER

To gain time, four buckets were in use, one always serving the water pipes from the launders. By this method of working we did not have to take up the water in cans and the pit bottom remained dry. In formations of this kind a continual running of water loosens the sides of the shaft, thus endangering the miners when the rings are taken out, causing a lot of extra work and allowing the water to escape behind the permanent shaft lining. To safeguard the men, the bucket guide-bearers were boarded in with 80-mm. planks, allowing just enough room for the two buckets to pass through.

On account of the bad state of the rock, it was decided to place the wedge-crib on masonry. A sketch, (Fig. 26), gives the particulars of the wall. An extra temporary ring had to be put in around the incline to support the sides of the shaft. We built a wall 2 m. high, used plenty of cement and overlapping three times toward the top. As the wedge-crib had not yet arrived, work came to a standstill temporarily. During this time leakage in the convelage was attended to, water removed and other small tasks carried out.

The erection of wedge-crib No. 3 took 8 hr. Each segment was made fast at three different places to the hauling rope and a pulley, and, without touching the platform, was lowered and placed on the wall. Under the wedge-crib in front, pieces of pitch-pine boards 50 mm. thick were used, and at the back, as usual, iron plates.

#### DETERMINING OF SIZE OF IRON LINING

It must be mentioned here that before the convelage is brought in, the exact distance between wall and wedge-crib must be ascertained. It may be calculated in the following manner:

Wedge-crib, with wood below	
(300+50).....	350 mm.
18 rings of tubing of 1503 mm.	27,054 mm.
18 lead packings of 2.5 mm....	45 mm.
Total.....	27,449 mm.
Distance measured.....	27,480 mm.

There remained a joint of.. 31 mm.

A thickness of 50 mm. of wood under the crib is too much, but in the circumstances it suited us best so. As the convelage had only partly arrived, we could not measure it exactly, the rings, however, varied between 1503 and 1505 mm. In case of difficulties, two fitting-rings 20 and 40 mm. high had been ordered. These have the disadvantage that they necessitate two wedgings. It is best that the whole convelage, except the uppermost ring of the series, should be at the pit

mouth before the work of erection begins. Therefore, as soon as part of the iron is set in, exact measurements can be taken and the last ring ordered. For the joint 10 mm. is allowed. The space between the wedge-crib, together with the first rings, and the sides of the shaft, was filled with beton and tamped, as already described. A picotage behind the wedge-crib would not have been possible, the ground being too soft and broken away.

#### ERECTION OF RING OF IRON LINING

With tubing ring No. 9 the iron convelage was 20 mm. out of plumb, and this difference grew to 35 mm.; but for careful manipulations it might have become much worse. In erecting a ring we generally began where the shaft was narrow, and set the segments there as far back as the holes permitted. Some of the screws on the horizontal flange of the first segment were then fastened. The pieces were set in alternately to the right and left, and securely fastened, one to another, with a screw in each vertical flange. Thus the last piece would be placed where the shaft was too wide, and where, according to the above precautions, the most free space existed. To begin with, the vertical flanges at the narrow part were screwed together, thus bringing the other segments in.

When laying down the lead packing, great care must be taken that it does not overlap at the joints. In erecting the top ring, three whole shifts were occupied, the reason being that there was not high enough between the two series to let the ring in. There remained nothing else to do but to cut off 3 mm. from the horizontal flange.

The method we used to put in the last ring of a series was as follows: About 0.3 m. below the top of the tubing a platform was constructed on bearers. The sides of the shaft underneath the wedge-crib were smoothed down so as to have about 10 cm. width for concrete. The segments were lowered into the shaft as usual with the winding rope, but the connection had to be made to the holes of the bottom flange, as there are none on the top. In the upper holes of the vertical flanges, two screws were put, each attached to a chain, the latter being secured to the cable. On the platform where the segment was to be located, three square-cut timbers, 120 to 150 cm., were placed with their ends against the tubings, but about 1.5 cm. higher. A strip of iron was held on each of the timbers and reached half-way over the flange. The suspended segment was pushed as near as possible into place, and allowed to rest on the above mentioned timbers; with the aid of crow-bars it was easily put into position. To take out the strips of iron the segments were lifted with a long, wooden beam, placed under one of the ribs. The last piece was put in by setting back the four neighboring ones.

In order to be able to fill out the space behind, four holes had to be bored in the top of the last ring. The beton was made as liquid as possible, and run through pipes from 5 m. above. A joint of 2 to 6 mm., such as we had here between series 3 and 2, of the convelage, was not sufficient for the picotage. It was decided to stem the joint with lead and copper. The joint proved to be larger at the back than at the front, the consequence being that the copper got lost behind the tubing. To avoid this, strips of iron were laid all around the shaft with a rest of about 30 mm. on the flange, and the copper stemmed against this; then lead was hammered in until the joint was full. A joint between two series of convelage increases or decreases according to the variation of temperature in the shaft. A picotage of wood is elastic, being pressed together or expanding according to the alterations of the joint. In the case where lead had been used to fill a joint, it would leak as soon as the temperature fell.

In the meantime, the water holes had been corked and wedged, and the joint could not withstand the enormous pressure of water—about 294 lb. However, by continual stemming, the convelage had sunk, the joint being 10 mm., and thus allowed a good picotage, which was at once placed.

The soft and loose condition of the ground made it impossible to shut out all the water behind the wedge-crib, a leakage to the amount of a few liters per minute taking place, thus necessitating more sets of convelage. A good engineer always puts one set of tubings in dry ground, that is to say, after the water has been shut out. It is interesting to note that the water was eventually shut out behind a wedge-crib placed at 248 m. depth.

## Iron Ore in Northern Ontario

The Provincial Bureau of Mines has received information that discoveries of magnetite iron ore have been made in Wisner township immediately south of Hutton township in northern Ontario, in the same section in which the Moose mountain deposits are situated. It is thought that the newly found deposits may be an extension of the Moose mountain iron beds.

The search for iron ore in Ontario has been carried out pretty thoroughly in the western section, but heretofore comparatively little has been done in the north. The discovery of the Moose mountain deposits two years ago, however, started exploration in that region.

It is reported that the British Borneo Exploration Company, Limited, has made the discovery of seams of coal, from 4 to 5 ft. in thickness, about 35 miles from the east coast.



## MODERN MINING ON THE COMSTOCK.

Methods of Unwatering the Lower Levels—Underground Temperature of 130 deg. F.—Excellence of System of Ventilation—Some Working Costs—Prospects for Ore

BY CLAUDE T. RICE

At present the main pumping installation on the Comstock is at the C. & C. shaft, but other pumping is being done at the Ward shaft. The new installation at the latter was described in a recent issue of the JOURNAL. In the near future the work of putting into shape the Alta shaft will begin.

having a 12-in. column pipe, the other a 14-in. pipe. There is also an Evans elevator on the 2150-ft. level acting as a reserve for the three Riedler pumps at that level. One of the Evans elevators in the shaft is also held in reserve. The Evans elevator lifts 2800 to 3000 gal. of water per minute a height of 330 ft. Its efficiency

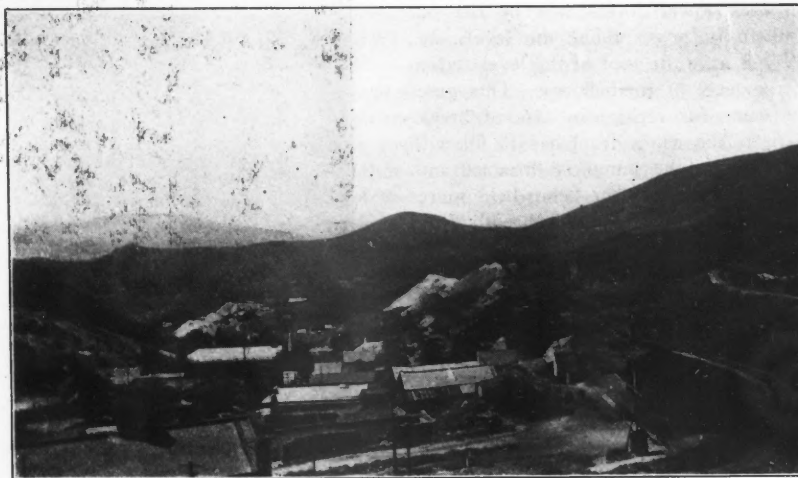


C. & C. SHAFT, VIRGINIA CITY

The pumps at both the C. & C. and Ward shafts, with the exception of the Evans hydraulic elevator, the Starrett air-lift pump and the Blake sinker, are run by electricity. The current, which costs the company \$5 per h.p. per month, is delivered at the mine at a voltage of 22,000, being of three-phase, 60 cycles. This is transformed at the surface to 2200 volts, and is taken down the shaft in a three-wire cable, each wire of 500,000 circular mils area. These wires are protected by a jute covering, a lead covering and a steel-wire armor, the whole making a cable of 2¾ in. diameter, weighing 10 lb. per ft. This cable is supported by brackets, every 30 ft., and at intervals of 6 ft. in between is secured by staples to the shaft timbers. Underground the 2200-volt current is transformed to 440 volts for motors under 50 h.p. and to 110 volts for the lighting circuit.

### PUMPING EQUIPMENT AT C. & C. SHAFT

The pump equipment at the C. & C. shaft is as follows: Two Evans hydraulic elevators raise the water from the 2480-ft. level to the 2150-ft., where they deliver it into the Riedler pump sump. At present the valves of these elevators are on the 2150-ft. level, while the elevators themselves are anchored at the 2480-ft. There are two of these in the shaft, one



GOLD HILL, ON THE COMSTOCK LODGE

is only 20 per cent. at this head, but it is the only sinker which has been able to stand the hot water, and moreover it is, in the opinion of the management, the only pump able to do the work in the limited space of the shaft, which is only 2x5 ft. in the clear, owing to an old 15-in. air pipe, a Cornish pump rod, and a 12-in. column pipe, the remains of operations in former days. The water power employed costs only about \$4 per h.p. per month.

At the C. & C. shaft drifts are run at

the 2250-ft. and the 2350-ft. levels, which deliver considerable hot water. This is caught before it reaches the shaft, and is raised to the 2150-ft. level. At the 2350-ft. level a two-step, special Jackson centrifugal pump, run by belt from a 40-h.p. motor lifts about 400 gal. of water per minute to the 2150-ft. level. A one-step centrifugal pump, driven by a 20-h.p. motor, lifts 100 gal. per min. from the 2250-ft. to the 2150-ft. level.

At the 2150-ft. level are three Riedler pumps, each driven by a 225-h.p. Westinghouse type C motor, using a 2200-volt current. In six years of use of this high voltage underground, not a single short-circuit has occurred, and not a fire has been started, although the motors are operating in a very misty atmosphere; nor has a single man been hurt. The three Riedler pumps together have a capacity of 4500 to 4700 gal. per minute from the 150-ft. level to the 1750-ft., the latter being the Sutro level. They have run continuously for two years and eight months without any great amount of repairs, except some new valves, etc. Phosphor-bronze lining is used in the cylinders of these pumps. The pumps are 6 11/16x24 in., duplex, double acting, 110 revolutions per minute.

### THE WARD SHAFT

The equipment at the Ward shaft is as follows: An 8x16x9-in. Blake sinker pumps about 300 gal. per minute from the 2430-ft. level to a special three-step Jackson centrifugal pump, run by a 50-h.p. motor. At this level there is a Starrett

air-lift pump, which is held in reserve. The centrifugal pump lifts the water 250 ft. to the 2100-ft. level, where there is a triplex Knowles 8x12-in. plunger pump, with phosphor-bronze lining, run at 85 to 90 strokes per minute. This pump throws the water to the 1600-ft., or the Sutro, level.

The plans of the company contemplate sinking the Ward shaft to a depth of 3100 ft., where a station will be cut, and large electric pumps will be installed. A de-

scription of this plant was published in a recent issue of the JOURNAL. At the C. & C. shaft, the plan is to install a four-step centrifugal pump at the 2450-ft. level. Pumping will then be continued until the 2650-ft. level is reached, which is the deepest at this shaft. A large station will be cut there, and a large electric pump will be installed, with possibly a Starrett air-lift pump as a reserve.

#### PUMP STATIONS AND DISPOSAL OF WATER

In all sinking on the Comstock the plan is to go down in the country rock,

all rotted away, allowing the tunnel to fill with vapor from the water, which is 92 to 93 deg. F. as it flows through it.

#### COST OF PUMPING

The pumping cost per month at the C. & C. shafts is approximately as follows: Water for hydraulic elevator, \$3000 (water costs \$20 per miner's inch per month, or about \$4 per h.p. at the pump); electric power (\$5 per h.p. per month), \$3000; attendance, \$900; repairs, \$250; total, \$7150.

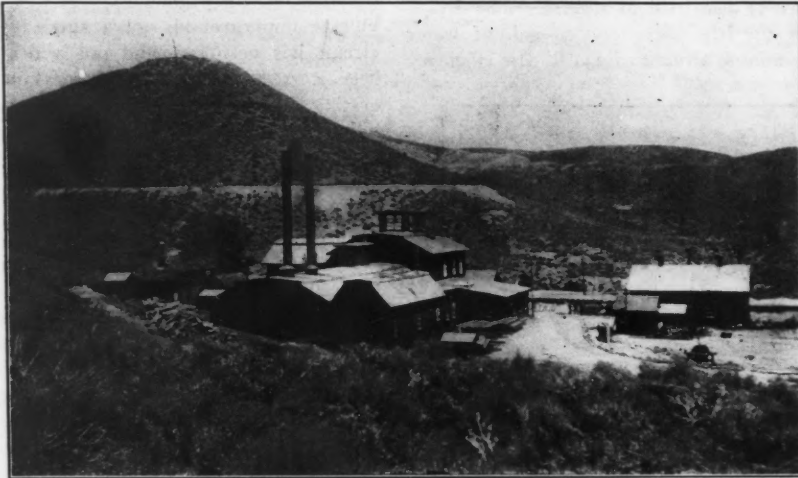
The present pumping equipment has run

some instances, of the air compressor on the level where the drills are running. These compressors are set up in some place where the air circulation is good, and are run by an individual induction motor. This dispenses with an air pipe in the shaft, and saves loss of power in transmission.

At the Yellow Jacket and the Union shafts electric hoists using the Koepe tail-rope system are employed in hoisting. The C. & C. shaft is also equipped in the same way, but owing to the fact that the hydraulic elevators have to be removed frequently this cannot be used at present, and consequently the old reel hoister of former days is employed.

#### HIGH TEMPERATURE UNDERGROUND— VENTILATION

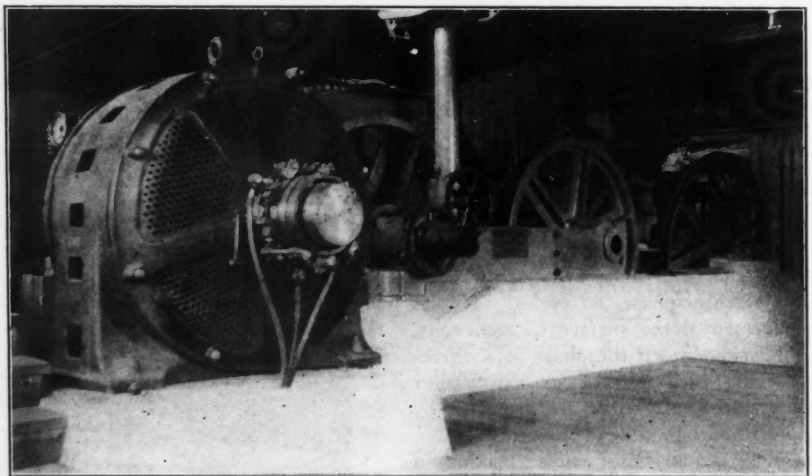
One of the most interesting features at the Comstock is the ventilation of the working faces and the method of rendering the drifts and raises fit for men to work in. The heat in these mines comes from the hot water, and not, as at Butte, Mont., from the crushing of the rock, decay of the timber, and oxidation of the rock and ore. In the Comstock the rock itself is hot, but the air is fairly good. The underground water is 160 deg. F. in some parts of the mines. In going into some abandoned drifts the heat almost takes the breath away, the temperature being 125 to 130 deg. One wonders how



OVERMAN SHAFT, GOLD HILL, NEVADA

avoiding cutting the vein until station pumps, etc., are installed. Then when ready for a large flow of water, prospecting is begun. The pump stations on the Comstock lower levels will be cut out about 10 ft. or so above the levels, i.e., they will have the roof of the level station for the level of their floors. This gives some time for repairs in case of breakdown, as the whole level has to fill with water before the pump is drowned out. Two sinker pumps, one being held in reserve, will be used to pump directly from the level sump to the large electric pumps. These sinkers will work submerged, and will probably be Jackson centrifugal pumps connected to a vertical driving rod, on which, at the pump level, is mounted an electric motor, which will run the submerged pump. These sinkers will be placed in a fourth compartment, sunk from the pump station to the sump especially for them.

The column pipes in the shafts discharge into wooden stave pipes made of Oregon pine, dipped in creosote and held together by iron bands. This pipe costs about \$1.75 per ft. and serves the purpose well. It carries the water to the Sutro tunnel; 24-in. pipe is used in the laterals and 30-in. in the main tunnel. The pipe in the main tunnel extends only for a short distance, but it is the intention of the company to put this wooden pipe in the ditch under the tracks, and pipe the water clear to the portal. Formerly the ditch was covered with planking, but this has



KOEPE ELECTRIC HOIST, C. & C. SHAFT

for two years and eight months, shut down only a few hours for repairs.

I am unable to give the cost at the Ward shaft, but it is not anywhere near so high, as only 300 gal. per minute are pumped there at present.

Formerly the water power alone at the Combination shaft, when using the hydraulic pumps, was \$12,500, while, besides, 50 cords of wood at \$11 per cord were burned per month. At that time (when the mines quit pumping in 1887) it cost about \$34 per h.p. per month to raise the water.

#### AIR COMPRESSOR AND HOISTING PLANTS

An interesting feature in present practice on the Comstock is the placement, in

men can work in such places and he thanks his lucky star that he has only a suit of flannel on, and that a bath awaits him on top. The fact is the men don't work in such places. Whenever a drift is run, at the same time a blower is installed. These blowers are either 40 or 45 in. in diameter. They are run by individual induction motors; 10 to 15 h.p. for the 40-in. fan; 16 to 20 h.p. for the 45-in.; both run at from 1600 to 1800 r.p.m. The air pressure is about 4 to 5 oz. per sq.in. A 15-in. air pipe is used to carry the air in, these mains being seldom over 1000 ft. long. The blower is set up at some place where there is a good circula-

tion of air. Owing to the many shafts on the Comstock, there is naturally a good circulation of cool, fresh air through the main workings. This is directed by partitions and brattices.

In this way the temperature is kept down to about 90 deg. Indeed it is surprising how cool (comparatively speaking) are these drifts where the circulation is kept up, compared with the drifts where there is no circulation. Sometimes a suction fan and a blower both have to be used at the same time in order to keep the drifts cool enough. But in some places it becomes too hot even when a blower and a suction fan are used. Then a pipe of cold water from the surface is carried into the drift and a spray of cool water played upon the men as they work. At the same time the blower and suction fan are kept running; in this way they find it possible to work in the hottest places. By opening up a level by drifts and raises, and allowing it to drain well and keeping up a good circulation of air, the workings become surprisingly cool.

#### COST OF DRIFTING

With this artificial ventilation, it is possible to drive with air drills a 5x6-ft. drift in ordinary ledge matter on the Comstock for \$9 to \$10 per ft., a remarkably low cost considering the unfavorable conditions. One wonders whether possibly it would not pay equally well to resort to artificial ventilation in other metal mines, like those at Butte, Mont., where the air in the stopes is notoriously bad. At least one "hot-water man" has not forgotten this lesson of ventilation, for the Silver King mine at Park City has a system of artificial ventilation with pipes on the different levels.

#### RESULTS OF PROSPECTING

And now I come to what is perhaps the most interesting part of the story—the degree of success that is attending this re-opening of the Comstock.

At the Yellow Jacket shaft and at the Overman a large quantity of low-grade ore, running from \$5 to \$15 per ton, has been opened. In the several mines working through the Overman shaft considerable crosscutting and drifting has been done on the Comstock ledge, but with very little success, although in virgin ground. This work has all been done above the Sutro level, the 1200-ft., for at present the water in the Gold Hill mines stands about at the Sutro level. In the Caledonia ground a spur vein, called the "middle vein," running southwest, has been opened up for a distance of 1000 ft. and is known to extend to the 900-ft. level. This vein runs mainly from \$4 to \$15 per ton, but in it there are small bunches of rich ore. The gangue is pyritiferous quartz, a good deal of the gold and silver being carried by the pyrite. It is thought that \$8 to \$9 ore can be made to pay on the Comstock.

In the Savage ground and also at the

Hale & Norcross some bodies of good ore have been found on the Sutro level. In the Ophir considerable good ore has been found in a northeast spur vein, leading off from the Comstock. At the Consolidated California & Virginia some good ore has been found. At both the Ophir and the C. & C. this ore is below the Sutro level; these are the only mines which have as yet been re-opened below the Sutro level. At many of the mines, however, in the old reports of their superintendents, are statements of bodies of good ore existing when pumping was suspended, especially in the Union mine on the 2400-ft. and 2700-ft. levels.

#### THE OLD DUMPS

And now we come to the surface again, where there is another lesson from the old dumps. In the haste and excitement of the bonanza days, barren rock and rock then too low in grade to pay to mill, but which would now be pay ore were dumped together. As a result, at least for the present, these dumps, although containing many tons of good ore, cannot be treated on any large scale. From time to time some of them are milled, but with very little profit. Had the ore, too low grade at that time to pay for milling, been kept separate, it would make a handsome return to the present stockholders. We think we are wiser now, but how few mines today have dumps where ore too low grade to mill at present is being kept separate from the barren rock?

And another thought also arises out of this visit to the Comstock, What would the present companies not give to have an accurate assay map of the different workings on the old lode?

It is said that the ore in the deepest levels formerly opened up, and in the ore-bodies which have been found since the re-opening has begun, is identical in character with that in the upper levels of the Comstock. It is of low grade in some places, of good grade in others, with bunches in it going from \$1500 to \$4000 or \$5000 per ton.

#### The Ontario Corporation Law

The unsatisfactory condition of the law respecting joint-stock companies has had frequent illustrations latterly, and the Ontario government has undertaken to make some important amendments in the interest of shareholders. A bill has been prepared for submission to the legislature. Among other changes it provides for the making of very full returns of the affairs of companies at annual meetings; makes the directors liable for all statements made in prospectuses, including those based on expert testimony; provides for the transfer of shares by the delivery of share warrants, and provides for a fixed minimum share subscription prior to the allotment of share capital, as a means of preventing floatations on insufficient capital.

### California State Miners' Association

#### SPECIAL CORRESPONDENCE

Upon being elected president of the California Miner's Association at the end of the recent convention of that body, Wm. C. Ralston said: "We know that we have one of the richest mineral countries in the world. There may be a few cases of fraud, but generally speaking investments in mines are now safe. A few years ago it was almost impossible to point out a large building in the city that was not built through the profits of the Comstock times. The city was never so prosperous as when the mining exchange was busy. Money was lost, of course, as it is in all ventures, but I am glad to see that the opportunity has come for the miners to get money to open their mines, and now that the selling of stocks is bringing capital here this is the time for California to reap the harvest. As the public is largely engaged in stock speculation I now see an opportunity to secure the support of Eastern capital for the development of our mines. This is all we need. It is the fashion to speculate in mines, and we must take advantage of the time and reap the benefit."

At the convention resolutions were presented by the committee and adopted by the convention, urgently requesting the California congressional delegation to make all possible efforts to pass the bill providing for the appropriation of \$200,000 for surveys of the gold-bearing gravel lands in this State and the overflowed lands of the Sacramento basin, preliminary to a plan to reclaim the overflowed lands through the deposit thereon of the detritus of hydraulic mines now lying idle; also requesting the legislature to authorize the governor to appoint a commission of three members to obtain data as to the extent of the gold-bearing gravel lands and the approximate value of the gold they contain; urging Congress to pass the bill providing for the segregation of the mineral lands within the railroad land grants in the State; urging the establishment of a national department of mines, the amendment of the mineral-land patent laws for the better protection of the miners and the amendment of provisions of the law relating to miners and material men's liens so the owner of a mine may bond it and still be able to protect himself and his property against liens for labor and materials, for the contracting of which he is not personally responsible.

There are 43 blast furnaces in Belgium, turning out about 2,000,000 tons of iron per year, 60 per cent. of which is Thomas pig and 30 per cent. forge pig. There are 25 steel works containing 25 steel furnaces and 46 converters, producing on an average of 1,000,000 tons per year.

## A MODERN COAL MINE

### Equipment and Methods of Illinois Midland Coal Company

BY M. F. PELTIER \*

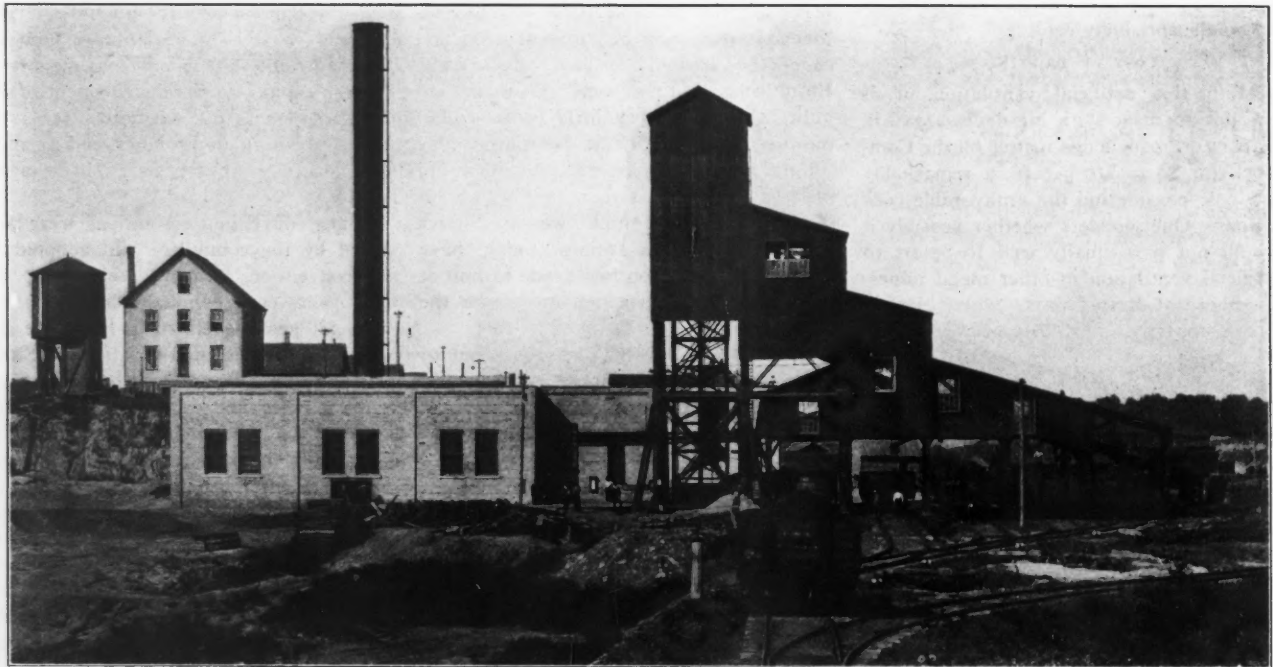
The plant of the Illinois Midland Coal Company is one of the most modern coal-mining plants in the State. It is situated near Springfield, Ill., on the northbound track of the Chicago & Alton Railway. In constructing this plant the general superintendent, T. J. Armstrong, did credit both to himself and company.

The mine is designed to handle 2500 tons of coal in eight hours, and at the present time is getting out about 1400 tons of coal in eight hours. This mine has many advantages over other mines in the size of the compartments in the shaft, which enables them to use a 3-ton mine car and self-dumping cages; this is econ-

and timbering. The main shaft is 10x20 ft. in the clear, and is divided into three compartments; two of these are 7x10 ft. for hoisting purposes, and the other 3½x10 ft. for electric wires, steam and water pipes. The shaft is timbered with 6x10-ft. white pine laid flat, and has 10x10-ft. buntings between the compartments, making a very substantial piece of work. The escape and air shaft is 10x15 ft. in the clear, divided into an air chamber 10x10 ft. and escapement 4½x10 ft. It is timbered the same as the main shaft.

No portion of the equipment of a modern coal mine is of more importance than the tippie, for no matter what the ca-

gages built by the Duncan Foundry and Machine Works, of Alton, Ill. The cage is different from that commonly used in the northern coal fields where the cars are pushed off and on the cage by hand, or with a steam pusher. With this cage the car rests on a platform supported by four legs, the lower end of which is fastened to the arms of the rockers supported to a shaft. These legs are secured to a platform in such a way that the greater part of the weight of the platform is at the rear side. The shaft has bearing rollers which engage a suitable stop when the cage reaches the top of the shaft. This causes the forward end of the platform to tilt downward so the car can be dumped. The car is kept in place on the cages by yokes that encircle the wheels, and is counterbalanced by weights below the platform of the cage. The cages dump the coal into a weigh-pan, built of ¼-in. sheet steel, and hung by rods on a Fair-



SURFACE PLANT OF THE ILLINOIS MIDLAND COAL COMPANY

omy, due to the fact that the cages do not need any attention at the top when in operation, except one man or boy to take care of the checks. There is a steel tippie absolutely fireproof which is equipped with shaker screens and the necessary chutes that handle and screen the coal with a small percentage of breakage.

#### ACREAGE AND EQUIPMENT

The company owns about 2000 acres of coal land and is mining what is known geologically as No. 5 seam, which is 6 ft. thick, having a strong slate covering and fire-clay bottom. Sinking was commenced Sept. 6, 1903, with J. C. Patterson in charge, and coal was reached 60 days later at a depth of 204 ft. This is a remarkable speed record in shaft-sinking

\*Chief engineer, Peabody Coal Company, Marlon, Illinois.

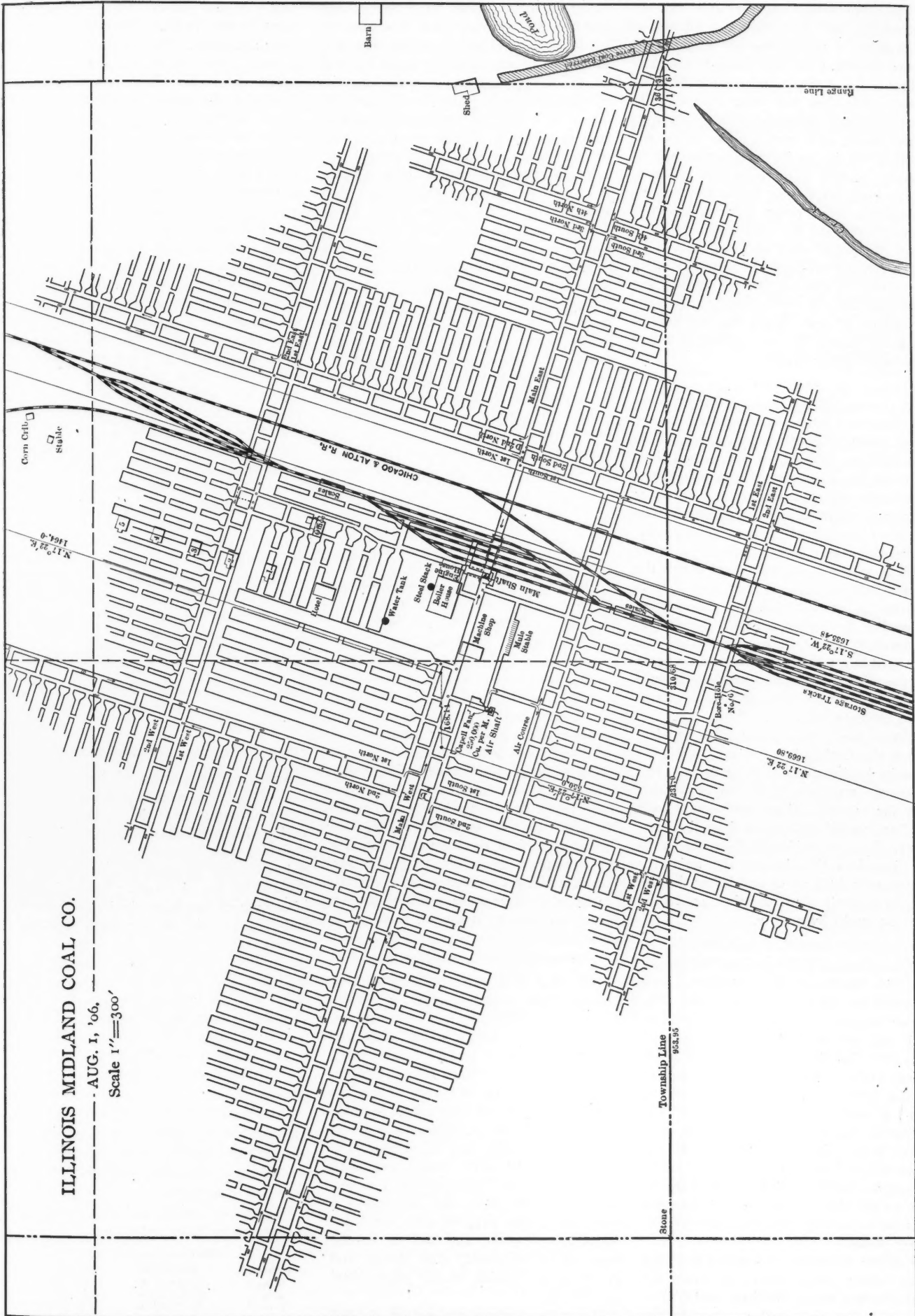
capacity of the works, or the amount of coal that is mined, unless the product can be placed on railroad cars in proper condition for market, all other improvements are of no avail. In other words, the success of the plant depends to a large extent upon the tippie. The head frame and tippie is built of structural steel on concrete piers and covered with corrugated iron. The tippie part is 20x64 ft., spanning the four loading tracks. The head frame is 68 ft. high from the top of shaft coping to center of sheave wheels, and is braced with steel incline frame work extending from the steel girders carrying the sheave wheels to a concrete foundation at the foot of the engine house.

#### HOISTING

The coal is hoisted by self-dumping

banks-Morse set of hopper scales. After it is weighed the counterbalanced door of the pan opens, and the coal falls by gravity on to the shaker screens.

There are two sets of shaker screens and chutes which span the four loading tracks for screening and loading the coal into railroad cars. These screens are 37½ ft. long by 6 ft. wide, built up with angles and plates, and hung on a 3-in. shaft. The plates are perforated with 1½-in., 2½-in. and 6-in. holes. The size of coal furnished is slack, nut, egg, lump and run-of-mine. The screens are provided with cross heads which are connected to a 6-in. shaft by eccentric rods, and driven by a belt and pulleys from a 10x18-in. Atlas engine. They were built by the Duncan Foundry and Machine Works.



ILLINOIS MIDLAND COAL CO.

AUG. 1, '06.

Scale 1" = 300'

In order to load box cars with coal economically and with the least amount of breakage, a Smith box-car loader has been installed by the Duncan company. This is in reality a device for handling cars while they are being loaded. The car rests on a platform which is supported and moved on a cradle. The tilting and rolling of the cradle is accomplished by means of two 15-in. hydraulic cylinders 24 ft. long, working by hydraulic pressure, furnished by a pump working under a pressure of 250 lb. The cylinders move and the piston rods are stationary. To each cylinder is attached a wire rope which in return is attached to the cradle, and through this the car is tilted to an angle of about 35 deg. When the end that is down is loaded, the car is tilted back and the other end is loaded.

#### VENTILATION

It is one of the best ventilated mines in the state, having a reversible double-inlet exhaust Capell fan, 13½x7 ft., built by William Clifford, of Jeannette, Penn. The fan has a guaranteed capacity of 250,000 cu-ft. per min. against a 5-in. water gage, and on its trial speed produced 400,000 cu.ft. of air per min. without mine resistance with a 4-in. water gage. The lower half is set on a concrete foundation, the upper half is built of sheet steel. It is driven by an 18x18-in. direct-connected Chandler & Taylor engine. By an arrangement of the doors, the fan can be changed in a minute to force the air down in the mine. The whole structure is built of brick, iron and concrete, and is, therefore, incombustible.

There are four loading tracks underneath the tipple, also a storage track for empties having a capacity for 80 cars, and a storage track for loads having a capacity for 74 cars. These tracks were built and are owned and operated by the company. They are laid with 80-lb. steel rails on first-class ties, having the necessary cross-overs, both above and below the tipple, to properly distribute the cars to the various tracks by gravity.

#### POWER HOUSE AND BOILERS

The buildings are unusually substantial for mine buildings, the foundations being of concrete and the walls of brick. The boiler house is 75x50 ft., with an 18-in. wall and gravel roof supported by steel trusses. The floor is paved with brick. There are at present four tubular boilers, of the Erie City type, 6x18 ft., rated at 150 h.p. each; room is provided for two additional boilers. One Wainwright feed-water heater which receives all the exhaust steam from the dynamo and hoisting engine, purifies and heats the water to 160 to 200 deg. F. before it is pumped into the boilers by Fairbanks-Morse feed-water pumps.

Fuel for the boilers is supplied by a coal drag, which carries the slack from the shaker screen under the tipple, and distributes it under each boiler. Outside the

boiler room is a steel stack 100 ft. high and 6 ft. in diameter; a 6-ft. flue connects the stack to steel breeching over the boilers. The engine house is 40x50 ft., with an 18-in. wall and gravel roof supported by one steel truss. The floor is concrete. There is a pair of first-motion hoisting engines, 24x36 in., built by the Aetna Foundry and Machine Co., of Springfield, Ill., having a differential conical drum tapering from 5 to 7 ft. with an 8¾-in. steel shaft and grooved for 1¼-in. steel rope. There is also one 110-volt Western Electric Company's generator, connected directly to a 50-h.p. Ideal engine. This furnishes lights for all the buildings on top, and for the bottom of the mine. The engine room is elevated about 10 ft. above the boiler room, which not only gives the engines the advantage of dry steam, but keeps the foundations sufficiently above the ground to allow access to the lower end of the anchor bolts. The machine and blacksmith shop is 30x60 ft., and equipped with two forges, 12-in. Buffalo blower fan, emery grinder, drill press,

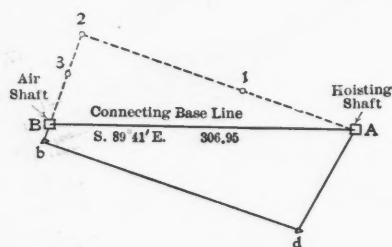


FIG. 1

hammer, etc. Power for same is furnished by an 8x12-in. engine.

The water supply for the entire plant is furnished by six 2-in. drive wells put down by D. B. Medill, the resident superintendent of the company. They are driven 25 ft. into the sand and gravel of the Sangamon river bottom. The suction of a No. 9 Cameron pump is directly connected to these wells, and the water is forced up into a 30,000-gal. tank 70 ft. above the boilers.

#### BUILDINGS AND MINERS' HOUSES

The office is a frame building with an artificial-stone foundation; it is divided into a main office, engineer and superintendent's room, supply room, vault and toilet room with all modern conveniences. The hotel is a three-story frame structure 56x40 ft., containing 22 rooms. There are five cottages with six rooms each, and having a brick foundation, cellar, hot and cold water, electric lights and steam heat. The toilet rooms all have closets and wash stands, which are connected to a sewer. In front of the hotel and cottages is a landscape garden supplied with water for sprinkling purposes, and laid off in the form of a boulevard, with drives and gravel walks leading to the office, hotel and cottages.

The mine workings are laid off at right

angles to the railway track, which runs north 17 deg. 22 min. east, and is worked room-and-pillar. The double-entry system is used, except in the main west entries, which are triple. The mine is planned so that in the future all the coal can be caged on one side and the empty cars taken off on the other. The main side and stub entries are driven 10 ft. wide with a 30-ft. pillar between. Rooms are turned off the stub entries at right angles with 34-ft. centers and driven 250 ft. long and 20 ft. wide, leaving a 14-ft. pillar between them. It is the custom in this mine to drive the rooms as well as the entries on sights, thus insuring the uniform thickness of the pillar, which also removes the danger of a squeeze or creep. The main bottom on each side of the mine is 16 ft. wide and 8 ft. high, timbered with yellow pine 12x12 in., and has a double track laid with 35-lb. steel rails on a grade of 1½ per cent. in favor of the loaded cars. From each side of the mine where the tracks lead to the cages, there is a cross-over diamond, or a double cross-over. By this arrangement the coal can be cross-caged from one track to the other and the cars can be more easily regulated. The bottom is lighted by electricity. The main and side entries are laid with 35-lb. steel rails, stub entries with 25-lb., and rooms with 16-lb. The overcasts which carry the air across from one entry to another are built of concrete for sidewalks, and the roof is made by laying steel rails about 18 in. apart. These overcasts have an area of about 60 sq.ft. The mine is perfectly dry and free from gas.

#### ESTABLISHING THE MERIDIAN UNDERGROUND

The general precision of the mine survey depends upon the instrument, tape, men and conditions of the survey. In surveying this mine the common method of plumbing two lines down a single shaft did not prove satisfactory, so the writer decided to try the rather unusual plan of one plumb line down the hoisting shaft, and another down the air shaft, and connecting the two points above and below the ground. The base line on top was established, and down below the main west entry and air course were open, which afforded a desirable connection. The direction of the base line underground *A* to *I*, was assumed and a traverse run from *A* to *B*, Fig 1, both above and below ground.

The plumb lines are represented by the letters *A* and *B* hanging in separate shafts, the surface stations being indicated by small letters, while the underground stations are numbered.

The surface survey and the traversing of this survey is as follows:

SURFACE SURVEY.		
Courses.	Bearings.	Distances.
<i>A</i> to <i>a</i>	S. 32° 22' W.	113.88 ft.
<i>a</i> to <i>b</i>	N. 72° 38' W.	264.00 ft.
<i>b</i> to <i>B</i>	N. 17° 22' E.	20.00 ft.

TRAVERSE SURVEY.			
Latitude.		Departure.	
N.	S.	E.	W.
.....	96.18	.....	60.96
78.77	.....	.....	251.96
19.08	.....	5.97	.....
97.85	96.18	5.97	312.92
96.18	.....	.....	5.97
1.67	.....	.....	306.95

The bearing of the closing course of the surface survey, or the line *A B*, is found as follows:

The natural tangent of the angle made by the line *A B* is  $\frac{306.95}{1.67} = 183.80$ , or the angle is 89 deg. 41 min.; the bearing of the line is therefore N. 89 deg. 41 min. W.

To find the length of this line:

$$\frac{306.95}{\text{Sine } 89^{\circ} 41'} = \frac{306.95}{0.99998} = 306.95.$$

The underground survey and the traverse of this survey are as follows:

UNDERGROUND SURVEY ASSUMED.		
Courses.	Bearings.	Distances.
A to 1	West	125.53
1 to 2	N. 88° 45' W.	166.60
2 to 3	S. 23° 15' W.	42.00
3 to B	S. 0° 18' E.	49.50

TRAVERSE OF SURVEY.			
Latitude.		Departure.	
N.	S.	E.	W.
.....	.....	.....	125.53
3.63	.....	.....	166.56
.....	41.96	.....	1.64
.....	49.49	.....	0.26
.....	.....	.....	.....
3.63	91.45	.....	293.99
.....	3.63	.....	.....
.....	87.82	.....	.....

The bearing of the closing line of this survey, or the line *A B*, is found as follows: The natural tangent of the angle made by *A B* is  $\frac{293.99}{87.82} = 3.347$ , or the angle is 73 deg. 22 min.

The bearing of the line *A B* underground is therefore S. 73 deg. 22 min. W.

To find the length of this line:

$$\frac{293.99}{\text{Sine } 73^{\circ} 22'} = 306.84.$$

The length of this line *A B* underground is therefore found to check the length of the same line on the surface within reasonable limits considering the conditions of the survey, but the underground bearing is S 73° 22' W., and the surface line is N. 89° 41' W., so the underground line must be swung 16 deg. 57 min. to the right. The correct bearings of the underground survey are as follows:

Courses.	Bearings.	Distances.
A to 1	N. 73° 03' W.	125.53
1 to 2	N. 71° 48' W.	166.60
2 to 3	S. 19° 12' W.	42.00
3 to B	S. 17° 15' W.	49.50

The diamond-working industry in the United States had its real beginning in 1898. It has steadily increased since that year. The imports in cut diamonds, notwithstanding the duty of 10 per cent., were nearly two and one-half times the value of the uncut imports in 1906. It is calculated that at least three-fourths of the world's output of cut diamonds find consumption in the United States.

### Safety Chambers in Coal Mines

In dealing with the use of compressed air in coal mines, J. L. Dixon, in a paper read before the Coal Mining Institute of America, submits an idea that is worthy of the attention of coal managers.

Mr. Dixon says: "In most explosions the majority of those lost are asphyxiated by the afterdamp. In numerous cases they have sufficient time to travel a considerable distance before being overcome by the deadly gas. Had there been some definite point to which these men could have directed their steps where fresh air and food in abundance could be found, it is likely that the death list would have been diminished.

"The plan I wish to suggest, is that in every mine, life-saving stations or chambers of refuge should be established. They should be excavated in the solid coal, the approach should be by a long narrow entrance which could easily be rendered explosion-proof. The chambers should be about 15 ft. by 30 ft., and should be connected with the surface by a compressed-air line, which could be put down a borehole directly into the chamber, or could be laid in the mine in such a way that no explosion would disturb it. This might be done by laying it in a ditch made for that purpose, or by covering it in such a manner that the line would not be broken by falls of rock. Connections should be made from this pipe into each chamber of refuge, which, when turned on, would give a sufficient supply of air to any refugees who may be so fortunate as to reach them.

"These chambers should be amply provided with first aids to the injured, with restoratives, with condensed foods, all in damp-proof cases. They should also be supplied with electric safety lamps, flasks of oxygen, and with modern life-saving appliances so that the safety chamber could be used as a base from which rescuers could go forth to the aid of those unable to reach the station. These places should also be connected with the surface by an explosion-proof telephone system. This can be done by laying the wire in the compressed-air pipe. I will venture to say that there is not one explosion-proof system in any mine in the United States. A 6-in. or 8-in. main line would insure a good supply of air for from 200 to 300 men if confined to three or four safety chambers. The line can also be used for the transmission of liquid foods, as well as a conduit for telephone wires. In order that the miners should have a guide to the safety station, arrows pointing in this direction should be made on the sides of the entries with luminous paint. Full instructions represented in the mine should be printed and posted in conspicuous places. These instructions should fully set forth the uses of the system and under what conditions it is to be em-

ployed. At each large mine there should be a corps of trained men conversant with methods of life saving after an explosion, who would act with intelligent and efficient promptness."

### The Coal Question in Utah

SPECIAL CORRESPONDENCE

The Federal grand jury in Salt Lake City has returned indictments against Everet Buckingham, general superintendent of the Oregon Short Line Railroad; the Union Pacific Railroad Company, and the Oregon Short Line Railroad Company, for violations of the interstate commerce law. Against H. G. Williams, general manager of the Utah Fuel Company; James M. Moore, general western sales agent of the Union Pacific Coal Company; Robert Forrester, geologist and agent of the Utah Fuel Company; William D. Foster, secretary to Robert Forrester; Elroy M. Clark, of Denver, attorney for the Utah Fuel Company; Alexander H. Cowie, chief clerk in the office of the vice-president of the Utah Fuel Company; George A. Moore, agent of the company, employed to secure dummies to locate coal land for said company, and the Utah Fuel Company, as a corporation, for conspiracy to defraud; also against Thomas A. Moore and Theodore Schultke, who located land for the purpose of disposing of it to the Utah Fuel Company. The last two will be required to stand trial for perjury.

The foregoing is the result of the investigation conducted recently by the Interstate Commerce Commission, during which testimony was given showing startling irregularities. In the cases of the Union Pacific and Oregon Short Line railroads it was shown that secret rates have existed in some instances and that only a certain number of retail coal dealers were permitted to conduct business in Salt Lake and other Utah points. In one instance a dealer, who had been in business in Salt Lake for a good many years, was refused coal altogether, because he chose to sell fuel at a reduction of 25c. per ton from the regular rate of \$5.25; he was thereby forced to retire from business altogether. The reduction stated was put into effect during the past summer when the railroads granted dealers a 25c. reduction in the freight tariff, with the view of inducing them to store a winter supply; the dealer, D. J. Sharp, believing it proper to give his customers the benefit of the lower rate. It was shown, too, that questionable methods, as seems to have been the case with the Utah Fuel Company, were employed to secure title to coal lands. The accused have furnished bonds for appearance for trial before Judge Marshall during the April term of court. It is said other indictments and arrests will follow.

## Smelting Blende Containing Calcareous Gangue\*

BY L. BISSCHOPINCK†

For a long time it was thought that the difficulty in smelting zinc blende which had a calcareous gangue was due to the presence of  $\text{CaSO}_4$  formed when the blende was roasted. It was asserted that in the muffle the  $\text{CaSO}_4$  was reduced to  $\text{CaS}$ , and that the latter reacted with  $\text{ZnO}$  to form  $\text{CaO}$  and  $\text{ZnS}$ . This theory is entirely wrong, inasmuch as the affinity of sulphur for lime is much greater than its affinity for zinc. The thermochemical investigations of Thomsen established this point with certainty. He found that the heat of formation of  $\text{CaS}$  produced in the wet way is 98,170 cal. and that of  $\text{ZnS}$ , also produced in the wet way, is only 41,580 cal., the difference being too great to be attributed to the presence of the water, and hence these figures are relatively true for  $\text{CaS}$  and  $\text{ZnS}$  formed by dry means. Practical experience confirms the above statement.

Experiment has established the fact that at a glowing heat,  $\text{ZnS}$  and  $\text{CaO}$  will react in the crucible, or in the muffle, in the presence of carbon, forming  $\text{CaS}$  and metallic zinc. If, then, a roasted blende containing calamine and a calcareous gangue is being worked, nearly all of that sulphur which still remains in the roasted blende will form  $\text{CaS}$  with the  $\text{CaO}$  of the calamine and metallic zinc will be produced.

Although the  $\text{CaS}$  itself does not do any harm, its formation in the muffle is the cause of the difficulty of reducing the zinc from its ore. The reason is the excessive amount of heat required to break up the  $\text{CaSO}_4$ .

Knowledge of the heats of formation of calcium compounds is incomplete, and the figures to be given must be considered as approximations, which are, however, accurate enough for present purposes. Researches of Thomsen, and Favre and Silbermann, show that the heat of reduction of  $\text{ZnO}$  is 85,430 cal., and the heat of reduction of  $\text{CaSO}_4$  to  $\text{CaS}$  is 220,200 cal. These figures apply, of course, to molecular weights of the substances in question. The molecular weight of  $\text{ZnO}$  is 81.2 and that of  $\text{CaSO}_4$  is 136. Hence one part of  $\text{ZnO}$  requires for its reduction  $85,430 \div 81.2 = 1052$  cal., and one part of  $\text{CaSO}_4$  requires for its reduction to  $\text{CaS}$ ,  $220,200 \div 136 = 1619$  ca. Therefore, one part of  $\text{CaSO}_4$  requires for its reduction nearly 60 per cent. more heat than does one part of  $\text{ZnO}$ . The logic of this reasoning is that the presence of  $\text{CaSO}_4$  in a charge requires an excessive amount of heat to insure reduction.

\*Abstract of an article in *Metallurgie*, 1906, XXI, p. 726.

†Godullahütte, Upper Silesia, Germany.

The roasted blende of Upper Silesia frequently contains 18 per cent. of  $\text{CaSO}_4$  and sometimes more than that amount. The furnaces, therefore, have to supply not only the heat necessary to reduce the zinc, but also the large amount required to reduce the  $\text{CaSO}_4$ .

If the zinc in blende which is rich in lime is not satisfactorily won, the reason is lack of sufficient heat, which may be due to too low a temperature in the muffle, to too short a period of reduction, or to both.

## The Boston Consolidated Mill, Utah

BY L. H. BEASON

The foundations of the Boston Consolidated mill at Garfield, Utah, are about all in and within a short time the work of raising the structural steel will begin. There is great interest in this plant, as well as in the one being erected by the Utah Copper Company, about a mile away, because they will be very different, although the ores to be treated are identical. The Boston plant will crush with Nissen stamps, while the Utah will be equipped with No. 7 gyratory crushers and Chilean mills.

Through the courtesy of A. J. Bettles, under whose direction the Boston mill was designed, and is now being built, I have for the *ENGINEERING AND MINING JOURNAL*, obtained the following data: The plant will consist of several structures, the principal of which are the main mill building, 600 ft. wide by 300 ft. in length; the crushing plant, 80 ft. wide by 70 ft. long; the crude-ore bin, 300 ft. long, 35 ft. wide and 40 ft. high; the crushed-ore bin, 560 ft. long, 22 ft. wide and 37 ft. high; and the repair shop, 43 ft. wide by 176 ft. in length, which is divided into separate departments.

A striking feature of the Boston mill is the absence of elevators. The big building is constructed on the terraces, and after leaving the crude-ore bin and crushers at the top of the plant the ore goes practically all the way down to the finish by gravity.

The ore is brought from the mine over the tracks of the Rio Grande Western railway, and delivered on two tracks over the crude-ore bin. This bin is to be equipped at the bottom with 40 patent gates, through which the ore is fed automatically upon two belt conveyors, each 30 in. wide, which are designed to carry it to two No. 6 style K gyratory crushers, whence it passes on through two large, 1.25-in. revolving screens. The undersize goes to two belt conveyors, while the oversize goes to two No. 5 gyratory crushers, by which it is crushed to pass through a 2.5-in. ring. This falls upon the two belt conveyors, which take the undersize from the screens, and all goes to the top

of the crushed-ore bin, where it is again taken by belt conveyors, operated each way from the center, and distributed the full length of the bin. The capacity of this bin, as well as the crude-ore bin, is for 12,000 tons of ore.

From the crushed-ore bin the product is fed automatically into the stamps, of which there are 212, each of 1500 lb. In the preliminary tests as much as 10.5 tons of ore per stamp was crushed in 24 hours, Mr. Bettles estimates the capacity of the plant at from 2700 to 3000 tons.

The stamps will reduce the ore to 28 mesh, No. 28 wire. The product is then classified into four sizes, to be run over Wilfley tables (of which there are 286) the first two sizes, to be finished on the Wilfleys while the last two, after passing the Wilfleys go into a set of Callow cone settling tanks, where they are settled and pulped. After being pulped, these products are to pass over a system of Johnston concentrators, of which there are to be 234.

The finished concentrate from each of the machines will be delivered automatically to launders and sluiced through them to large settling bins from which the product will be removed by machinery into railroad cars and shipped to the Garfield smelter. The tailings will be run down into the valley, where they will be confined in dams.

The tests conducted by Mr. Bettles and his assistants showed that an extraction of 65 to 67 per cent. can be made by the Wilfley tables alone; but by re-treating the finer concentrate on the Johnston machines, the extraction can be brought up to from 75 to 80 per cent. The ratio of concentration will be 16:1 to 20:1.

In the designing and construction of the mill, Mr. Bettles has been assisted by R. F. Mosey, mechanical engineer, and L. H. Wheeler, superintendent of construction. It is estimated that 3400 tons of structural steel material will be used.

Through a favorable contract having been made with the Telluride Power company, the Boston Consolidated management will not be required to build a power plant of its own for at least five years. The Boston Consolidated, Utah Copper Company and Garfield smelter are jointly interested in the Garfield townsite and water supply. Water for the Boston plant is delivered to Spencer spring, and then lifted 380 ft. by pumping to a reservoir above the mill, which will hold a reserve supply of 1,000,000 gallons.

The present price of bismuth, in a wholesale way, at London, is 5s. per pound. The recent fluctuations have been as follows: From Dec. 1, 1904, to March 6, 1905, the price was 10s. per pound. March 6, 1905, it was reduced to 9s. per pound, and Dec. 1, 1905 it was further reduced to 5s. per pound.



## RECENT INNOVATIONS IN RAND METALLURGICAL PRACTICE

### The New Process of Sliming and Continuous Cyanide Circulation

BY G. A. AND H. S. DENNY

The new treatment plant of the Meyer & Charlton Gold Mining Company, Ltd., which has been in operation for the last 12 months, embodies practically all the radical departures from orthodox Rand practice which we have in the past few years so persistently advocated, and no better method of broadly illustrating the results achieved could be adopted than to describe briefly the operations of that equipment.

handling of slimes in conical tanks of special design; (6) filter-pressing; (7) circulation of cyanide solution. Every one of these operations represents an absolute innovation on the methods of the time when the proposals were made, and the suggestion to carry them into practice was not too warmly received.

Up to the present the first four of these recommendations may be said to have become general practice. The results ob-

#### FILTER-PRESSING AND SOLUTION CIRCULATION

So much for the first four recommendations. The adoption of the last three is quite a different matter, for whereas the inclusion of tube-milling does not affect to any great extent the general arrangement of the orthodox plant, the filter-press section aims at the final antiquation and scrapping of the decantation slimes plant—at once the most cherished idol and yet withal the most crude and inefficient section of the Rand metallurgists' equipment. There is only one way to handle slimes economically, and that is to keep them alive right up to the moment they are ready for burial on the dump. In the Meyer & Charlton plant the slimes are automatically and at no cost transferred from one tank to the other, the plant

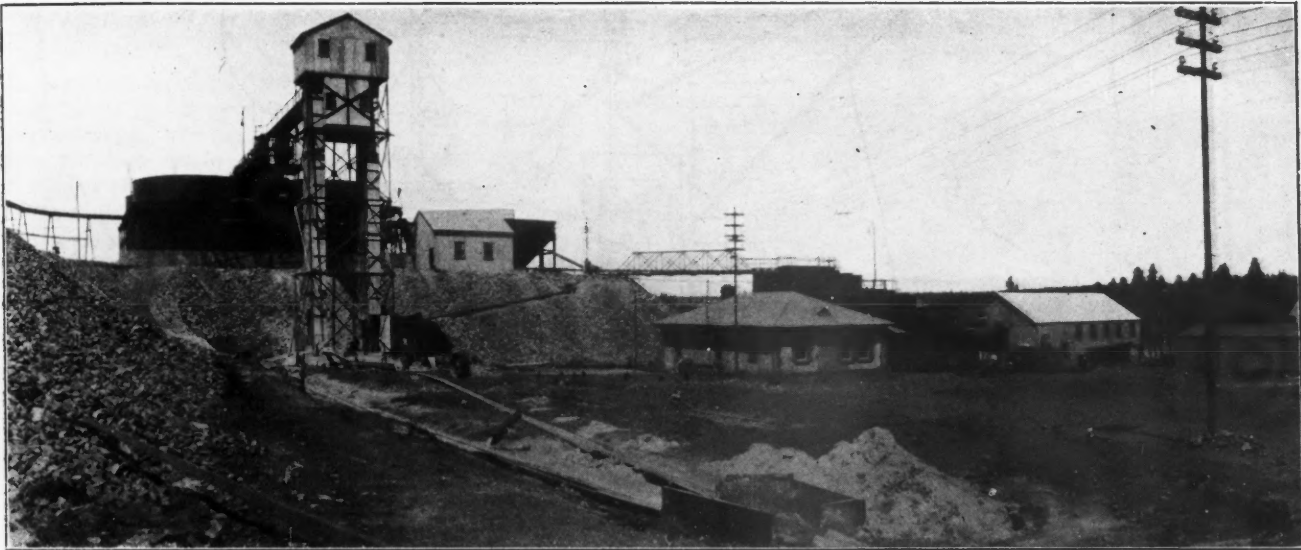


FIG. 1. MEYER & CHARLTON TREATMENT PLANT, HANDLING 400 TONS OF ORE PER DAY

Legend: From left to right, is shown: (1) Return solution launder, in which the excess solution after automatic and continuous separation in 35-ft. conical tank is gravitated back to mill service tanks. (2) The sands treatment tanks, 8 in all (four upper, four lower). (3) Two-legged tower with bucket elevator in each leg, raising pulp, 76 ft. In foreground launder conveying pulp to elevator from sand battery is shown. The bucket elevator discharges into launder at top and the spitzlutten for separating concentrates can be seen between the elevator and sands tanks. Spitzkasten classifying sands

and slimes are immediately over sands tanks, but do not appear in photograph. (4) Small building to right of elevator contains three shaking amalgamated copper plates over which the fine ground product from two tube mills passes. The tube mills are behind this shed. (5) To the right of the shed half of the 35-ft. conical tank is seen. The peripheral discharge from this tank consists of over 90 per cent. of solution separated from the incoming pulp. This solution is perfectly clear and returns direct by the launder first mentioned to the mill service tanks. The bottom discharge is led by a launder, over

the bridge shown, to the series of conical tanks on the right. The building in the foreground of the bridge is the general mine office. (6) To the right of the series of conical slimes tanks is the filter press house, containing four Dehne filter presses. (7) A curious feature in this plant is that the sands treatment, tube mills, and water separating sections, are built on a waste rock heap. This is done, firstly, to economize space, secondly to provide fall for the process, and thirdly to create dumping facilities for the sands residues. In every respect the idea has fulfilled the expectation held for it.

Fig. 1 gives an excellent idea of the general appearance of the plant, while Fig. 2 shows the exact arrangement in plan. With the aid of these two illustrations the reader should have no difficulty in following the course of the ore and solution through the entire process.

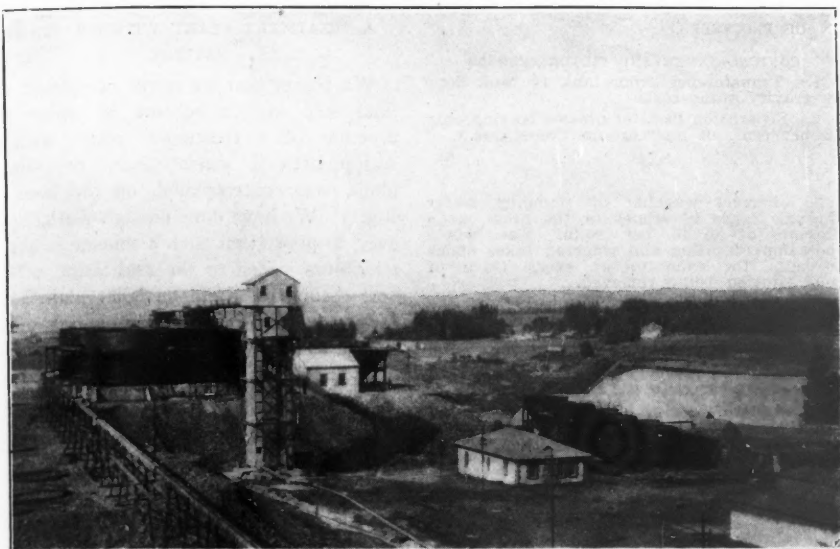
#### NEW FEATURES

The sections of the apparatus and operations which come under this head, and which are the direct consequence, and on the precise lines, of the original scheme laid down by us in 1903, are: (1) tube milling; (2) fine grinding of heavy product; (3) second amalgamation; (4) treatment of reground heavy product with the current slime; (5) automatic separation of return water or solution to battery, and

tained from their introduction have been excellent in two important directions, viz.: increased recovery, and reduced cost. The use of the tube mill has had the anticipated and important effect of assisting the stamp-mill duty and of settling the question of concentrate treatment. In the old scheme concentrates were made (1) on vanners or other mechanical apparatus, and then chlorinated; or (2) in spitzlutten and treated by cyanide in leaching tanks for long periods. The first method was very costly, and the second gave high residue losses and was also costly. The present scheme does away entirely with the separate treatment of concentrates, and has added considerably to the profits of the companies which have adopted it.

working on the gravity principle, and finally the last traces of gold solution are washed out in a few minutes in the filter-presses under a pressure of about 85 lb. per sq.in. The decantation tanks, flat bottomed, and all on the same level, do nothing automatically. Their use involves large pumping plants for transference and large cubic-foot capacity for settlement, and very heavy capital outlay in installation. The most modern plants on this system completed in the last year have represented in capital outlay a figure that on fair interest and redemption charges would alone amount to 25c. per ton of slime treated. The final washing of the slimes can only be done at the pressure represented in the height of the tank—a





A CONDENSED GENERAL VIEW

few pounds at most—and the final discharge has to be run away with water to slimes dams at the cost of large water losses, and high maintenance charges on the upkeep of the dams, not to mention the loss of gold solution in the imperfectly washed slimes. The comparative schedule, shown in table I, reflects the relative merits of the two systems.

The respective results obtainable from the two systems show in the above comparison all in favor of the filter-press scheme and in those cases where water has to be purchased the comparison becomes more one-sided. In our opinion, therefore, the adoption of the first four recommendations will, without the slightest doubt, be followed by the further adoption of the remaining three in all future plants. The question as to whether existing decantation plants should be scrapped immediately is one which will also receive a good deal of consideration. Into such a calculation, however, is nat-



A NEARER VIEW



A CLOSE VIEW

urally interwoven the question of the life of the mine. In those cases where the mine has a long life, we believe it would be a profitable proceeding to discard the decantation system and replace it with the one now discussed.

CIRCULATION OF THE CYANIDE SOLUTION THROUGH THE STAMP BATTERY

To make the best use of the filter press the cyanide solution must be circulated through the stamp battery. Two points of greatest importance are bound in in this principle, these being:

(1) That the gold is attacked by the solution from the moment the ore enters the stamp-battery mortar-box, the result being that about 98 per cent. of the gold in the slimes and 70 per cent. of the gold in the sands is brought into solution before either of these two products is settled. The slimes, therefore, require no actual treatment in the slimes plant or in the filter presses, the operation being

simply the mechanical one of separating and washing out the gold-bearing solutions from the slimes.

(2) If the cyanide solution is not circulated through the mill there must be an unnecessary waste of accumulated excess solution. The mill water would have to be returned from the overflow of the main conical tank, while the product from the under discharge would contain 75 per cent. of water, the whole of which would have to be made up into cyanide solution. As this quantity would represent more than the losses in the discharged residues and elsewhere, there must from time to time be accumulations which would have to be run to waste.

We do not purpose to enter into great detail in this digest, but to illustrate the gold-dissolving effect of the circulating solution quite clearly, table II is submitted. These figures were averaged from a painstaking and laborious study of the progress of the solution throughout, and

TABLE I—COMPARISON OF PROCESSES

DECANTATION PLANT	CONICAL TANKS AND FILTER PRESSES
1. Transference from tank to tank done with big delivery centrifugal pumps.	1. Transference from tank to tank done by gravity at no cost.
2. Separation of slimes and gold-bearing solution by allowing slimes to settle and decanting off the clear solution; the best separation leaving from 50 to 60 per cent. of moisture in the slimes.	2. Separation in filter presses leaving only 26 per cent. of moisture in the slimes.
3. Imperfect washing, by adding water after the first solution is drawn off and repeating the process of settling and decanting, occupying considerable time and invariably leaving quantities of gold solution in the slimes.	3. Perfect washing by pumping water through cakes of slimes in the press, at a pressure of 85 lb. per sq.in. The whole operation of filling and washing takes about 40 min. for each press; every trace of gold solution being removed.
4. The slimes discharged with a flow of water through pipes or open conduit to dams.	4. The washed cakes dropped from the press into trucks or conveyor belts and dumped directly, carrying 26 per cent. of moisture.
5. Average recovery 75 per cent.	5. Average recovery 95 per cent., or 20 per cent. higher than the other system.
6. Actual working cost per ton treated about 48c., not including losses in water or gold solution, or heavy maintenance on dams; charging in these items the average cost is considerably higher.	6. Actual working cost per ton treated about 48c. including dumping, and this working under disadvantageous conditions on a new dump and only running the presses one shift per day. This figure of cost is certainly susceptible of a 33 per cent. reduction.
7. Average cost of a complete decantation slimes plant for a 100-stamp mill, \$125,000.	7. Outside cost for plant for 100 stamps, \$75,000.

A TREATMENT PLANT WITHOUT STAMP BATTERY

We regret that we never completed the final step in our scheme in which the erection of a treatment plant without stamp battery, sands plant, or slimes plant, was contemplated, on the lines of Fig. 3. We have done enough work, however, to prove that such a scheme is above all others suited to the realization of the best results on Rand or other plain auriferous ores. The saving in capital outlay would be at the very least 33 per cent.; the recovery would not average less than 95 per cent.; while the operating cost must on the smaller plant be substantially less. A glance at Fig. 3 will show how simple the whole design and general scheme of such a plant is, and even this

TABLE II.—SHOWING SOLUTION OF GOLD BY CIRCULATING CYANIDE SOLUTION IN PLANT, ALSO AMOUNT RECOVERABLE BY AMALGAMATION AND SANDS TREATMENT, FOR THE MONTH OF MARCH, 1906.

	A Tons Milled.	B Value. dwt.	C Gold Contents.	D E F G SOLUTION TO MILL.				H I J SOLUTION FROM MILL.			K Gold Dissolved in Mortar Boxes.	L Fine Gold from Amalgamation Mill.	M Pulp from Mill.	N Gold Dissolved in Transit.	O Gold from Shaking Tables.	P Pulp to Sands Treatment.	Q Extracted in Sands Treatment.	R Residues from Treatment.	S Total Extraction.
				Prop. Sol. Ore.	Au. Grains per ton	KCy %	Alkali %	Au. Grains.	KCy %	Alkali %									
Total.....	10,740	..	3837.524	6.610	58	.03	.004	63	.03	.004	Oz. 738.375	Oz. 2560.173	Oz. 2538.976	Oz. 1519.156	Oz. 176.0	Oz. 843.92	Oz. 569.72	Oz. 274.20	Oz. 5563.304
Dwt. per ton...	..	10.871	10.871	..	..	..	..	..	..	..	dwt. 1.375	dwt. 4.768	dwt. 4.728	dwt. 2.829	dwt. 0.328	dwt. 1.571	dwt. 1.061	dwt. .511	dwt. 10.3544
% of Screen Value.....	..	..	100%	..	..	..	..	..	..	..	12.65	43.85	43.49	26.02	3.01	14.47	9.76	4.698	85.31

EXPLANATORY.—A to J (inclusive). Averages for March. K = Difference between E and H worked out on basis of 6.6 S. l. to 1 Ore, and taken on total tonnage. L = Average for March. M = C - (K + L). N = Difference of M - (O + P) being amount of gold dissolved in circulating solutions between Mill and Plant. O = Average for March. P = Average value for March of undissolved Gold in Sand and Slime when settled in Sand Tanks and delivered to Slimes Plant. Q = P - R. R = Average for March.  
NOTE.—K, L, N, O, Q and R gives disposition of total gold.

the values at each point were established on the data obtained from many check assays.

The deductions to be drawn from these figures are obvious, and no more convincing argument in favor of reducing the whole of the sand to the fineness of a slime could be wished for. We had a good deal of faith in the powers of a circulating solution, but to find that 85.53 per cent. of the gold had been extracted before the ore had been subjected to any treatment in either the sands or slimes plant came very much in the nature of a surprise. That the figures are correct there is no doubt. From day to day there is naturally a slight variation, but the above may be taken as a fair average.

The slimes plant does nothing more than act as a storage plant and the sands plant only accounts for 9.76 per cent. of the pulp value. The sands plant cost \$75,000 in the first place and the operating cost is 42c. for every ton handled by it, while the residues are as high on average as 40c., against the slimes residue average of 12 cents.

If these facts be duly considered, it becomes quite clear that the sands plant is doing very poor work. Further, if to the credit of fine grinding the sands, and treating them in the presses concurrently with the slimes, we carry an amount

TABLE III.—SUMMARY OF TABLE II.

	Dwt.	Percentage of Total Gold.
Pulp to Mill.....	10,871	100%
Dissolved in Mortar Boxes .....	1,375	12.65
= Pulp to Mill Plates.....	9,496	43.85
Extracted on Plates.....	4,768	
= Pulp to Plant.....	4,728	26.02
Dissolved in Transit.....	2,829	
=	1,899	3.01
Extracted on Shaking Tables.....	0,328	
= Pulp to Treatment Plant.....	1,571	9.76
Extracted in Treatment Plant.....	1,061	
= Residue.....	0,510	4.698
		99.988

equivalent to what we should save by leaving out the sand plants altogether, we have the following credits to make; viz: (1) The interest and redemption of capital cost of sands plant; (2) the operating cost per ton; (3) the difference between 12 and 40c. in the residues.

Taken together there is in these factors a good deal of margin to cover the outlay involved in the erection of the increased grinding plant required and the cost of grinding. Calculations made on these lines show very emphatically in favor of fine grinding of sands after allowing 72c. as the cost of reduction from 3600 holes to 22,500 holes to the square inch.

is capable of further modification, as we do not consider it absolutely necessary to make use of the amalgamation process at all. The coarse particles of gold would be reduced in the tube mills to a fineness that would render them easily soluble in the circulating solution, and in any case there would be no other escape for the heavy particles of gold once they reach the tube mills. The removal of the copper plates and the whole scheme of amalgamation would carry with it the disappearance of amalgam theft, which undoubtedly is responsible for the loss of a considerable amount of gold today.

In the original contribution dealing with these questions, which appeared in the

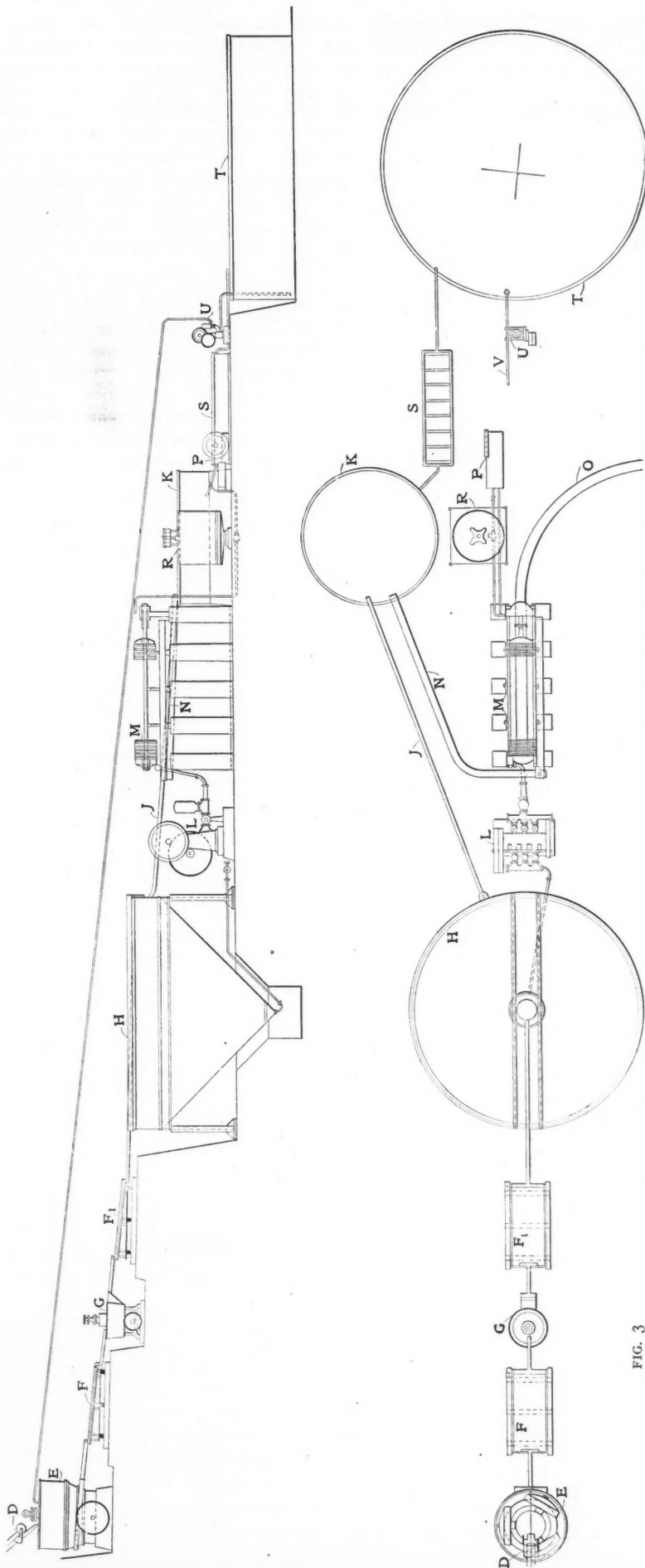


FIG. 3

LEGEND

- E. Edge runner for grinding coarse product from stamp battery or stage crushing plant.
- F. Copper amalgamated plates (shaking).
- G. Wheeler type grinding pan.
- H. Second set copper amalgamated plates (shaking).
- I. 35-ft. conical tank.
- L. Filling and washing pumps for filter presses.
- M. Filter presses.
- N. Launder from perpendicular discharge of conical tank leading to sump.
- O. Hydraulic accumulator for closing filter presses.
- P. Clarifying tank or press.
- R. Hydraulic accumulator for closing filter presses.
- S. Precipitating boxes.
- T. Solution sump.
- U. Return pump for circulating solution.
- V. Accumulator pump.

*Journal of the South African Association of Engineers for June, 1906, a mass of detailed statements is given, respecting every important step in the process. We propose here only to briefly refer to some of the more important of these.*

WATER CONSUMPTION

Details are given showing the total consumption of water under the headings of power, moisture left in residues, domestic supply and evaporation at all points, amounting to 170 gal. per ton of ore crushed (of which the metallurgical process absorbs only 30 gal.) as against an average on the fields of over 400 gal. To a company with a precarious water supply such a saving may mean all the difference between continuous and very intermittent running; in fact, it might save a property from being shut down during the whole of the dry season. To a company purchasing water it means an important saving in working costs. To the industry generally the saving is important enough to warrant the use of the filter-press and circulation-solution scheme on this ground alone.

DISPOSITION OF CIRCULATING SOLUTION

Tabulated statements and a general description are given of the flow of the circulating solution throughout the whole cycle. This is also graphically shown in Fig. 4. The total tonnage of solution, varying strength and alkalinity, fluctuating gold value and total gold in circulation are all clearly shown.

SCREEN ASSAY VALUES

This is rather an important section, seeing that the ordinary methods of arriving at the screen value are not applicable to the conditions obtaining when circulating solution. Allowances have to be made for the enrichment of the solution in mortar boxes, and the detailed method—which is an entirely satisfactory one—is given.

TUBE MILLING

Various tabulated statements in regard to the work being done by the tube mill are given and figures are submitted reflecting the additional profits secured by the use of these machines. The relative merits of tube milling as compared to grinding plants are discussed in detail, and some interesting deductions are made, which from certain points of view favor the grinding pan. Full details are given in regard to the cost of flints—both as lining, and as pebbles—together with statements of the general operation of the plant.

ALL SLIMING AND ITS ADVANTAGES

An important section of the contribution is devoted to a discussion under this head, in which the deductions show all in favor of such a scheme as opposed to any other, on the grounds of, firstly, capital outlay; secondly, operating cost; and thirdly, percentage recovery.

In conclusion we repeat that the process which has only one product to deal with must eventually oust all others from the field, when the ore is as simple in constitution and so amenable to cyanide treatment as those of the Witwatersrand.

To what extent these remarks may apply to the gold ores of America, we have

mine, a coffer-dam is being built across the end of Cobalt lake at the south, and at about 100 ft. from the shore line, to enable the veins running under the lake to be developed. The work will cost \$20,000.

The Timiskaming & Northern Ontario Railway Commission has advertised for

tenders for mining rights upon three other sections of the railway in addition to those already disposed of, as follows: Between the 90th and 95th miles; between the 95th and 101st miles, and between the 105th and 108th miles. The leases are to run for 999 years, and to be subject to a royalty of 25 per cent, on the value of the output at the mouth of the mine. A cash bonus of not less than \$1000 per mile must be given by the successful tenderers.

Notwithstanding the setting in of cold weather, the rush to Cobalt shows no signs of abatement. A large number of American capitalists are on the ground, looking for investments and many properties are changing hands. Much attention is being devoted to the Portage Bay area in the western end of Coleman township, from which many deals are reported.

The London *Mining Journal* reports that the railway in German Southwest Africa, from Swakopmund to Tsumeb, has been completed. It is a narrow-gage line, about 360 miles long, and is expected to stimulate effectively the development of the northern part of the colony. The work of construction, begun in January, 1904, was considerably delayed by the Herero outbreak, as well as by a strike on the part of the Italian workmen brought in to replace native labor.

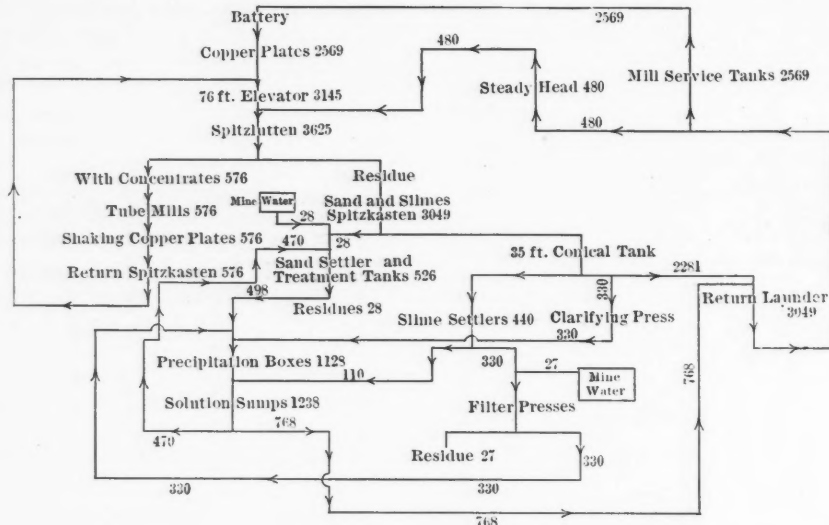


FIG. 4. SOLUTION FLOW DIAGRAM

Showing cycle of circulating solution through the whole crushing and treatment plant at the Meyer & Charlton mine, Johannesburg. The figures all refer to tonnages. The only losses are in the sands and slimes residues, and these are water losses, as the residues are well washed before discharging. Including evaporation, which amounts to 8.7 gal., the consumption of water for the

metallurgical scheme is under 40 gal. per ton. Of the total tons of solution in circulation it will be noticed that 1128 passes through the precipitating boxes. This can be increased or decreased at will. The average value of the circulating solution should be about 30 grains. The smaller the tonnage of solution put through the boxes, the higher the value becomes, and vice versa.

yet to learn; but we think it probable that in many instances ore exists, which offers the right conditions for such treatment.

### New Cobalt Leases

SPECIAL CORRESPONDENCE

In pursuance of the policy of the Ontario government to derive a substantial revenue from all future mining concessions involving property of known productiveness, Premier Whitney has announced that the right to mine the beds of Cobalt and Kerr lakes will be put up for sale on a cash basis. The area of Cobalt lake, which remains crown property, is 46 acres, four acres having already been sold to the Nipissing Company. It is not more than 40 ft. deep, and the mining will be done from the shore by sinking shafts and running levels, as to drain the lake would probably give rise to litigation. Two claims, known as the Greene and Bessey claims, were made on the lake bed, but were disallowed. The total area of Kerr lake is about 40 acres, 17 acres of which have been sold to the owners of shore locations, leaving 23 acres to be competed for. Tenders were received until Dec. 20, but no award has been made.

Mining under Cobalt lake has already begun. At the McKinley-Darragh-Savage

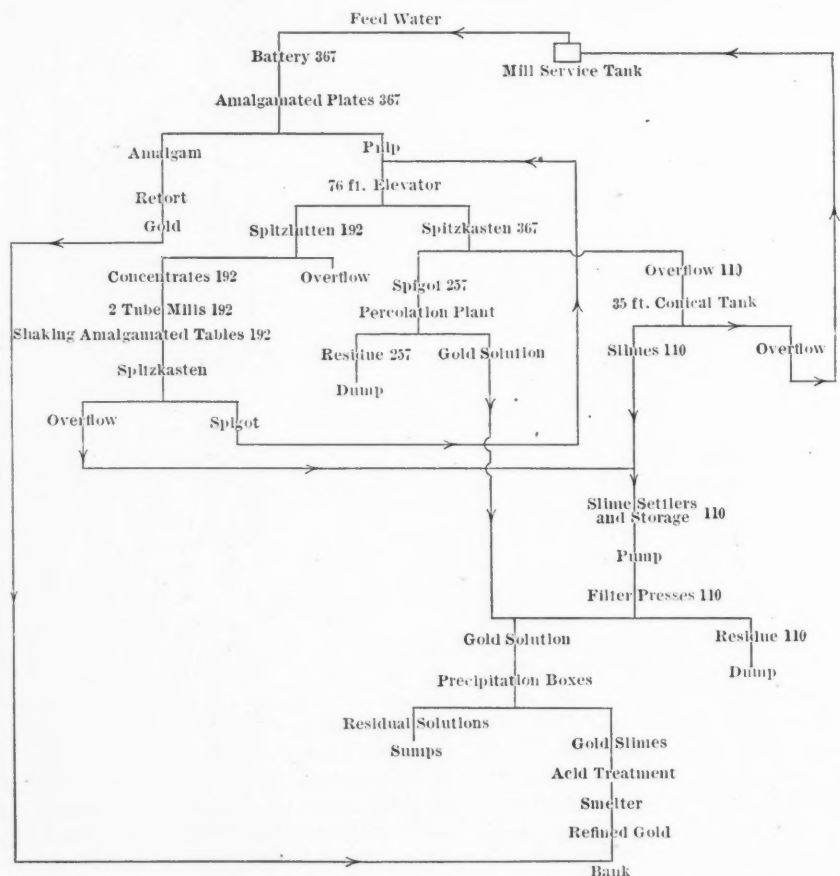


FIG. 5. PULP FLOW DIAGRAM

## COLLIERY NOTES

### Details in the Operation and Development of Anthracite and Bituminous Mines

In charging a hole preparatory to blasting, it is best to insert the tamping a little at a time, each quantity being successively rammed with the tamping rod, before the next portion is inserted.

An ordinary self-dumping cage suitable for raising coal from a shaft mine will weigh about 5000 lb. complete with dumping angles, chairs, etc. Two such cages can be installed complete for about \$2200.

Owing to the difficulty in securing a reliable earth near the coal face in a dry mine, some managers advocate carrying a third wire from outside or some other place where a reliable earth can be obtained.

In determining the size of conductor necessary to carry a specified electric current, one good rule is to see that the density is not greater than at the rate of 1000 amperes per square inch sectional area of copper wire.

In a modern electrical plant, it is now thought advisable to connect directly each generator with its own exciter. This method is not only more economical, but avoids the trouble that would ensue should the steam-driven exciter break down.

At one of the larger Southern coke operations, the installation of a coke-drawing apparatus has proved successful. One of the machines is now drawing the charge from about 29 bee-hive ovens each day. Where labor is scarce, these machines prove a most valuable substitute.

When electricity is installed and used in a mine, all metallic covering, armoring of cables and the frames of generators, transformers and stationary motors, should, if possible, be carefully earthed when the pressure at the terminal for the electricity used exceeds 250 volts.

The cost of building and equipping a coke-crushing plant for furnishing domestic fuel will amount to about \$2800. Such a plant would include crushing rolls, elevators, cylindrical screens, driving machinery, and a hopper-bottom storage bin, all complete excepting the 25-h.p. motor for driving.

At one operation where a large excavation was made, the collected data showed that each cart moved on an average of 23 cubic yards of dirt in ten hours, at a cost of \$2.80, which shows that the cost of moving each cubic yard is about 13c. This figure cannot be considered general as everything depends on local conditions.

The draw-bar pull of locomotives, where all the wheels are driven by a single motor, is greater than where each axle is driven by a separate motor. The

reason for this is that less than one-half of the weight of the locomotive is on the upper wheels, which, therefore, tend to skid and become ineffective, leaving but one motor to do the work.

As a rough check on the graphical and instrumental work done in locating a simple curve on a mine haulway or siding, it is worth remembering that the radius of the curve is equal to 5730 divided by the degree of curve. Should minutes occur in the figure representing the degree of curve, they should be expressed decimally as degrees. The result obtained will be correct within 0.1 per cent.

The draw-bar pull of an ordinary locomotive on a level track is about 20 per cent. of its weight. On a 1 per cent. grade the draw-bar pull is 19 per cent. of the weight of the locomotive. On a 5 per cent. grade the pull is 25 per cent. less than on the level, while on a 10 per cent. grade it is 50 per cent. less. When the grade encountered is as much as 10 per cent., the draw-bar pull is practically nothing, so that a traction locomotive may get itself up such a grade, but cannot pull any considerable load.

In fighting a mine fire, or other dangerous work of a similar nature, conditions often make it desirable to prevent a body of fire damp from reaching the explosive point. This fire damp may be in a room, entry or shaft, and while the place is being shut off, it may be found advantageous to force steam and carbonic acid down the shaft or into the place where the fire damp is accumulated. A small amount of carbonic acid will render fire damp explosive, and in this way a serious disaster may be delayed until the men have closed the shaft or entry and left the point of danger.

Statistics show that one motor out of every eight employed broke down at some time during the last year. The rate of accident to continuous-current motors exceeded the rate among alternating-current motors by 40 per cent., while the rate among alternating-current dynamos exceeded the rate among continuous-current dynamos by 29 per cent. In dynamos, 53 per cent. of the break-downs occurred in the armature and rotors, while 21 per cent. were probably due to age and deterioration. In motors 48 per cent. of the break-downs occurred in the armatures and rotors.

In excavating for a railroad siding, or any other construction work about a mine, it has been shown by long experience that, on an average, a two-wheel cart with one horse will travel 200 ft. per min. In haul-

ing the load, the travel is slower, but the return is somewhat faster. In this connection also it has been found that the time required while loading, dumping, waiting to load, etc., is approximately 4 min. per load. One authority claims that on a descending grade three loads are required to haul one cubic yard of dirt. On an ascending grade, estimates are generally based on four loads to each cubic yard of excavation. Where wheel-barrow are used for carrying away the dirt, it may be considered that the travel is 200 ft. per min., and the time for loading, etc., is  $1\frac{1}{4}$  min. per wheel-barrow.

There are many points to be considered when deciding what kind of haulage to install in a coal mine. Conditions differ so widely that fixed rules will not apply, however; most authorities agree that where the road is practically level, the traction locomotive with a trolley attachment is most suitable. Where grades of 3 to 5 per cent. are encountered, and the expense necessary to obtain a sufficient quantity of sand is considerable, the locomotive with third-rail attachment is generally preferred. On grades of from 5 to 14 per cent. there is little doubt but that the choice lies between rope haulage and the rack-rail system. Since the former lacks flexibility and must be controlled by an engineer located at a point remote from the trip, besides making it impossible to run more than one train at a time in the entry, the rack-rail motor is better adapted. Rope haulage also must be run at a high speed in order to secure any considerable output.

The accumulation of oil and dust on the insulating ring of a series-wound motor often causes the segment at the outer end of the commutator to come into electrical contact with the frame. In a case of this kind, if the coal face is dry so that the machine runner does not receive any severe shock, it is probable he will make no attempt to restore the installation at the faulty parts. If the trouble is thus allowed to continue, another of the segments will likely become faulty, which causes a portion of the armature to become short-circuited, thus burning out the conductors. If this occurs, the armature may have to be entirely rewound. To prevent such accidents, the frame of the machine should always be effectively earthed, so that the earth clock or other instrument on the dynamo switchboard will immediately indicate the development of the first fault, and by putting one of the mains to earth, the fuse at the motor would melt and the fault could be located and remedied.

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\*Illustrated

## The Utilization of Black Sand

The investigation of the U. S. Geological Survey at Portland, Oregon, and the claims of the Black Sand and Gold Recovery Company, of Chicago, have been the subject of considerable discussion, both in our own columns and in those of the daily press. The communication of Mr. Parkyn, of the Black Sand and Gold Recovery Company, published elsewhere, in reply to some remarks by Dr. Day, indicates a misconception of the problem and also of the projects which his company is promoting.

The commission of the U. S. Geological Survey has had no idea of taking low-grade placer gravels and treating them directly on shaking tables. Ordinary placer-mining methods are amply sufficient to bring such gravels to a concentration of the black sand, and at the same time the latter is put in an excellent condition for further concentration on shaking tables. There are many highly efficient shaking tables, such as the Wilfley, adaptable for this work. Moreover, Mr. Parkyn is wrong in his statement that the Lovett separator is the only magnetic separator which can handle wet material containing magnetic iron. Finally, the method of extracting gold from black sand by leaching with cyanide solution is neither new nor patentable. To our own knowledge, such material was so treated experimentally 12 years ago. The results showed uniformly a high extraction of gold and a low consumption of cyanide, while from the leaching standpoint the raw material was practically ideal. The only drawback was the insufficient supply of the material offered. Of course, the utilization of black sand as an iron ore, by electrothermic smelting or otherwise, is an old idea. The practical difficulty is that the black sand is too widely scattered. An iron mine extending over one hundred miles or so of sea coast or river bottom would be rather diffuse.

There appears to be a general misconception as to this black sand investigation. We believe that Dr. Day's original idea was to look into this material as a possible commercial source of platinum, but he soon found that it contained other minerals of commercial value, wherefore he turned his attention to them also. Finally came the idea of smelting the sand for iron in an electric furnace. It is probable that the material will really prove an im-

portant source of platinum, and in this respect Dr. Day's ideas will be justified. Its value as a source of iron is more problematical.

The process finally adopted by the commission was worked out by Henry E. Wood, of Denver, to which certain features were added. It consists essentially in classifying the material into various sizes by screening, the sizes larger than 8 mm. being hand-picked, while the smaller sizes are jigged or washed on Wilfley tables. The concentrates are dried and passed under Wetherill magnets with successively increasing current, yielding separate products consisting of magnetite, chromite, or ilmenite, garnet, hypersthene, monazite and zircon. With a little additional cleaning these are supposed to be ready for the market.

The very fine leaf gold, which is found on the sea coast, goes into the concentrate almost wholly; after repeated concentration, the gold is found in the concentrate each time. The final product could be treated easily by the cyanide process. This, however, would not extract the platinum, if platinum were present. Consequently, a different mode of treatment has been planned, which it is hoped will yield both the gold and the platinum, but the commission has not yet had an opportunity to prove whether this will be a method that is feasible commercially. Anyway, private interests are now successfully extracting platinum from this material.

However, to our mind, this is a minor problem. The great problem is how to collect the black sand. So far as we know, the Geological Survey has not yet solved it. It is an engineering problem rather than a geological or metallurgical. As we remarked above, an iron mine extending over a hundred miles of coast would be rather diffuse. It is true, however, that there is a great accumulation of black sand at the mouths of rivers, where it appears that the heavy minerals, brought down through the geological ages, have remained behind while the quartz has been washed away. To what depth these deposits of black sand may go is entirely unknown, as is also their workability under the conditions of the rising and falling of the tides, and the dangers of periodic storms.

In regard to black sands collected in hydraulicking and in dredging, they are all of considerable interest, inasmuch as



they are found to carry more or less percentages of rare and valuable minerals. It will be for each hydraulicking or dredging plant to test and determine whether the quantity and value of these minerals is sufficient to warrant the expenditure necessary to put up a mill for separating them. The especial value of Dr. Day's investigation has been the demonstration that these sands contain valuable, although small, percentages of platinum, osmium, iridium and other marketable substances. Secondly, he and his staff have worked out practicable methods of treatment, and in these as in many other methods the determination of the process is the prime consideration, while the demonstration of machines is secondary. But the chief problem of all is the original collection of the sand, and that does not appear to have received much consideration.

### The New Cyanide Process of the Witwatersrand

During the last three years we have on many occasions recorded the progress in metallurgical practice on the Witwatersrand, and it has been with a great deal of interest that we have observed the gradual evolution of the scheme to adopt tube mills and filter presses, accompanied by the circulation of cyanide solution through the stamp battery, as advised by the Denny Brothers in a noteworthy contribution to the Chemical, Metallurgical and Mining Society of South Africa in July, 1903, which was reproduced in the JOURNAL, and since then we have commented upon a number of more recent contributions bearing upon the same subject.

The suggestion finally culminated in the erection of two plants embodying the principles advocated by the Denny Brothers, and after several months' operating experience the results were made public in a contribution entitled "Rand Metallurgical Practice and Recent Innovations," presented by them before the South African Association of Engineers a few months ago. A study of this exhaustive statement shows that the combined process of tube-milling, filter-pressing and circulating the cyanide solution throughout the whole plant, has achieved very interesting results with regard to low capital cost, low operating cost, and high recovery of gold. Our readers will be glad to have the concise summary of the new

process which Messrs. Denny have contributed to this issue, which will surely stimulate consideration of this new and important departure in gold extraction.

### Mining Conditions in the Transvaal

The close of 1906 sees the mining industry of the Transvaal in an unhappy state, although the production for the year is the largest ever recorded. A good many of the producing mines are doing well, but little progress is being made with new properties. The market in the Kafir stocks in London does not interest anyone. Many persons have lost money in their investments in these stocks, owing to the general overvaluation. The non-producing mines are running into debt, and many of them will have to be provided with fresh capital before they can arrive at the milling stage. The most hopeful feature in the general situation is the fact that operating costs have been reduced to a lower point than formerly, and ore of \$6 grade can now be worked in such a way as to meet expenses.

The labor question is, of course, the big question. Undoubtedly the use of Chinese labor is doomed. There will not be any sudden withdrawal of the Chinese—both parties seeing the folly of that—but as soon as the contracts expire, the Chinese will be sent home. These contracts begin to expire at the end of 1907. We may look, therefore, for a further large production of gold in the Transvaal in 1907, although possibly not so large as in 1906, but after that the outlook is for a diminishing production because there will be insufficient labor.

There will be no revival of interest in the market for Kafir shares until the mines yield a fair return on the cost price as established by the market. At present, good authorities consider that there are very few that are worth buying. The future of the Rand depends largely upon the introduction of improved methods of mining, such as the development of an economical stoping drill, which will permit the same tonnage of ore as at present to be produced with fewer men. The general condition of mining in the Transvaal will be greatly improved by a reduction in the cost of living, which would permit more white men to be employed in the mines, and it is to be hoped that changes in conditions will bring that about.

### Car Shortage

The car shortage, which is a general topic of discussion in the West, has become a serious matter, specially affecting the coal trade. Car shortage is the general term, but the deficiency exists in motive power also, interfering with the movement of trains and delaying both deliveries of freight and return of empty cars. In large part this condition is at once a sign and a result of the great prosperity of the country during the past two years. Large crops, a great demand for goods and construction materials, have overtaxed the railroads. They have failed to provide additional equipment and motive power in time to meet the demands upon them; trade has grown faster than transportation facilities, to the consequent embarrassment of both.

The coal trade is not the only sufferer. Blast furnaces and steel works report trouble from delays in receiving supplies of fuel and ore, while their yards are congested with finished material, which cannot be shipped, though it is urgently needed by consumers. In Montana the copper mines have been delayed in their work by the slow transportation of ore to concentrators and smelters.

Much blame is cast upon railroad managers for the short-sighted policy in failing to provide what is needed to meet the demands upon the roads. This is natural and to some extent deserved, but it is not altogether just. In many cases traffic has grown faster than anyone could foresee. Existing car and locomotive works have been overrun with orders, and have not been able to make deliveries in anything like the time demanded.

Notwithstanding these excuses, there is no doubt that many companies have been too cautious in their provisions for increased traffic. There is room also for much improvement in methods of handling and distributing cars, as most progressive railroad managers will admit, and advance in that direction is very slow.

The recent decision of the Homestake company to give all its employees an eight-hour day, at the same rate of pay as heretofore, which was unasked by any except the miners, has greatly disturbed mining conditions in the Black hills. The new policy of the Homestake company is regarded generally as a political move and is greatly deprecated by the other operators in the district.

## Metallics

A furnace of the McDougall type costs, erected, from \$5 to \$6 per square foot of hearth area.

An 18-lb. hand stamp will reduce the size of ore for a sample eight times as fast as a single jack.

Dynamite can be detonated by 2 grains of fulminate, but it requires at least 10 grains of fulminate to detonate gun-cotton.

Rise of temperature in battery mercury diminishes the surface tension, and the viscosity of the mercury, thereby allowing it to flow more readily.

While fire or shock may explode powder under favorable conditions, the use of a detonator is necessary to obtain the most power from the explosive.

The British courts hold that a mine manager is not liable for disaster due to incorrect maps prepared by others and accepted by him in good faith.

The air pressure produced by explosions often renders a miner unconscious so that the afterdamp catches and kills even when the victim was neither burned nor near the initial explosion.

The American Sheet Tin Plate Company has announced that hereafter it will stamp every sheet of its roofing plate with the number of pounds of coating it carries per box of 20x28-in. plates.

The mining company operating at Friedrichsseggen on the Lahn, Germany, is reported as being about to erect a zinc smeltery, together with a sulphuric acid works. It is intended to enter the market for foreign ores.

A dust-settling chamber should be of such section that the velocity of the furnace gases passing through it will be reduced to 4 ft. per second and before the gases are allowed to escape through the chimney they should remain in the chamber long enough, say 15 seconds, for the dust to settle.

Pyrite is changed into the magnetic sulphide by roasting for 10 to 20 minutes at dull red heat (600 deg. C.). The mineral becomes black, indicating the formation of the magnetic sulphide. If brownish or reddish particles are manifest, it is an indication that the roasting has gone too far, oxidation having been begun, which is undesirable.

The chief weakness of the dry assay of lead is its absolute unreliability in all cases where the ores treated are complex or of low grade. Even under the most favorable conditions this method is of little value where approximate accuracy is desired. The results of metallurgical tests should never be calculated on the basis of anything but the wet assay.

The mining and metallurgical companies which operate railways will be inter-

ested in some figures which have recently been published for the Harriman lines. The cost of car repairs on these lines has averaged \$2.42 per car per month for 11,704 steel freight cars, and \$3.74 per car per month for 10,641 wooden freight cars. These figures are the averages of records covering a period of 17 months.

It has been established that a wooden beam, which for a short period will sustain safely a certain load, may break eventually if the load remains. For instance, wooden beams have been known to break after fifteen months under a constant load of but 60 per cent. of that required to break them in an ordinary short test. There is but little definite and systematic knowledge of the influence of the time element on the behavior of wood under stress.

Tin as a roofing material has fallen far in reputation during the past few years, on account of the substitution of steel sheets for wrought iron and the competition among manufacturers to reduce the tin coating to the thinnest possible wash. The old-time tin roof, laid by honest workmen, was expected to last and often did last for more than a generation. The present-day tin roof has such a facility for developing leaks that architects, builders and owners have learned to avoid its use wherever any other roofing will answer.

For the volumetric assay of lead the molybdate method is generally used. When the ore contains more than 3 per cent. lead and does not contain any considerable quantity of lime, this method gives excellent results. If the percentage of lime be so high as to interfere with the accuracy of this method, the sulphate-chromate method devised by H. A. Guess may be advantageously employed. When the lead amounts to less than 3 per cent., satisfactory results may be obtained by the addition to the sample of a weighed amount of lead sulphate, sufficient to bring the percentage of lead in the sample above 3 per cent., the addition being, of course, deducted in computing the result of the titration.

In connection with the improvements at the Great Falls smelter of the Boston & Montana Company, a chimney is to be erected which will be not only the largest and highest in the world, but also may be the highest masonry structure. It will be 50 ft. in diameter, and upward of 500 ft. in height, the precise height not yet having been determined. It will be constructed of radial brick. It is particularly interesting to note that the question of mechanical draft was carefully considered, and it was decided by the engineers of the company that the chimney would be the cheaper means of moving the volume of gas required, the estimated demand on a fan-installation being something like 3000 horse-power.

In American silver-lead smelting prac-

tice, the baghouse appears again to be coming into favor. The installation at East Helena, Mont., which was out of commission for several years, is now being employed again. In the lead-smelting department of the United States Smelting Company, at Salt Lake City, Utah, a baghouse is now being installed. It is hoped that this will to some extent obviate the smoke trouble. Of course it will not prevent the sulphur dioxide from escaping into the atmosphere, but it will collect the dust and soot, the presence of which in the smoke from these works is one of the chief objections of the inhabitants of the valley. Of course, this smoke should be collected for economic reasons, not to speak of any other.

In the summer of 1899 certain smelters in Kansas received small shipments of blende concentrate from Creede, Colo. The real development of the zinc industry west of the Rocky mountains may be dated from this time. At first, the Colorado ore was regarded askance, although that received from Creede was really a superior ore by any standard save that which existed among Kansas-Missouri smelters, who based their ideas at that time upon the ore of remarkable purity which was afforded by the Joplin district. They considered an iron content of upward of 2 per cent. in a zinc ore to be highly objectionable; and in fact, in view of their smelting methods and equipment at that time, it was objectionable. The attempts to smelt even the comparatively clean ore from Creede in 1899 were disastrous.

Among the early installations of the Huntington-Heberlein process outside of Europe were two in Australia—one at the works of the Tasmanian Smelting Company, at Zechan, Tasmania; the other at the works of the Broken Hill Proprietary Company, at Port Pirie, New South Wales. At the works of the Tasmania Smelting Company galena ore high in zinc is desulphurized. After a partial roasting the hot ore (containing about 10 per cent. sulphur) is charged into a conical converter, 5 ft. 6 in. in diameter and 5 ft. deep. Air is blown through the charge at a pressure of 17 oz. The ore is burned down to 1 per cent. sulphur. The operation lasts from two to four hours, averaging three hours. At the works of the Broken Hill Proprietary Company, at Port Pirie, Australia, the ore treated is galena concentrate assaying 50 to 55 per cent. lead, 10 per cent. zinc and 26 oz. silver per ton. This is mixed with crushed hematite, limestone and sand in such proportion as to produce an easily melted slag, low in silica. The charge is roasted in Ropp furnaces, which discharge their product in a mealy condition. While still hot it is fed into the Huntington-Heberlein converting pots, of which there are 17, arranged in a row; each pot holds 8 tons of charge. The pots have the form of a segment of a sphere, being 8 ft. in diameter and 6 ft. in depth.

## CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

### The Black Sand Investigation

My attention has been called to Dr. David T. Day's letter in the *JOURNAL* of Oct. 27, in which he took exception to some of the claims made by the Black Sand and Gold Recovery Company, of Chicago, in some of its printed literature, and by inference credited the company with making claims that have never been made.

After Dr. Day's letter appeared, I called on him personally, explained the scope of the operations being conducted by the Black Sand and Gold Recovery Company, and called his attention to the process patent included in what is known as the Lovett method for recovering gold from the black sands; the patent referred to having been granted by the United States Government over a year before the Government's investigation of the black sand was started.

The Black Sand and Gold Recovery Company has never at any time even hinted that the Geological Survey ever tested any of the patented apparatus belonging to the company, nor has it ever claimed an actual monopoly to the black sands or to the Government's method for treating the sands. But it has claimed and does claim, that through its patented magnetic separator, its several patented concentrating devices, its process patents for recovering the gold from sand that has been magnetically separated, and its patented bedrock pneumatic pipe dredge it holds a "virtual" monopoly for the successful commercial treatment of the black sands for the following reasons:

(1) There is no other magnetic separator on the market, or known to exist, that can compete with the Lovett separator in low cost of operation.

(2) The Lovett separator is the only magnetic separator in existence that can make a commercial separation of magnetic iron from black sand in commercial quantities, while the sand is in a wet condition.

(3) The capacity of the Lovett separator in handling dry sand is many times greater than the capacity of any other separator that can do the work.

(4) By extracting the magnetite from the raw material as the raw material is recovered, the Lovett method, as opposed to the ordinary sluice and the bumping table used by the Government, makes it possible to handle and concentrate enormous

quantities of the raw material without losing a large percentage of the gold present in original material. It would require an acre or more of the ordinary concentrating tables to handle the sand recovered by a single dredge, or to do the work of a few Lovett separators.

(5) The Lovett process is the only practical commercial method of recovering the gold from the sand from which the iron has been extracted magnetically.

On calling Dr. Day's attention to the Lovett process patent, he generously admitted that at least in part of its work at Portland, the Government, without knowing of the existence of this patent, had employed the process described in it. Dr. Day's contention that our claims to a "virtual" monopoly did him an injustice and tended to mislead the public, may be well taken, with the limited knowledge he had at the time of the operations of the Black Sand and Gold Recovery Company, but it was never the intention of this company to mislead the public or anyone else for we believe, and still believe that our superior method of handling the black sands will give us an actual monopoly of the black-sand business, including the manufacturing of steel, on the Pacific Coast.

HERBERT A. PARKYN.

Chicago, Ill., Nov. 7, 1906.

[We have elsewhere commented on this matter.—EDITOR]

### A Substitute for Diamonds in Drilling

I noted in a recent issue of the *JOURNAL* a little paragraph to the effect that tantalum may possibly be used in the future to replace diamonds in drilling. I have been endeavoring for some time to find something that would do that, at least in the softer rocks in which the greater part of our drilling is done, and am desirous of experimenting with anything that promises good results. Will you kindly inform me where tantalum can be obtained, and in what shape and quantity?

C. A.

Deerwood, Minn., Dec. 5, 1906.

[The note referred to was certainly interesting, but we think it expresses a hope for the future rather than a fact of the present. So far as we are aware, tantalum is produced only by Siemens & Halske, of Berlin, and is used only for the preparation of the filaments for a new form of incandescent electric lamp, and

for the manufacture of writing pens as a substitute for steel pens. However, the metal has properties of extraordinary value, and it is likely to find use for many things, including drills, when it becomes a regular market commodity, which at present it is not. A good deal has been published recently in the *JOURNAL* on this subject, which may be found by reference to the indices.—Ed.]

### Depreciation of Smelting Plants

In your editorial on "Depreciation of Smelting Plants" and the resultant discussion, there has not been brought out, to my mind, in its proper proportion the question of "depreciation due to the advance in the state of the art."

When I was studying electrical engineering at Trinity College, Hartford, Prof. Wm. Lisenard Robb, who was then engaged as expert in several accounting suits, brought this forcibly to my knowledge. While in electrical engineering the advance has been so fast to give especial prominence to this phase of accounting, nevertheless it is a decided but less important factor in determining the proper allowance for depreciation of smelting plants. The invention of the "Welsbach" mantle has put the electrical lighting installations to a most serious competition and their rather poor industrial condition can be attributed in a large measure to this cause. Similarity, in the zinc business the adoption of the mechanical roaster, which operates for as low as 25c. per ton of ore for labor, power, and repairs, is so general as to destroy the capital worth of the old multiple-hearth hand roaster, of which the operating cost is \$1 to \$1.25. Therefore, a rigid system of book-keeping, in which broad principles of economics are recognized, would wipe off at once their value from capital inventory.

The advance also in the methods of treating complex sulphide ores, by improved wet, magnetic, and electrostatic concentration, as well as by better work at the reduction plants in treating zinc ores high in iron, has destroyed the natural monopolistic value of the Joplin zinc field. Illustrations could be easily given in the metallurgy of iron, lead and copper. Probably most striking is the case of the soft Mesaba ores.

In mining, however, the tremendous increase in the consumption of metals in the past ten years has not lessened the

value of the older mines possessing ores that are easily treated, but has rather increased the value of all mineral reserves.

If, however, a severe industrial crisis should occur the value of the old and restricted mines would be lessened. But it is in the smelting business that "depreciation due to the advance in the state of the art" is most pronounced.

Any proper system of accounting will allow for this, but its proportion is uncertain. Undoubtedly the best way for any concern is to replace immediately old machinery by new, as soon as it is certain that the new is better. The most conspicuous exponent of this policy was Andrew Carnegie, who himself set the standard of the art.

WOOLSEY MCA. JOHNSON.

Colorado Springs, Colo., Dec. 21, 1906.

## The Sulphide Corporation

SPECIAL CORRESPONDENCE

The Sulphide Corporation has issued its report for the year ended June 30 last. Though a net profit of £94,000 was made, it has been deemed best not to distribute any dividend among ordinary shareholders, though £55,000 is paid as a 10 per cent. dividend among the preference shareholders. The company commenced the financial year with a balance of £94,000, so it has now a balance on hand of £133,000 of undivided profit. Certain shareholders are kicking at this continued suspension of ordinary dividends, for it is just six years since they received anything. The company has been obliged to spend much money on capital account out of revenue during the last few years, for the provision of new plant, and it has been the ordinary shareholder that has had to suffer. In addition to these expenses much trouble has been caused by the creep that occurred in the mine at Broken Hill, N. S. W., in May last, and for this reason also it is advisable that plenty of money should be kept in hand. The financial troubles of the company originated with its being saddled with £500,000 capital, representing the abandoned Ashcroft process. Logically, the capital of the company should have been written down by this amount when the process was dropped. If that had been done, the ordinary shareholders would have had some of the profits now going to the preference shares. Besides this, with a smaller capital it would have been possible to issue additional shares to provide for the new metallurgical plant, instead of paying for it out of revenue. In that case, the ordinary shareholder would have benefited still further. The opportunity for adopting such a policy has now, however, passed by, and the directors are doing everything for the best, so that the grumbling of shareholders is quite unreasonable. With regard to the results of the year's work, it is not necessary to enter into details.

## New Publications

"A Practical Handbook on the Distillation of Alcohol from Farm Products." By F. B. Wright. Pp. 194; illustrated. 5x7 in., cloth, \$1. New York, 1906: Spon & Chamberlain.

"Grundriss der Eisenhüttenkunde." By Dr. Hermann Wedding. Pp. 392; illustrated. 5½x8½ in.; paper, 9 marks; cloth, 10 marks. Berlin W., 1906: Wilhelm Ernest & Sohn.

"The Bryozoa Fauna of the Rochester Shale." R. S. Bassler. U. S. Geological Survey, Bull. No. 292. Pp. 137; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Geology of the Bighorn Mountains." By N. H. Darton, U. S. Geological Survey, Professional Paper No. 51. Pp. 129; illustrated. 9x11½ in.; paper. Washington, 1906: Government Printing Office.

"Text Book on Geodesy and Least Squares Prepared for the Use of Civil Engineering Students." By Charles L. Crandall. Pp. 329; illustrated. 6x9 in.; cloth, \$3. New York, 1906: John Wiley & Sons.

"California Miners' Association. Proceedings of the Fourteenth Annual Convention, Held at Nevada City, November, 1905." Pp. 149; illustrated. 6x9½ in.; leather. San Francisco, 1906: Press of the Hicks-Judd Company.

"Report of the Department of Mines of Pennsylvania for 1905. Part I, Anthracite; Part II, Bituminous." Pp. 1332; illustrated. 6x9½ in.; cloth. Harrisburg, Penn., 1906: Harrisburg Publishing Company, State Printer.

"Turbine Water Wheel Tests and power Tables." By Robert E. Horton. U. S. Geological Survey, Water Supply and Irrigation. Paper No. 180. Pp. 134; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Rhodesia Chamber of Mines (Incorporated), Bulawayo. Eleventh Annual Report for the Year Ended 31st March, 1906." Pp. 125. 7½x10 in., cloth. Bulawayo, Rhodesia, 1906: Argus Printing and Publishing Company, Ltd.

"Geology and Water Resources of Owens Valley, California." By Willis T. Lee. U. S. Geological Survey, Water Supply and Irrigation. Paper No. 181. Pp. 28; illustrated. 6x9 in., paper. Washington, 1906: Government Printing Office.

"Rocks of the Cape Colville Peninsula, Auckland, New Zealand, Vol. II." By Professor Sollas. Introduction and descriptive notes by Alexander McKay. Pp. 215; illustrated. 7½x9½ in., cloth. Wellington, 1906: John Mackay, Government Printer.

"Bibliography and Index of North American Geology, Paleontology, Petrology and Mineralogy for the Years 1901-1905, Inclusive." By Fred Boughton Weeks. U. S. Geological Survey, Bull.

No. 301. Pp. 770 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Underground Waters of Tennessee and Kentucky West of Tennessee River, and of an Adjacent Area in Illinois." By L. C. Glenn, U. S. Geological Survey, Water Supply and Irrigation Paper No. 164. Pp. 173; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Formation et Recherche Comparées des Divers Combustibles Fossiles (Etude Chimique et Stratigraphique)." By L. Lemièrre. Extract from *Bulletin de la Société de l'Industrie minière*, Quatrième série—Tomes IV et V. Pp. 284; illustrated. 5½x9 in.; paper, 7 fr. 50. Paris, 1906: H. Dumod et E. Pinat.

"Nitro-Explosives." By P. Gerald Sanford. Second edition, revised and enlarged. Pp. 300; illustrated. 5½x8½ in.; cloth, \$4. New York, 1906: D. Van Nostrand Company.

Contents. Introduction. Nitro-glycerin. Nitro-cellulose, etc. Dynamite. Nitro-benzol, roburite, bellite, picric acid, etc. Smokeless powders in general. Analysis of explosives. Firing Point of explosives, heat tests, etc. The determination of the relative strength of explosives.

"Universal Dictionary of Mechanical Drawing." By George H. Follows. Pp. 60; illustrated. 8x11 in.; cloth, \$1, net. New York, 1906: Engineering News Publishing Company.

Contents: Introduction and an alphabet. Letters and lettering. Figures and dimensions. Projection and projected views. Sectioning and sectional views. Finishes and the finish mark. Dimensioning. The record strip. Nomenclature and written matter. Checking. Standard data. Example drawings.

"The Immediate Care of the Injured." By Albert S. Morrow, M. D. Pp. 340; illustrated. 5½x9 in.; cloth, \$2.50 net. Philadelphia and London, 1906: W. B. Saunders Company.

This book is one that ought to be in the hands of every superintendent of mine and smelting works. It is written in language that any intelligent person can understand, and the character of the illustrations is such that the various systems of bandaging, etc., are explained almost without text.

"Practical Lettering for Beginners, Draftsmen, Engineers, Engravers, Sign Painters, Stone Cutters, Lithographers, etc., with Original System for Spacing." By Thomas F. Meinhardt. Pp. 15; illustrated. 9x14 in.; paper, 60c. New York, 1906: Norman W. Henley Publishing Company.

The lettering of engineering drawings is usually more conspicuous for its inelegance than for its excellence. Nothing helps a drawing to look good more than good lettering. The work of Mr. Meinhardt will be a useful aid to draftsmen.

## Personal

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

Alexander W. Scott has retired from his position as manager of the Foster mine at Cobalt, Ontario.

Hermann A. Keller, of New York, was married to Miss Laura Guitéras, of New York, Dec. 22, 1906.

Robert Hawxhurst, Jr., of San Francisco, has joined Charles Kaufman, of London, as engineer.

Henry F. A. Riebling, of Colorado Springs, Colo., is at Shafter, Texas, on metallurgical business.

C. L. Whittle, of Boston, has just returned from West Virginia, where he has been examining properties.

Ellis Kaufmann, of the Consolidated Gem Mines Company, at Idaho Springs, Colo., is on a visit to New York.

Philip Argall, of Denver, Colo., has been appointed consulting metallurgical engineer for Stratton's Independence.

B. H. Bristol, of Waterbury, Conn., has been looking at interests in mines near Eldora, Boulder county, Colo., recently.

William Cooper, manager of the Capital Prize Mining Company, of Georgetown, Colo., has gone to Pittsburg, Penn., on business.

Edward Skewes, who recently returned to London from Texada Island, B. C., has gone to Hungary on professional business.

W. S. Leebrick, an operator in the Idaho Springs district, Clear Creek county, Colo., has been a visitor to Chicago and other eastern points.

Frank G. Baum has resigned his position with the California Gas and Electric Corporation, and has opened an office in San Francisco as consulting engineer.

Robert N. Bell, of Boise, Idaho, at the recent election was reelected to the position of State mine inspector of Idaho, his plurality being the largest on the ticket.

Wakely A. Williams, superintendent of the Granby smelter at Grand Forks, B. C., has been visiting in Golden, Colo., being a graduate of the School of Mines in 1899.

E. H. Garthwaite arrived in New York last week, after spending 12 years in South Africa. He is now on his way to California, where he proposes to stay for some time.

John C. Treadwell has resigned as manager of the Sahuayacan Mining Company, to take a like position with the Coahuila Mining and Smelting Company at Viesca, Coahuila, Mexico.

George A. Packard, of Wakefield, Mass., will be at Rolla, Mo., during the winter, giving lectures on metallurgy to

the students of the School of Mines of the University of Missouri.

L. W. Trumbull, of Laramie, Wyo., is examining mine properties in Gunnison and Chaffee counties, Colo. Upon his return from Colorado he will make a short trip to Sierra county, California.

William H. Radford has returned to San Francisco from Alaska where he spent all of last summer in the Cook Inlet district. His office will, for the present, be at 2360 Broadway, San Francisco.

Darcy Weatherbe, mining engineer, passed through New York last week on his way to London, whence he goes to the Argentines to take charge of the mines of the Capillitas Copper Company, at Muschaca, in the province of Catamarca.

R. H. Channing, manager of the Utah Consolidated Mining Company, of Salt Lake City, has resigned that position and is going to Peru as general manager of the Cerro de Pasco properties, in place of A. W. McCune, who has been in charge of them since 1902, and recently resigned.

Dr. L. D. Ricketts, consulting engineer for Phelps, Dodge & Co., and general manager of the Old Dominion Copper Company, has been appointed general manager of the Greene-Cananea Copper Company. It is said that he will continue to be consulting engineer for the Old Dominion company.

H. S. Clark, who has been manager at Breckenridge, Colo., of the Lanyon Zinc Company, for some years past, has resigned his position, and the control of this company's affairs in Summit county, Colo., will be in the hands of Benjamin B. Lawrence, who has accepted the position of western manager for the Lanyon company.

James B. Risque, who for years managed successfully the affairs of the Bi-Metallic Mining Company, of Montana, and who has been connected with some of the largest enterprises in the Southwest and Mexico, has been appointed manager of the Utah Consolidated Mining Company, of Utah, in place of R. H. Channing, resigned.

W. N. Sawyer, general manager of the Lake Superior Corporation, operating the associated industries at the Sault, has tendered his resignation, effective Jan. 1. He will become associated with the Wellman-Seaver-Morgan Company, Cleveland, as general manager, taking the place made vacant by the death over a year ago of Charles H. Wellman.

## Obituary

George Bancroft Kilbourne, for seven years past a director of the Kilbourne & Jacobs Manufacturing Company, of Columbus, Ohio, died Nov. 22, of pneumonia. He went to Chicago a few months ago, to take charge of the steel-car department of the company.

## Societies and Technical Schools

*Royal School of Mines*—The annual dinner of graduates of the Royal School of Mines resident in South Africa was held in Johannesburg, Transvaal, Oct. 13, U. P. Swinburne presiding. There were 42 graduates present, and a number of interesting speeches were made.

*Coal Mining Institute of America*—The annual meeting began in Pittsburg, Penn., Dec. 18, with a large attendance. In the business session that preceded the reading and discussion of technological contributions, a motion was made for the appointment of a committee to revise the constitution and by-laws, and to inquire into the advisability of incorporating the society. This committee is instructed to report at the meeting next June. Officers were elected as follows: President, Fred C. Keighley; vice-presidents, W. L. Affelder, L. L. Logan and James Boyle; secretary-treasurer, I. G. Roby; auditors, Thomas Hall and John Britt.

## Industrial

The International Steam Pump Company has been compelled, by the steady advance in the cost of raw materials, to increase the prices of its products. This policy has been adopted by all other manufacturers of machinery.

The American Manufacturing Company, New York, states that, owing to the continued high condition of the Manila hemp market, it has been forced to increase the price of "American" transmission rope, the extra of 1/2c. per lb., as announced in November.

The Power and Mining Machinery Company, of Cudahy, Wis., in conjunction with the Snow Steam Pump Works, of Buffalo, N. Y., has opened a new sales office at 719 White building, Buffalo, where will be handled the several types of gas-generating apparatus, such as the Loomis-Pettibone system, suction and pressure gas plants, and the Snow gas engines. Seward Babbitt is in charge.

The Weber Gas Engine Company, of Kansas City, Mo., has recently made sales of multiple-cylinder vertical gas engines and Weber suction gas producers to a number of important plants in the United States and South America. These plants operate on a number of different kinds of fuel, such as Virginia and Pennsylvania anthracite, charcoal, coke, etc. Owing to the large number of contracts on hand, the Weber company is contemplating extensive additions to its plant at Sheffield, Mo., which will provide unusual facilities for the prompt execution of orders.

The Virginia Portland Cement Company, of Fordwick, Va., is about to add 2000 barrels per day capacity to its plant, which will be one of the largest cement plants in the South. Many improvements will be made in the buildings and ma-

chinery; there will be a new power-house, and the existing mill will be driven by electricity. In the power-house two turbines are to be installed, and the boiler capacity, increased by 1500 h.p., will now aggregate 2000 h.p. The whole of the old and new machinery will be driven by electricity. The consulting engineers of this plant are W. S. Barstow & Co., of New York and Portland, Oregon.

The United Iron and Steel Company, which recently took over the Cherry Valley Iron Company, of Pittsburg, has been incorporated. The company has a capital of \$3,000,000 and bonds of \$5,000,000. Edward N. Ohl has been elected president; W. H. Schoen, vice-president and secretary, and A. W. Thompson, treasurer. The directors include, besides those named, J. W. Rhodes, Harry Rubens and L. E. Block. The new company will become operative on Jan. 10. It has also taken over the interests of the Cherry Valley Iron Company in the Pittsburg Iron Ore Company, which has a capital of \$10,000,000. The mining properties on the Mesabi, which are managed by the Pittsburg Iron Ore Company, include the following holdings: 37 per cent. of the La-Rue; 52 per cent. of the Croxton; 20 per cent. of the Hobart; 10 per cent. of the Nassau, and all of the Brunt which is owned in fee. This represents ore to the amount of, approximately, 24,000,000 tons. The office of the Pittsburg Iron Ore Company is in Hibbing, Minn., in charge of C. H. Lewis.

### Trade Catalogs

Receipt is acknowledged of the following catalogs and circulars:

Ohio Brass Company, Mansfield, Ohio. Monthly Bulletin, December, 1906. Pp. 14, illustrated; paper, 5x8 in.

Wire and Telephone Company of America. Hand Telephone Equipment. Pp. 12, illustrated; paper, 8x12 in., 1906.

Queen & Co., Philadelphia, Pa. High Grade Meteorological Instruments. Pp. 172, illustrated; paper, 6x9 in., 1906.

The Dayton Globe Iron Works Company, Dayton, Ohio. Head Gate Hoists. Pp. 8, illustrated; paper, 6x10 in., 1906.

Cone Gas Machine Company, Detroit, Mich. Bulletin No. 5, The Cone Gas Generator. Pp. 8; paper, 4x7 in. December, 1906.

United Iron Works Company, Springfield, Mo. Catalog of Concentrating Machinery. Pp. 58, illustrated; paper, 10x6 in., 1906.

American Diamond Rock Drill Company, New York City. The Diamond Drill and Its Work. Pp. 86, illustrated; paper, 6x8 in., 1906.

George V. Cresson Company, Philadelphia and New York. Power Transmitting Machinery. Pp. 350, illustrated; cloth boards; 6x8 in., 1906.

The Denver Fire Clay Company, Denver, Colo. Case Laboratory Crusher. Muffle Furnaces, Coal, Wood and Coke, Case Gasoline Furnaces, illustrated; folders, 3½x6 in., Bulletins Nos. 19, 21, 23, 1906.

Sprague Electric Company, 527 West 34th St., New York City. Electric Hoists and Cranes. Pp. 12, illustrated; paper, 3x8 in., 1906. Also, The Electric Equipment of a Modern Hotel. Pp. 8, illustrated; paper, 8x10 in., 1906.

### Construction News

*Pikeville, Kentucky*—A large tract of coal land is to be opened near this place, and machinery installed. F. Rogan, Pikeville, is lessee.

*Georgetown, Colorado*—The Ramsdell Mining Company intends to put in a 75-ton mill. G. W. Teagarden, Georgetown, Colo., is manager.

*De Koven, Kentucky*—The De Koven Coal and Coke Company is arranging to increase its mining plant. S. A. Scott, Pittsburg, Penn., is chief engineer.

*Apex, Colorado*—The Evergreen Gold and Copper Mines Company proposes to put in a 60-ton matte smelter for its low-grade copper ores. J. L. Walters, Apex, Colo., is manager.

*Etna, Georgia*—The Etna Steel and Iron Company is developing iron mines, and will need mining and ore-washing machinery. The offices are at Etna, Ga., and 43 Broadway, New York.

*Fall River, Colorado*—The Continental Mines, Power and Reduction Company is preparing to put in an electric plant, run by water power. H. I. Seeman, Equitable building, Denver, Colo., is manager.

*Nederland, Colorado*—The tungsten field in Boulder county, Colo., is quite active, and the Tungsten Mining, Milling and Exploration Company will erect a plant on Beaver creek, about two miles south of Nederland.

*Kansas City, Missouri*—The Blue Seal Portland Cement Company is arranging to put up cement works on a large scale, and will need machinery. J. H. Marshall, New York Life building, Kansas City, Mo., is general manager.

*Central City, Colorado*—New machinery is to be erected at the Gem mine. G. P. Goodier, Central City, Colo., is manager.

New machinery is also wanted at the Egyptian mine, of which H. Irving Jones, Central City, Colo., is manager.

*Sunshine, Colorado*—The Golden Message Mining Company, operating near Sunshine, Boulder county, Colo., is making preparations to erect a mill for the treatment of their ores. It will probably be a cyanide plant, the ore to be crushed by stamps.

### Special Correspondence

San Francisco Dec. 20

Mining people owning claims in the Death Valley region of Inyo county want a lot of annual assessment work done on their claims in a short time, and have originated the novel idea of getting students from the University of California and from Stanford University to do this. The Christmas vacation is to be thus utilized by some 80 California students, and as many from Stanford.

The offer is for three weeks' work at \$2.50 per day and board and fare paid both ways. Men are scarce in that region in these days, and the young students will have a chance to earn a little, and see some mining regions at the same time.

General Manager Shirashi, of the Toyo Kisen Kaisha Steamship Company, and representatives of the California petroleum refineries, signed, a contract this week by which the oil company undertakes to deliver to the steamship company 20,000,000 bbl. of liquid fuel over a period of 10 years. The document was signed after Shirashi had inspected the oilfields in Santa Barbara and Kern counties. While the contract was made in the name of the California Petroleum Refineries, the Union and Associated Oil Companies will share in the business. The contract calls for crude oil to be delivered at the rate of 2,000,000 bbl. a year. Although the California corporation which secured the contract is erecting a large refinery on San Luis bay, it will not ship the refined product to Japan. The high tariff on refined oil makes this prohibitive. The oil will be refined in Japan, where a large plant is to be erected for the purpose of handling the California petroleum. Shipments will be made from Oilport, on San Luis Obispo bay, where the pipe-line of the Graciosa Oil Company reaches tidewater and where a large wharf is now being constructed.

Some new deposits of copper ore are being opened in Nevada county, at points where only gold mining has heretofore been carried. In fact some of the old mines being reopened for copper were originally worked for gold only. In various parts of Inyo and San Bernardino counties numerous new deposits of copper ore are being prospected and opened. There is more search going on for copper than there is for gold in these regions. Up at the Tom Head mines in Tehama county, the California-Massachusetts Copper Mines Company has started a new tunnel to open deeper the large orebodies known to be in the Uncle Sam lode. A shaft will also be sunk and continuous work kept up. Tehama has not been known as a mining county, though some years ago large bodies of chrome ore were worked. The Sugar Loaf group of copper claims on Spring creek, near the Iron Mountain deposit, Shasta county, is

being opened by John Filius and others. In the Greenwater district, Inyo county, some sales have been reported to Thomas Lawson, who is the last addition of famous copper men to invest in that camp.

The trustees of the State mining bureau have decided to have certain field work done to supplement the information in the copper bulletin printed by that institution in 1902, entitled the "Copper Resources of California." State Mineralogist Aubury will appoint two field assistants to take up this work first in Inyo and Fresno counties, subsequently visiting other counties of the State. The copper resources bulletin will then be revised and reprinted. The mining bureau is also about to make a collection of ores from the State of Nevada, and display them in the museum, as much inquiry is made in connection with Nevada mines. While the bureau is in a State institution yet the mining interests of Nevada are so closely identified with those of California in the matter of investments, that such a collection will be of mutual benefit.

A pleasing feature this year is that in all the counties of the State there is plenty of water to supply all the demands. Last year at this time the mines in several counties were beginning to shut down for lack of power, owing to the great reservoirs in the high Sierras being drained by the continuous drought. Heavy rains have added to the supply in the reservoirs and plenty is assured. The snow supply in the mountains is also quite satisfactory, insuring a long water season during the summer months.

#### Salt Lake City Dec. 22

The directors of the Utah mine at Fish Springs have posted a regular dividend of 5c. a share and an extra of 3c. a share, making a total of \$8000.

The Boston Consolidated Mining Company has let a contract for the electrical equipment of its new concentrating mill, now in course of construction at Garfield, 13 miles west of Salt Lake City. It was awarded to L. M. Cargo, local representative of the Westinghouse Electrical and Manufacturing Company. The contract calls for the delivery of about \$50,000 worth of machinery. Oil-insulated water-cooled transformers, of 444-kw. capacity at 80,000 volts, will be installed, with 80,000-volt automatic high-tension circuit-breakers for their protection. Three individual high-tension power lines will enter the substations, one of which lines will be in service all the time and two held in relay, thus insuring the company continuous service. The contract also includes the entire motor equipment, consisting of 2500-h.p. induction motors. Power for the operation of the plant will be furnished by the Telluride Power Company.

A complete change of management in the Carisa Copper and Gold Mining Company has been effected. In the reorgani-

zation H. G. McMillan was elected president; Henry Newell, vice-president; E. B. Critchlow, secretary and treasurer, and Sidney M. Bamberger, manager.

As a result of the smelter-smoke agitation, which resulted in the late injunction of Judge Marshall, of the Federal court, the Utah Consolidated Mining Company has decided to abandon its present smelter and will erect a new one at some other location away from the agricultural districts. The proposed plant will cost a million dollars, and the company proposes to engage in the custom ore smelting business. The business men of Ogden are endeavoring to induce the smelting companies affected by the recent injunction to locate their plants near that city. Another site being investigated by the Utah Consolidated management is located in Tooele county, west of Garfield.

#### Denver Dec. 23

Practically all the needed funds for the construction of the new drainage tunnel in the Cripple Creek district have been pledged. The sum of \$760,000 has been subscribed by the mine owners, \$200,000 has been pledged by the railroads, smelters and mills, and the remaining amount will undoubtedly be raised by small subscriptions from several small mining companies, which are to be benefited by the great bore. At a meeting of the mine owners this week, the directors were empowered to decide on the plan of construction. Sherwood Aldrich, the president, who is at present in Nevada, has resigned, and S. S. Bernard was elected in his place. Work is expected to commence in the near future, and as the tunnel is of the greatest importance to the district it will be constructed as quickly as possible.

Judging from present appearances it looks as if there will shortly be a rate war in treatment charges for the control of the Cripple Creek ores, when the Golden Cycle mill at Colorado City starts operations in January. The sampling department has already started, and at that time three roasters of 100-ton capacity are expected to commence operations, additional roasters being in course of construction. The United States Reduction and Refining Company has just cut the price of ore treatment practically \$3 per ton on all grades, offering to contract at lower figures than before for one, two and three years.

The evidence in the case of the Government and the Carbon Coal and Coke Company, in which lands in the vicinity of Trinidad are involved, is on and the transcript will be forwarded to the secretary of the interior at once.

Dr. Victor C. Alderson, president of the State School of Mines, has left for Washington in the interest of the Patterson-Mondell bill, providing Government aid for mining and agricultural schools in the United States.

A good deal of interest has been shown

here in the purchase by the Mexican government of the Mexican Central railway system, and the speech of Limantour, the Mexican minister of finance, explaining that action to his congress.

Governor-elect Buchtel has appointed George W. Snyder, of Central City, to be State commissioner of mines during his term of office.

There has been a great deal of inconvenience and suffering caused by a serious coal famine in some of the towns in the southwestern part of the State lately; in Telluride it has been badly felt.

#### Duluth, Minn. Dec. 24

There will be a great amount of stripping on Mesabi range mines this winter—far more than ever before. Mine operations of the shipping season were so heavy that it is absolutely necessary to keep ahead of them by additional stripping. It was but a few years ago that mine operators thought they could not strip in cold weather, but necessity has shown them that they can as easily as in summer.

Few people realize the enormous amount of dirt that is moved during an ordinary year on the Mesabi range, in preparing for mine shipments. The Drake & Stratton Company has kept its steam shovels busy all the past season, many of them working straight through the year, and has moved something like 3,000,000 yards in that time. Other contractors have had nearly as many, and mining companies have been very busy also, so that the amount of dirt moved during the year has been not less than 7,500,000 yards. For the coming year there will be from 30 to 35 shovels employed, and the amount of material to be taken off orebodies on the range should not be less than 10,000,000 yards. If the Panama canal excavators move anything like this in a year it would be heralded from one end of the country to the other as a most remarkable achievement. And so it would be; but Mesabi range stripping operators go about it as a mere matter of the day's work.

Stripping will be started in a few days for the winter at the Burt pit, where an enormous amount of ore was taken out this year, and where the mine shovels are close on the heels of the strippers. This work is to be done by Winston & Dear, who have been in that pit for a long time. The Drake & Stratton Company is busy in the Fayal, Leonard and Stevenson mines, where an enormous amount of stripping has been carried on during the year and where much more remains to be done. At the Stevenson a new pit is being opened diagonally to the old one from which so large a tonnage has been taken in the past few years. This new pit will maintain the company's tonnage at about 1,000,000 tons for another year, and, possibly for a slightly longer period, but it

cannot be expected that this mine, which is not large as Mesabi mines go, shall continue the enormous tonnage of present years very long. It has been for this reason that some of the steel-making companies that have had long-term contracts for Stevenson ore at low prices have been pushing for delivery faster than their contracts called.

At Leonard there is to be great stripping work. The mine is deep and the pit is now very much constricted, so that any large addition to present tonnage will require millions of yards of additional earth removed.

The Pillsbury stripping, which has been under way for a year, is going on this winter and will be pushed through steadily. It is probable that this mine and Glen will be made into one large property in time. New approaches have been put in at Pillsbury and the mine will be a larger producer the coming year.

On western Mesabi properties, from Nashwauk to Coleraine, stripping will be continued through the winter. At the Mountain Iron mine the year's production has been so great that stripping must be maintained all winter on a considerable scale in order to give room for the production expected next season.

It is probable that not less than 30 to 35 steam shovels will be employed on the Mesabi range in earthwork the coming year and that these will move during the season of 1907 not less than 10,000,000 cubic yards of material.

The Duluth, Missabe & Northern road is now building 10 miles of additional yard tracks at Proctor to accommodate the vast increase in traffic expected the coming season. The road has ordered about 8 miles of freight cars, and this new yard will scarcely more than accommodate them. Large additional yards have been built at various points on the range, especially near Hibbing and at points along the Alborn branch to Coleraine.

The Cleveland Cliffs Iron Company has finished the year with shipments of a greater volume of ore than any preceding season, namely 2,221,753 tons. This is to be compared with 2,101,021 tons last year and with 1,226,125 tons in 1904. The company has not only made a larger production than before from some of its older mines, but it has added the Iron Belt, on the Gogebic, the Crosby on the Mesabi and the Austin on the Marquette range. Crosby mine has shipped this year 115,000 tons. This ore is milled down and hoisted from underground. The mine is so mixed with rock that it takes a good deal of care to get a clean product. A steam shovel has been stripping a new portion of the deposit and it is hoped that the quantity of ore, as well as the ease of mining, will improve with new developments.

The Newport mine, owned by Fred Schlesinger, at Ironwood, on the Gogebic range, has shipped this year 466,000 tons,

an increase of about 28,000 tons. The Norrie, also at Ironwood, and belonging to the Oliver company, has shipped this year 725,000 tons, and the Oliver group there has produced for the year the large amount of 1,250,000 tons.

Pickands, Mather & Co. have added the Pike to their Gogebic holdings. This mine is a small property close to and perhaps part of, the Brotherton, which also belongs to the same company. It will be developed as fast as possible. Cary, Brotherton and Sunday Lake, the largest P., M. & Co. mines of the Gogebic range, have produced this year a total of 430,000 tons, of which the Cary mined 195,000, an increase of 50,000 tons from last year.

#### Scranton Dec. 24

John Markle, of Hazleton, one of the best-known anthracite operators, in an interview this week states that the prospects of the anthracite industry are as bright as ever, and the plans of himself and his associates prove that he means what he says. At their No. 4 colliery, near Hazleton, they are now opening up and operating the Mammoth vein, and can give employment to 400 additional men. The Mammoth vein has been held in reserve for some years. They are also making arrangements to extend operations on the unmined Buck Mountain vein on the Highland property, near Hazleton. New gangways and airways are being driven at the No. 6 slope, where there is a large area of virgin coal. Speaking of this improvement Mr. Markle said: "The Buck Mountain seam is of good quality, and we have proved another vein beneath it. This coal is of superior quality, the vein extends over a large area, and its discovery at this point means much for the region. We will also open up the Harleigh property in the spring, and we will operate it exclusively by electricity—hoisting, preparation and transportation—everything, in fact, will be moved by that force. In No. 4 colliery we have also sunk a slope to the Buck Mountain vein, which will last for many years. We are also going to erect additional breakers on our properties, but our plans are not quite completed. Electricity will be the power to be used, and the day is not far distant when power from a central station will be utilized to operate not only the coal mines but every other industry in the region. Electric power makes it possible to develop the smaller veins throughout the region that have been unworked for years; as in the past, to develop them would have been a losing venture. I cannot help but feel that the region has a very bright future. There is no sign of diminution in the coal-mining output for many years to come."

Fred Nichter, of the coal department of the Delaware, Lackawanna & Western Railroad, has been granted a patent upon his invention for rotary coal screens.

Vice-President Lewis, of the United Mine Workers, has made some strong remarks regarding the organization in the anthracite region. He says: "The condition of the organization in Luzerne county is bad. At Edwardsdale, but one-fifth of the men in one of the collieries belong to the union. Too much politics and too little effort to build up the union is the complaint."

He added much specific criticism of local unions.

#### Toronto, Ont. Dec. 24

The Ontario government, on Dec. 21, accepted a tender of \$1,085,000 cash for mining rights in the bed of Cobalt lake, the area covered being 46 acres. There were five tenders in all, but two were informal and were not considered. The sale was made to a syndicate promoted by Pellatt & Pellatt, Toronto; Thomas Birkett, Ottawa; Raymond Mancha, Detroit; George F. Henderson and D. B. Rochester, Ottawa, and Britton Osler, Toronto, representing several hundred subscribers who have contributed at least \$1000 each. The location will be free from royalty.

Five tenders were also received for the bed of Kerr lake, but no award was made, as the best offer, \$51,500, was not considered high enough.

The bid of \$38,100 bonus for mining rights on about 14 miles of the railway right-of-way offered by Miller, Ferguson & Hunter and T. A. Beament, Ottawa, was accepted. This grant is subject to a 25 per cent. royalty on the output.

McKeown & Co., of Pittsburg, Penn., have taken an option on the McGown and Wilcox copper mines, near Parry sound, Ont. Both will be thoroughly tested and operated extensively should the result prove favorable. The McGown, opened some years ago, showed some gold and high-grade copper ore. The Wilcox mine is low-grade copper.

The Dominion Government will introduce in Parliament during the present session a bill creating a department of mines. It is understood that when this change is affected Hon. William Templeman, of British Columbia, now minister of inland revenue, will be made minister of mines.

A model plant for the treatment of Cobalt and other ores is being constructed here for carrying out a new process, the result of experiments conducted by Messrs. Wills & Co., of Toronto. While originally set on foot to treat Cobalt ores it is claimed that the process is also available for British Columbia gold quartz. The principle is that of pneumatic concentration, and the plant can be operated at any temperature.

Considerable activity is being shown in the Tilbury oilfields, in Kent county, Ont. The Campbell Oil Company, of Detroit, has sold the oil rights on M. Campbell's 100-acre farm, Tilbury East, to A. D. Adkin, Spencerville, Ohio, and C. Melvin Van Buren, Bolivar, N. Y., for \$56,000.—



On Dec. 19 oil was struck on J. A. Tremblay's farm, Romney township, six miles distant from the productive center of the field, at a depth of 300 ft. The oil flowed with such force that fully 1000 barrels escaped, flooding the surrounding country.

#### London Dec. 15

In the early part of this year, something of a scare was created in the Indian gold-mine market by the announcement that the Champion Reef had got into poor ground. The report for the year ended Sept. 30 last reflects the situation very exactly. The developments during the year are reported to have disclosed a narrowing and impoverishment of the veins. Though the directors are hopeful that the veins may widen out again, as has been so often the case in the Kolar goldfield, they express their doubts on the subject in a very practical manner by proposing that the company shall acquire options on properties on the Dharwar district in the residency of Bombay. The result of the year's working has been not at all bad, however, for a dividend at the rate of 90 per cent. has been paid, £234,000 having been disbursed among shareholders. This is rather more than half of the amount distributed during the previous year, and is the smallest distribution since 1897 when the dividends totaled £220,000. The amount of ore milled during the year was 203,000 tons, and 207,000 tons of tailings were cyanided, yielding altogether 174,264 oz. of standard gold. This compares with 212,203 oz. of standard gold from 215,000 tons of ore and 177,000 tons of tailings, recovered during the previous year. The ore reserves are estimated at 383,000 tons, but the average contents are not specified. The market price of the shares at present is 13s., the par value being 2s. 6d. The nominal capital of the company is £260,000, in 2,080,000 shares of 2s. 6d. each. Two years ago these shares were quoted as high as £2. Under the present circumstances the current quotation is pretty high, and speaks volumes of the confidence in the mine and the management on the part of shareholders.

For a worked-out mine, Strattons Independence is having a remarkable life. For the second year in succession handsome profits have been made by the lessees, the ore extracted having realized £256,000, or after freight and cost of treatment have been deducted, £190,000. Of this sum, £120,000 went to the lessees and £70,000 to the company. After deducting all kinds of expenses at the mine and in London, the net divisible profit was £36,681. During the year, three dividends, amounting in all to £75,000, have been distributed, half of this being from previous undistributed profits. The company still holds a balance in hand of £25,000. Experiments have shown that the dumps

and the low-grade ores are worth exploitation, and Philip Argall has been appointed consulting metallurgist with a view of working out the best method of dealing with them. This appointment has given great satisfaction in London, for it is felt that it puts the future of Strattons on a very reliable footing.

A few months ago you recorded the collapse of the Fresno Copper Company, a property in California, operated by a Scottish group, and you mentioned that after Mr. Siebert's condemnatory opinion, the directors decided to have the views of J. S. MacArthur. The preliminary report of the latter gentleman has been received. He estimates that the large orebody already opened out above the 300-ft. level contains 185,000 tons, averaging 1¼ per cent. of copper. In addition to this main body, there are other subsidiary parts of the mine that show good prospects, and he recommends that they should be developed; also that the lower parts of the main body should be opened up. There is no ore that can be profitably treated by the smelter at present, and the plans of concentrating will have to be further studied. The present position of the company, therefore, is that it possesses large bodies of low-grade ore and a smelter; the problem how to bridge over the gulf between these two remains to be solved.

About a year ago a new company was formed in London to reopen the Bonmahon copper mines in the county of Waterford, in Ireland. This company has done a great deal of booming in the press and much literature has been circulated. Some of your readers may remember that the mine was worked for years during the middle of the last century, and was finally closed in 1878. In its time it produced a large amount of copper. The new company formed last year has spent most of its time and money in unwatering the mine and in extracting from the slopes some ore that could be shipped to Swansea. Recently J. A. Chalmers visited the mine and he has just issued a report, so we now get for the first time some really dependable information. Mr. Chalmers treats the proposition as a prospect, which is all it is, and calculates that if the ore in depth is of the same character as that shipped in previous times, a certain profit should be made. He recommends the expenditure of £25,000 to ascertain whether the ore is there or not, and says that if it is, it will require another £35,000 to put the mine on a paying basis. Naturally, Mr. Chalmers would not recommend this expenditure on prospecting and development unless he considered that the present showing warranted it; but what I want to point out is that the mine is nothing more than a promising prospect, and that the newspaper reports about bringing back commercial prosperity and happiness to Ireland are so much piffle.

#### Johannesburg Nov. 26

This city reminds one of an American metropolis in a presidential election year. The papers are full of political speeches, with illuminating editorials. The citadel of Chinese labor is the chief point of attack and defense. The feeling on the subject is very bitter, indeed. The anti-Chinese advocates, headed by Mr. Creswell, a former mine manager, are using every possible opportunity to push their cause. Every little incident they can get hold of is distorted into a crime, and the orators of the anti-Chinese brigade hurl defiance at the other leaders for what they call "the crime of Chinese labor."

One of the most exciting, and at the same time rowdiest meetings ever held in Johannesburg was witnessed a few nights ago. Several prominent citizens asked the mayor to call a meeting to demand the publication of the report which has caused so much excitement in the House of Commons. This report by Mr. Bucknill was a confidential one regarding vice among the Chinese on the Rand. Many of the public demanded that Mr. Bucknill's accusations be made known, so that the people of the Rand could set their house in order, if they were true, or prove their unfairness, if they were false.

The anti-Chinese league thought they would turn the meeting to their advantage, so on the morning before the meeting the town was deluged with leaflets asserting that "this is another chamber of mines dodge;" and the general character of the leaflet was such as might have been looked for from the opposition at an election meeting.

It was an interesting exhibition, for it shows how keenly the people of the Transvaal feel about the Chinese question. The anti-Chinese faction are in the minority so far, but they are certainly bitter, and determined to send the yellow men out of the country. For this reason they are willing to throw in their lot with Het Volk (the Boer party) or any other party that will help them to carry out their designs.

Just as a presidential election in America disjoins trade and causes a feeling of uncertainty, so in this country the mining industry is seriously affected by the political rows and dissensions.

The Progressive party (which might be called the conservative party of the Transvaal) has opened a most vigorous campaign, and one of their leading lights has orated in the stronghold of the enemy, Pretoria, and proven by statistics the impossibility of doing away with the coolies at present.

Will the Chinese be sent away? When the Liberal party climbed into power in England on the Chinese question, people declared the coolies would be sent out of the country forthwith. But they are still here, and in spite of the fury of the anti-Chinese organization, it is highly probable they will remain.

## General Mining News

**Lake Superior Iron Ore**—The shipments of iron ore by lake from Dec. 1 until the final close of navigation were 450,588 long tons. This addition to the season shipments makes the total for the year, by ports, as follows:

	1905.	1906.	Change.
Escanaba.....	5,307,938	5,851,050	I. 543,112
Marquette.....	2,977,828	2,791,033	D. 186,795
Ashland.....	3,485,344	3,388,106	D. 97,238
Superior.....	5,118,385	6,083,057	I. 964,672
Duluth.....	8,807,559	11,220,218	I. 2,412,659
Two Harbors..	7,779,850	8,180,125	I. 400,275
<b>Total.....</b>	<b>33,476,904</b>	<b>37,513,589</b>	<b>I. 4,036,685</b>

The shipments from the three ports which serve the Old Ranges were this year 12,030,189 tons, an increase of 259,079 tons, or 2.2 per cent. only; those from the three ports serving the Minnesota ranges were 25,483,400 tons, an increase of 3,777,606 tons, or 17.4 per cent. The total gain over last year was 12.1 per cent. Nearly all of this came from the Mesabi range.

In 1905 the all-rail shipments were 876,552 tons, raising the total to 34,353,456 tons. The rail shipments included a little over 100,000 tons taken by the Colorado Fuel and Iron Company. This year that special demand did not exist, but it is probable the rail shipments—which are not yet reported—were about 800,000 tons, making the total 38,313,589 tons. This is only 700,000 tons less than the mark set at the opening of the season. Of this year's shipments about 20,979,000 tons, or 55.9 per cent. of the total, were made by the United States Steel Corporation.

The shipments do not include the ore from the Baraboo range, in Wisconsin, nor that from the Michipicoten range, in Canada, which are not yet reported.

### ARIZONA

#### GRAHAM COUNTY

**Arizona Copper Company, Ltd.**—This company sends us the following notes relating to the recent flood at Clifton: "The loss exceeds \$50,000; operations were suspended, with the expectation of resuming smelting in about 10 days. The Detroit tailings dam collapsed, causing most of the damage. The steel bridge remained intact. . . . The washouts caused by the Gila river were repaired by Dec. 15. The losses were heavier than at first reported, the Coronado Railway being badly wrecked. The company's dam and ditch were partially destroyed, the water supply cut off, and many houses wrecked. The yards, machine shop and furnace yard were covered with tailings and debris. Rapid progress is being made in repairing damages."

#### YAVAPAI COUNTY

**Blue Bell Mine**—This mine, situated near Mayer, is shipping five cars of ore per day to the smelter at Humboldt, and it is given out that the output will soon be increased.

**Trinity Development Company**—This company was organized, during the last week, entirely by local men of Prescott; the objects are to develop and put in shape for sale some of the properties in this county that are at present idle. There are a number of such properties which only need development to put them on a paying basis.

**Wood Dry Concentrating Company**—This company has been operating its plant successfully for the past two months. The fact that a high-grade concentrate can be made without the use of water is of great interest to mining men in sections where water is scarce. This experimental plant is situated at Mayer.

### CALIFORNIA

#### AMADOR COUNTY

**McNeely Copper**—This mine, near Forest Hill, at Ione, will soon be unwatered and the shaft repaired, preliminary to development work and the taking out of ore. A new company now has the property, composed of San Francisco and Oakland men. The mine has been idle many years.

#### BUTTE COUNTY

**Fall River District**—A strike has been made at this place 18 miles from Oroville by J. Moore and Wm. Langdon, who have been some time searching for the ledge they expected to find. The ledge is four feet wide and assays of the ore run from \$40 to \$50 per ton.

#### EL DORADO COUNTY

**Walker Gravel Mine**—Work has been commenced at this property east of Fairplay. N. B. Hall recently sold the mine to J. W. Perry, representing Eastern capital.

#### INYO COUNTY

**Trojan**—This company, George Palmer, superintendent, owns a group of copper claims in the Argus range 15 miles northwest of Ballarat, and expects shortly to build a smelter which will use oil as fuel.

**Skidoo**—This mine, owned by E. A. Montgomery, is 40 miles north of Ballarat. A pipe-line is being built to bring water to the mine, the line to cost some \$200,000. The claims are being developed and machinery has been provided.

#### KERN COUNTY

**Kern River Gold Mining Company**—This company has been organized at Bakersfield by R. Bigsby, Enos Parker, Geo. H. Parker, T. R. Bigsby and E. A. Tucker, all of Los Angeles.

#### MADERA COUNTY

**Golden State**—In this mine near Raymond, E. W. Peck, president, the tunnel has developed a 5½-ft. ledge of good values, and a mill is contemplated.

#### MONO COUNTY

**Masonic District**—A company represented by S. Lund has taken over the Oro Grande, Golden Mammoth, South Side and a few other claims. The name is the

Masonic Investment Company. Extensive development work is being done on these and other claims. At this camp miners' wages are from \$4 to \$4.50 per day of eight hours.

#### NEVADA COUNTY

**Ironclad**—This mine near Rough and Ready has had to close down owing to inability to obtain fuel oil. Other properties near by are experiencing similar difficulty.

#### PLACER COUNTY

**Colfax**—The Tadpole mine near this place has closed down for the winter, but a mill is to be erected in the spring. W. H. Cass is superintendent. The Barton mine near Westville is giving employment to 55 men and the 40-stamp mill is kept busy. The Golden West, Santa Fe and X-Ray claims are closed for the winter.

#### PLUMAS COUNTY

**California Hercules**—This company is opening ground near Ward Creek and is hauling in machinery. The lava cap is to be drilled to determine the thickness and width of the gravel. C. Brown is superintendent.

#### RIVERSIDE COUNTY

**Seal of Gold**—This company (formerly the O. K.) in Dale district, has crosscut a ledge at the 650-ft. level which carries high-grade ore.

#### SAN BERNARDINO COUNTY

**Cracker Jack**—This is a new camp, 20 miles from Silver Lake on the Tonopah & Tidewater Railroad, which is being settled by Nevada men. The Crackerjack Company, W. A. Gates, of Los Angeles, president, is sinking a shaft and driving a tunnel. The mines carry mainly copper ore.

#### SAN LUIS OBISPO COUNTY

**Van Ness**—This company has been formed at Paso Robles to open new mines in Van Ness Cañon, ten miles west of Templeton. The ore carries lead and silver and a small amount of gold. The section is a new one for mining. C. M. Steinbeck is president of the company and A. W. Smith, secretary.

#### SHASTA COUNTY

**Balaklala Consolidated Copper Company**—This company at Coram is building a large dust settler. Its flue chamber is 180x120 ft. inside, and its designer believes that it will save more of the values which pass off in fine particles than the narrow ones which are now used. As it is the first of its kind to be constructed, its operation will be watched with interest by mining and smelting people.

#### SISKIYOU COUNTY

**Homestake**—This mine in the Salmon river section, N. O. Hamlin superintendent, has been purchased by F. H. Osgood, of Seattle, Washington. The shaft is 300 ft. deep.

## STANISLAUS COUNTY

*Phoenix*—This quicksilver mine, formerly owned by the Alvinza Hayward estate, is being reopened, with E. P. Newhall as superintendent.

## COLORADO

## BOULDER COUNTY

*Puzzler*—It is reported that this property at Ward has been taken over under option for \$100,000 and that the mill is to be overhauled.

*American Queen*—Announcement is made that the company will double the capacity of the mill at Summerville.

*Yellow Aster*—Arrangements have been made for equipping this company's tunnel, near Ward, with a gasoline compressor plant. C. W. Strong, Ward, Colo., is manager.

*Revenge*—A strike of sylvanite ore, carrying high values, is reported at this mine at Eldora.

*Taylor*—Hendrie & Bolthoff, of Denver, have taken the contract for the 20-ton cyanide mill to be built at Magnolia. The application of cyanide solution will be preceded by an oxidizing roast.

## CLEAR CREEK COUNTY

*Waldorf*—It is reported that British capitalists are figuring on purchasing the 1800 acre holdings of this company in the Argentine district.

*Knickerbocker Mill*—J. J. White, of Georgetown, has purchased the mill at Empire, new machinery is to be installed and steam power will be replaced by electricity, mill to be removed to the American Sisters mine on Silver creek.

*Dorit*—This company has been incorporated with capitalization of \$1,000,000, and Chicago people have taken over the Peters tunnel property on Chicago creek. F. L. Patrick, Idaho Springs, is manager.

*Alamaden Mines Company*—Missouri people are interested and they will move a plant of machinery from their Leadville property for installation on Fall river. F. W. Dickerson, Idaho Springs, is manager.

*Dewey*—Terre Haute capitalists have purchased this group in Argentine district for a reported consideration of nearly \$100,000. A. A. Ireland, Georgetown, is manager.

*Red Oak*—Chicago people who recently purchased this group for \$300,000 are reported to intend the erection of a 100-ton mill, and will repair the aerial tramway with a length of over one mile. A. B. Montgomery, Georgetown, Colo., is manager.

*Everett and Lebanon Groups*—These are reported sold to Denver people for a consideration of \$85,000. A larger compressor plant is to be installed and the new owners will figure on erection of a milling plant.

*Continental Mines, Power and Reduction Company*—This company has purchased the holdings of the Yankee Consolidated Company, comprising several hundred acres in the Yankee and Lincoln districts, eight miles west of Idaho Springs. The property is to be opened by the Seemann tunnel from Fall river, and next spring a hydro-electric power plant is to be built on Fall river for future operations. H. I. Seemann, Equitable building, Denver, is manager.

*Brazil*—Idaho Springs people have taken a lease and bond of \$20,000 for two years on this property in Freeland district. W. Morgan, Idaho Springs, is to be manager.

*Ramsdell*—A contract is to be let for the erection of a new 75-ton mill by this company, at Georgetown. G. W. Teagarden, Georgetown, Colo., is manager.

## GILPIN COUNTY

*Lotus*—It is reported that an examination of these properties in Russell district has been made in the interests of Eastern people and that a deal is pending in the purchase price of this and some property in the Fall river section in Clear creek county. Denver and Philadelphia people are the owners, and New Englanders are the probable purchasers.

*School Hill*—Chicago people have organized this company and have taken an option on the Coeur D'Alene group on Academy hill. New machinery is to be installed, including air compressor. J. N. Mackey, Black Hawk, Colo., is manager.

*Banzai*—A 12x12 Norwalk high-altitude air compressor is to be installed at their After Supper mine at Black Hawk.

*Pewabic Consolidated*—Daily shipments from Pewabic mine to company's mill now average between 85 and 100 tons. The company is preparing to sink the Pewabic and Iron shafts, each 500 ft. deeper. J. C. Fleschlutz, Central City, is manager.

*Cashier*—A contract for a new shaft-building 22x44 ft. has been let, and an 80-h.p. boiler and 8x10 hoist are to be installed on the Meeker shaft. W. Auger, Central City, is superintendent.

*Evergreen*—Two claims and ground adjoining the main group have been purchased for a consideration of \$7,000. A 60-ton matte smelter is to be erected next spring, to handle the low-grade copper ores of this property. J. L. Walters, Apex, Colo., is manager.

*Gem*—Chicago people have purchased this property, reported price being \$25,000, from St. Louis, Mo., people, the former owners. The main shaft is down 250 ft. New machinery is to be installed, and new shaftbuilding will be erected. G. P. Goodier, Central City, Colo., is manager.

*Egyptian*—This mine, together with seven other claims, has been leased and bonded to J. R. Hastings, Chicago, Ill. Main shaft is down 800 ft., and new machinery is to be installed, and new build-

ings erected. H. Irving Jones, Central City, Colo., is manager.

*Old Town Consolidated Mines Company*—A 16x18 double-post brake has been ordered from the Leyner Engineering Works, Denver, Colo., and 2500 ft. of insulated wire cable, for electric and telephone lines in shaft, has been received from the Westinghouse Electric Company, of Pittsburg, Penn. Production for 1906 will exceed \$300,000, with large amount of developments carried on during year and planned for coming year. G. K. Kimball, Jr., Idaho Springs, Colo., is manager.

## SUMMIT COUNTY

*Country Boy*—This property is again shipping high-grade zinc ore, which averages about 50 per cent. zinc, in carload lots. The company has lately installed an electric hoist to raise the ore from the 90-ft. winze which is now being deepened below the tunnel level. The pay streak is about 3 ft. wide and the ore is taken out without blasting, being simply shoveled into cars and sent direct to the smelter. A drift has been run to the west, where the winze was started and another rich shoot of zinc ore was encountered. The first shoot has been producing rich ore at the rate of 500 tons a month and the second shoot is expected to produce quite as richly.

*Blue Flag*—This company has remodeled its stamp and concentrating mill on Bald mountain above Illinois gulch. The new mill has been started and is turning out a good grade of concentrates. Its orebodies are large and of first-class concentrating material, being made up of lead, zinc and iron sulphides, carrying gold and silver values. This property includes the Laurium group and other surrounding property. Robert Niles is superintendent.

*Gold Dust*—This company, operating the Gold Dust and Puzzle groups, has taken a lease on the old West Side mill in the town of Breckenridge, and is now thoroughly overhauling it, renovating it for a steady run on their concentrating ores. By the addition of Hartz jigs and Wilfley tables to the old mill, the plant will be able to handle close to 100 tons per day, making very good zinc and lead products. James F. Callbreath, secretary of the American Mining Congress, is manager of this property.

*French Creek*—The manager of this company, Mark T. Evans, is making arrangements to resume operations in the large tunnel in Bald mountain. This tunnel is now in 2300 ft., and has passed through several valuable veins and it is the intention to do some prospecting by drifting. This project is backed by a syndicate of Colorado Springs men.

*Washington*—D. P. Marvel is still operating a portion of the Washington property, in Mayo gulch, on a lease and has just completed a valuable shipment of ore

to the local plants of the Chamberlain & Dillingham Ore Company's sampler.

*Wellington*—The management of this property has just made a contract with a zinc smelter to handle from 50 to 75 tons per day of high-grade zinc ore; contract to last for a few months, until such time as their own concentrating mill is completed and ready for work.

*Excelsior*—This property is being worked again, and a new contract has been let for driving from the first level, a distance of 500 feet.

*Hibbs*—The manager, J. Percy Hart, has been in Denver looking up machinery for installation on the main shaft. The company intends sinking this to a level of 300 ft., and opening up the vein at several levels.

#### TELLER COUNTY—CRIPPLE CREEK

The meeting of the drainage-tunnel committee, which was to be held in Colorado Springs last week, was postponed until the coming week. It was understood that at this meeting final arrangements were to be made for the driving of the drainage tunnel. The putting off of the meeting had a tendency to weaken the stock market, as it was thought that the postponement was due to dilatory tactics, but the announcement that it would be held next week has restored confidence. That the tunnel will soon be started appears almost beyond question at this time. From reliable sources it is learned that practically all of the necessary funds have been subscribed for the work. The general belief at present is that the Window-in-the-Rock or longer route proposed will be the one taken.

The milling situation with regard to the erecting of mills on the ground is receiving a good deal of attention.

Several new strikes have been made lately, and the district is looking well.

#### MINNESOTA

Shipments out of some of the more important mines of the Mesabi district for the season just closed have been as follows: Mountain Iron, 2,536,111; Morris, 1,909,743; Burt, 1,376,874; Lake Superior, 2,257,420; Mahoning, 1,020,000; Stevenson, 1,015,000; Fayal, 1,634,531; Adams-Spruce, 1,913,050 tons.

Shipments from the other mines were: Chemung, 227,120; Higgins, 114,199; Missabe Mountain, 5674; Chisholm, 379,156; Clark, 274,394; Glen, 279,424; Huli, 1,508,265; Rust, 749,155; Meyers, 228,451; Pilsbury, 33,546; Sellers, 241,031; Tener, 174,309; Monroe, 190,622; Iroquois, 190,971; Lincoln, 367,192; Troy, 146,849; Shenango, 383,717; Genoa, 179,467; Mohawk, 92,715; Hector, 37,220; Elba, 255,571; Corsica, 100,606; Malta, 115,762; Minorca, 151,530; Cass, 60,512; Mayas, 107,244; Bessemer, 131,790; Union, 20,691; Franklin, 66,934; Pettit, 82,756; La Belle, 50,466; Miller, 234,070; Biwabik, 807,374;

Duluth, 158,336; Holland, 95,472; Victoria, 64,819; Adriatic, 3294; Tesora, 12,001; Kinney, 57,690 tons.

From the Vermillion range shipments were: Minnesota, 146,502; Chandler, 318,990; Pioneer, 766,853; Zenith, 181,580; Savoy, 106,932; Sibley, 271,495 tons.

#### MONTANA

##### BUTTE DISTRICT

*North Butte*—The crosscut going toward Berlin ground from the 1600-ft. level of the Jessie has cut through a wide vein of copper ore in Gem ground, which adjoins the Jessie on the north. This makes four veins from which the company can draw ore, the Speculator, Edith May, Jessie and Gem. The shortage of railroad cars continues and the company is still experiencing trouble in having its ore transported to the Washoe plant. It is mining about 1200 tons a day. Sinking in the Berlin shaft has not been resumed, the company having decided to not do anything on this ground until February or March. It is the intention to connect the shaft and crosscut now going north to cut the Berlin veins.

*Boston & Montana*—Failure of the Great Northern Railroad to relieve the pressure on the ore-bins at the West Colusa and Leonard mines caused a loss of two or three days recently. A supply of ore on hand at the smelter prevented a reduction in the tons treated. The company usually keeps about 5000 tons in transit. It is sinking on the Badger State and will resume sinking on the Greenleaf in a few days, when it will have finished the installation of the new hoisting engine there. The boiler capacity at the Greenleaf has been increased to 450 h.p. Greenleaf is entirely new ground, with a surface showing equal to that of the large mines. It is east of the flat and northeast of the Pittsburg & Montana property. The shaft is 600 feet.

*Anaconda*—The shaft on the High Ore will reach the 2600 level about Dec. 26. A large pump station will be cut at the bottom and heavy machinery, probably electric, will be installed. Crosscutting will not begin until the latter part of January. The veins have not yet been cut at the 2400 level, but will be in a short time. Drifting in the vein of the Anaconda at the 2400 is progressing with good results, the ore body showing up as well there as on the 2200. Beginning about Jan. 1, the company will increase its electric power and use the current for operating its compressors and pumps.

*Raven*—W. Spencer Hutchinson, of Boston, has finished his inspection of the Raven property and will submit a written report to Boston men who are heavily interested. The future of the property depends upon the action taken by them. No work whatever is in progress on the property.

*Reins Copper*—This company is mining

between 25 and 40 tons of good copper ore a day. It has opened the vein on the 800, 900 and 1000 levels, and is securing most of its present output from the 1000. Some of the ore is glance and runs high in copper. It is figuring on crosscutting at the 1100 with a view of catching the vein there.

*Red Metal (Coalition)*—The company is prosecuting development vigorously and is rapidly bringing its mines from their former chaotic state, the result of haphazard operation by United Copper, up to the standard of other large mines. Good ventilation has taken the place of bad air in parts of the Minnie Healey and Rarus and the work continues. The output of ore is between 1000 and 1100 tons daily.

*Davis-Daly*—The face of the cross-cut going south of the 1800-ft. station of the Original in the interest of the company is in more than 1100 ft., but no ore has been cut. The shaft on the Smokehouse is now clear of water and crosscutting for veins supposed to traverse the property will begin at once. Sinking is in progress on the Mt. Moriah and Silver King. Lessees on the Plymouth, owned by this company, have struck a 6-in. streak of ore that carries high average values in gold and silver.

#### NEVADA

##### NYE COUNTY—TONOPAH

*Ore Shipments*—Ore shipped over the Tonopah Railroad for the week ending Dec. 13, was: Tonopah Company, 954 tons; Tonopah Extension, 395; Belmont, 355; Montana Tonopah, 50; total, 1754 tons. Shipments from Goldfield were 1420 tons, making a total of 3174 tons.

##### NYE COUNTY—BULLFROG

*Banner*—A lode 40 ft. in width has been cut in this property. It has been opened for a length of 1500 ft., and assays up to \$50 per ton. The mine is situated on a prominent hill five miles northeast of Rhyolite, and was discovered and opened in 1880. Owing to its remoteness at that date it was soon abandoned. After the rush to Bullfrog late in 1904, it was relocated and has since been steadily developed. Today it is one of the most promising properties in the Bullfrog district, and has been compared by some miners with the great Shoshone mine.

*Commodore*—A new hoisting plant is about to be installed to enable the shaft to be carried down 300 ft. The company has been reorganized recently and there are ample funds in the treasury to enable extensive development operations being embarked in. The mine comprises a group of six claims and carries a promising quartz vein, of the same nature and running parallel to the vein successfully worked in the Gold Bar mine.

*Golden Scepter*—The main tunnel is now in over 600 ft., and has cut a good looking 5-ft. vein. The tunnel will be

continued with the view of intersecting the big Hobo vein. The mine has been equipped with a rock-drilling plant, and the shaft will shortly be sunk below the 300-ft. level.

#### NYE COUNTY—JOHNNIE

*Johnnie Consolidated*—In the face of the drift on the 40-ft. level a 3-ft. vein has been cut, which carries rich ore. About 6 in. of the vein matter assays very high in silver. In the 700-ft. level the vein is widening. It is now 15 ft. in width and averages between \$15 and \$20 per ton in value.

*Panama*—Development operations have been resumed. The shaft is down 65 ft. and will be continued to the 100-ft. level before crosscutting is commenced. Recent assays have shown the vein in the bottom of the shaft between 60 and 65 ft. to be worth \$50 per ton.

*Battery*—The tunnel has now been run a distance of 80 ft. and cut the vein. It is over 2 ft. in width and assays \$20 per ton across the face. The shaft has been sunk 35 ft., and will be continued to the 100-ft. level without delay.

*Johnnie Wonder*—A shaft is being sunk to prospect a vein on the Ella B. and Copper King claims. A new vein was cut recently in a surface trench on the Copper King, which carries copper values. A cross-cut will be run to intersect this orebody from the 100-ft. level as soon as the shaft can be sunk to that depth.

#### NYE COUNTY—LIBERTY

*Liberty*—This old property is being reopened by a Philadelphia firm. A crosscut on the 250-ft. level is out 420 ft. from the shaft, and is expected to reach the ledge within 150 ft. Preparations are being made to install a 20-stamp mill, and an electric power and lighting plant. A large Hornsby-Ackroyd oil engine has just been erected in the mine. It will burn crude oil and displace the steam plant hitherto employed. Many years ago this property yielded a large quantity of high-grade ore that was shipped to California across the desert and Sierra Nevada by teams. But as the water level was approached the ore decreased in value, so that it did not pay to transport it by such a costly method. The mine was consequently closed until it came into the possession of the present owners.

#### NYE COUNTY—MANHATTAN

*Mammoth*—The tunnel in this property has been run into the hill for a distance of 450 ft. and a 10-in. quartz stringer is showing in its breast which carries free gold. It is regarded as a feeder of the main ledge which is rapidly being approached.

*Santa Lola*—This property is being vigorously prospected. Several well defined veins outcrop on the surface, and one of them has been shown by trenching to be over 6 ft. in width, and carries an average value of \$15 per ton.

*Ralston Valley*—The shaft has reached a depth of 30 ft., and sinking will be continued to 100 ft. before drifting is commenced. It is proposed to run a long cross-cut from the 100-ft. level to the Toquima mine boundary, as it is believed that a large copper-bearing orebody runs through the Ralston Valley ground parallel to the Toquima vein.

*Butler*—Work on this property is confined to surface trenching and the running of a tunnel with the view of cutting a system of veins known as the Manhattan Breyfogle. The weather has been very severe in the district during the past month and there is a large amount of snow on the ground which handicaps prospecting operations.

*Zanzibar*—Work is being actively pursued on this mine with a view of cutting the rich Consolidated vein which is believed to run through the Zanzibar holdings. Several veins have already been developed, and one of them is of large dimensions, and is possibly the continuation of the Consolidated. This ledge carries high-grade milling ore and in places has streaks of quartz, which assay well above the average shipping ore. A large tonnage is being accumulated in the dump, in view of the rapid completion of the Tonopah company's mill, which will afford crushing facilities.

*Santa Lola*—The shaft being sunk on the King Oscar claim has reached a depth of 80 ft. The vein assays up to \$25 per ton, and has been prospected for a length of 800 ft. A tunnel is being driven to strike the vein at 280 ft. depth.

*Stray Dog*—A 4-ft. ledge was recently cut in the east drift of the 100-ft. level in this property which carries the richest ore hitherto found at depth in the district. The property is owned by a Goldfield company.

*Independence*—A calcareous-quartz deposit 6 ft. in width, carrying rich ore, has been cut in this mine at a shallow depth. About 3 ft. of the vein shows free gold. The ore is all of shipping grade, and is being sacked.

### NEW JERSEY

#### WARREN COUNTY

Fifty men are employed in developing the old Pahaquarry copper mines, near Stroudsburg, on the New Jersey side of the Delaware, which was opened by the Hollanders in 1660, and reopened by the Allegheny Mining Company, in 1860. A tunnel 1000 ft. long has been driven, and the company has purchased 1600 acres of land. It is claimed that the quality of the copper ore has now been fully determined, and that it exists in paying quantities.

### NEW MEXICO

#### GRANT COUNTY

*Lost Bullion Spanish Mine*—A strike has just been made in this old mine, Silver

City, which is being worked by the Lost Bullion Spanish Mines Company. The discovery was made 3000 ft. west of the shaft in the main workings. The vein disclosed measures from 4 to 6 ft. in width, and consists of a ferruginous quartz carrying high values in gold, with some silver. This new strike will be the scene of active operations with the intention of shipping the ore to the Silver City smelter. This company has offices in Silver City, with an assay and chemical outfit for making all assays and analysis of ores. The metallurgical department is under the supervision of Geo. L. Chase, of Denver.

### OREGON

#### BAKER COUNTY

The Cornucopia mining camp, 60 miles east of Baker City in the Eagle mountains is in a state of excitement over the discovery on Boulder creek, two miles from Cornucopia, by Herbert, Underwood & Blair, of placer gold. Many claims have been staked out.

### PENNSYLVANIA

#### ANTHRACITE COAL

*Delaware & Hudson*—This company will reopen the Conyngham colliery, one of the largest in its system, after an idleness of four months. The breaker and the mines have been thoroughly repaired, and the production will be increased 20 per cent. The Hillman shaft has been closed and the coal from the small veins will be conveyed by means of a tunnel to the Baltimore or main opening. Two pairs of large hoisting engines have also been installed and a tower added to the breaker.

*Lehigh Coal and Navigation Company*—Lewis A. Riley has announced that he will not accept re-election as president of this company. It is said that W. A. Lathrop will succeed him. Mr. Lathrop was elected a manager to fill the vacancy caused by the resignation of Francis R. Cope. For three years Mr. Lathrop was assistant to Mr. Sayre, chief engineer of the Lehigh Valley Railroad, and in 1881 went then to Virginia as superintendent for the Southwestern Virginia Improvement Company. Mr. Lathrop opened the mines and built the town of Pocahontas, under great physical difficulties in a region then almost primitive. He left this field in 1885 to take charge of the bituminous coal operations of the Lehigh Valley Coal Company, in Center county, Penn., and three years later became superintendent of the extensive anthracite operations of the same company, with headquarters in Wilkes-Barre. Five years ago he resigned this position to become the president of the Webster Coal and Coke Company.

#### BITUMINOUS COAL

A tract of 2000 acres of coal land in Redstone and Luzerne townships, in Fay-

ette county, has been acquired by J. V. Thompson and associates. The property consists of several tracts, which have been acquired gradually, until 2000 acres have been secured in one body. The average cost was \$1500 per acre. The land adjoins the property of the Thompson Connellsville Coke Company. It is reported that it will be turned over to the United States Steel Corporation.

## SOUTH DAKOTA

### CUSTER COUNTY

*Southern Queen*—Plans are being made to put in a diamond drill to locate copper deposits, some of which have already been worked. This property consists of three claims and a few years ago several carloads of ore carrying copper were shipped. The ore was found in irregular chambers, lying flat in the limestone formation, the largest one being 16 ft. wide, 100 ft. long and 4 ft. thick. These deposits were worked out, and no permanent ones discovered. The property is owned by Custer and Deadwood men who intend prospecting for the mother lode.

*Fraternal*—Axel Erickson, in charge of this property, six miles from Hill City, has sunk a shaft on the vein. The vein, a few inches wide at the surface, has increased to 2 ft. at a depth of 180 ft., and carries high average values.

### LAWRENCE COUNTY

*Victoria*—At the annual meeting of this and the Victoria Extension Company the old officers were reelected. The companies are in good condition financially, and the recent strike on the lower contact of the Victoria shows milling values which are encouraging.

*Cleopatra*—This company is considering resuming operations in January. For some time a deal has been pending, but it has not been urged lately, as the company has secured good ore, and desires to operate the property itself. The new strike is a flat deposit of shale ore 9 ft. thick. It is cyaniding ore, and can be handled cheaply. The company has a 100-ton cyanide plant.

*Dividend*—A test run of the out-of-door cyanide plant erected by Ward Weigand, and others to treat the ore on the dump, has been so satisfactory that two more sand tanks and a crusher will be installed. The latter has not been needed hitherto as the ore on the dump was fine enough for the rolls. Now, however, ore from the mine will be treated and the crusher will be needed.

*Golden Reward*—The company is sampling mines that have not been worked for some years, cleaning out tunnels, laying track, and arranging to handle ore from these old workings as soon as the mill, which is undergoing changes, is in working order. A new assay office and other buildings have been erected and electrical machinery is being installed.

*Golden Development*—A shaft is being

sunk to quartzite, and is now 180 ft. deep. The property, consisting of 500 acres, is located on False Bottom, near the Penobscot mine, and the formation is similar to that at the latter place. The company is equipped with a steam hoist, sawmill, machine drills, pumps, etc., and the shaft has now passed through the porphyry, and is in the shales.

### PENNINGTON COUNTY

An important deal has just been consummated whereby the Security Investment and Mines Company, of Denver, Colo., has secured a valuable tract of placer land in Pennington county, consisting of nearly 500 acres, free from boulders and clay, well timbered, having an abundant supply of water and carrying good values in coarse and fine gold. The property was thoroughly examined by T. R. Miller, of Denver, and David H. Lawrence, also of Denver, on whose report the property was taken up by the Security company for a price in the vicinity of \$250,000. The owners intend to install an up-to-date hydraulic plant and work the ground.

## TENNESSEE

The *Baltimore Manufacturers' Record* reports that a deal which has been pending for control of the Howard-Carpenter holdings (J. H. Carpenter and J. W. Howard of Columbia, Tenn.) of phosphate lands in Hickman, Williamson and Maury counties has been completed, but no details of the transaction have been announced. Among the properties included in the deal the Leatherwood tract of 1200 acres in Hickman county is considered as the most important. It is said to contain very large deposits of high-grade phosphate rock. In addition to this tract there are several other less extensive properties in Maury and Williamson counties mentioned in the purchase. It is understood that capitalists of Nashville are interested in the enterprise, which is reported as involving \$1,000,000, and that an independent company will be organized to develop the properties.

## UTAH

### BEAVER COUNTY

*Newhouse Mines and Smelters*—The work of enlarging the mill in which ores from the Cactus mine are treated is going ahead steadily. The company has also a number of new mine buildings under construction.

*Cedar Mining Company*—Another deposit of high-grade silver ore has been encountered at 273 ft. depth in the shaft.

*Majestic Copper Company*—Shipments of copper ore are being made from the Old Hickory and O. K. mines. The former contributes to the market a carload a day and the latter one a week.

*Revenue Mining Company*—This corporation, operating in the Pine Grove dis-

trict, has its new mill about ready to go into commission. The company owns about 80 patented claims.

### JUAB COUNTY

*Little Chief*—The new steam hoist ordered for this property some time ago is in operation. Drifting on the 800 level is in progress.

*Lower Mammoth*—Two electric hoists have been ordered for this mine and will be installed early in January. Connections have been made with the 1800 level in a winze from the 1600 and a drift is being run to the orebodies.

### SALT LAKE COUNTY

*Last Chance*—Regular shipments are being made from this Bingham mine, which is owned by the Nevada-Utah Mines and Smelters Corporation.

*Columbus Consolidated*—The management of this Alta company has completed the installation of a new triplex pump, directly connected, with a maximum capacity of 400 gal. per minute.

### SUMMIT COUNTY

*Park City Shipments*—The output of the camp last week was a little more than 2000 tons, the shipping mines and amounts being: Daly Judge, 582; Silver King, 528; Daly West, 520; Little Bell, 137; Ontario, 46; Odin, 21; Scottish Chief, 35; Copper Apex, 13; Kearns-Keith, 122; New York, 33 tons.

*Odin Mining Company*—Shipments were made last week, assays showing the presence of 4 per cent. copper, 8.5 per cent. lead, 21 oz. in silver, 30c. in gold and 12 per cent. iron.

### TOOELE COUNTY

*Consolidated Mercur*—This company has been obliged to curtail its output on account of the scarcity of fuel. The roasters connected with the mill have been shut down temporarily, throwing about 100 men out of employment.

*Southport Mining Company*—Encouraging developments have been reported from this corporation's Stockton property. The management has recently acquired additional territory.

## WASHINGTON

### FERRY COUNTY

*Monitor Group*—An agreement was filed Dec. 1 with the county auditor under which the Monitor, Treadville, Ironsides, Red Cloud and Red Chief claims on Missouri mountain, 12 miles north of Republic, were sold by Z. C. and J. I. Perkins to E. R. Fraser, of Spokane, Wash., for \$15,000. The purchaser paid \$3000 cash down and agrees to pay \$2000 in 90 days, \$5000 in nine months and \$5000 in 15 months.

*Oversight*—Two new ore bins have been constructed at the portals of the Nos. 2 and 3 tunnels on the Oversight claim, and regular shipments of ore are

going to the smelters. On the Pin Money claim an incline shaft is down 30 ft. on a small vein of soft iron oxide ore, which assays well in gold, silver, copper and cobalt. Some nodules of smaltite run with the vein. The grading has been started for two miles of a ground tramway from the portal of No. 2 tunnel of the Belcher mine to the Oversight tunnels, for the transportation of ore to the Belcher Mountain Railway. The tramway will finally be extended to the Copper Key and Anonymous mines.

**Bortle Copper Gold Mining Company**—An incline shaft has been sunk 52 ft. on the northerly extension of the Belcher vein. An assay of ore from the bottom ran well in gold, silver and copper, the copper content amounting to 4 per cent. The ore also carries an excess of 42 per cent. iron. This company owns the Gold King, Alpha and Omega claims, which adjoin the Belcher mine on the north. It has a contract with the Belcher Mining Company for the use of the Nos. 1, 2 and 3 Belcher tunnels, through which the Gold King group may be developed to a depth of 500 ft. From the No. 1 tunnel the Bortle company will drive on the vein across the vertical dividing line of the two properties. C. Eugene Bortle, the president of the company, is visiting the mine. His address at headquarters is 822 Penobscot building, Detroit, Michigan.

**Manila**—This is situated near Keller, on the south half of the Colville Indian reservation, 53 miles south of Republic, and has been bonded by R. A. and L. P. Farr to J. L. Harper and associates, for \$40,000, of which amount \$5,000 is said to have been paid at the time the bond was executed. The Manila, South Manila, Cavite and Manila Fraction claims compose the Manila group for which the bond has been given. Mr. Harper took a bond on this property over two years ago, but allowed it to expire.

## Foreign Mining News

### CANADA

#### NOVA SCOTIA

**Dominion Coal Company**—A bad fire started last week in this company's hub colliery at Glace bay. All ordinary means failed to extinguish it, and it became necessary to break down a concrete dam, built several years ago to protect the workings from the sea, which adjoins the colliery.

#### ONTARIO—COBALT DISTRICT

**Nipissing**—The mine manager's report, recently published, announces that underground development, of which almost none has been done heretofore, will now proceed, the new compressor plant being in readiness. The hydraulic system of surface exploration has not been wholly successful, on account of the unevenness

of the bedrock, and the increasing depth of overburden. No general deduction has yet been formulated as to the persistence or richness of the veins in depth, but a wide fluctuation may be anticipated. The company has none but current indebtedness, and this is covered by quick assets to the amount of \$794,288. From workings on less than one-tenth of the company's whole area, net earnings of \$2,000,000 have already been secured.

**Foster Mine, Cobalt**—Henry G. Adler, who has had considerable experience in South African mining, has been appointed general manager, in place of A. W. Scott.

**Gamey Property, Cobalt**—This property, 40 acres in area, north of the Buffalo and west of the Coniagas, has hitherto not come up to expectations. A small calcite vein, however, gives indications of better results. At 24 ft. it has widened and shows niccolite and cobalt. About 12 men are at work.

**Green-Meehan Mine, Cobalt**—A rich orebody exposed on vein No. 1 is being worked. Mine Superintendent O'Connell states that ore to the value of \$25,000 was taken out in two days. The company is preparing to make large shipments.

**United Cobalt, Cobalt**—Work has been commenced on some of the properties, with Algernon Delmar, mining superintendent, in charge. Sinking will be begun immediately.

#### ONTARIO—STURGEON LAKE DISTRICT

**Sturgeon Lake Mine**—A six weeks' clean-up at this gold mine, Sturgeon lake, has resulted in gold bricks valued at \$8,000 and concentrates about equal in value. Manager A. McEwen has taken the gold to Port Arthur.

#### ONTARIO—PORT ARTHUR DISTRICT

**Canadian Bessemer Ore Company**—This company is being organized to work the large area of iron-ore land, near Port Arthur, recently discovered. Borings and test-pits are reported to show the existence of a large body of ore, at a moderate depth below the surface, and of considerable thickness. The ore is a hard hematite, running from 40 to 68 per cent. iron, generally below the bessemer limit in phosphorus, and low in sulphur. Much of the area is close to Mundy bay, and the ore can be shipped by water at small expense.

#### ONTARIO—ALGOMA DISTRICT

**Northern Ontario Consolidated Copper Company**—A smelter is to be erected at the company's mines at Dean Lake, Algoma district, where a run of copper ore was recently encountered in cross-cutting at the 130-ft. level. Assays give good returns in copper in addition to some gold and silver.

#### ONTARIO—MANITOU LAKE

**Laurentian Gold Mine**—Development work is being directed toward the location of the whole vein and the ascertaining of

its depth. It has been found to be from 4 to 14 in. thick with a width of 30 ft., but the bottom has not been reached. The shaft is down 280 ft. with no falling off in the quality of the ore.

#### ONTARIO—EAGLE LAKE DISTRICT

**Grace Gold Mine**—Thirty-five men are at work under the direction of Manager J. H. Castor. A new stamp mill with a capacity of 50 tons per day is being installed. In blasting for foundations for the stamp mill a new vein was encountered.

#### ONTARIO—HASTINGS COUNTY

**Central Ontario Granite and Marble Company**—This company started work about two months since to develop the large marble quarry near Bancroft. It has a plant comprising two channeling machines, two 30-ton derricks, hoisting engines, etc., and has erected buildings on the property. The marble is free from seams and imperfections, and is of four distinct grades. Thirty men are now employed and if this product can compete with the imported marble there is a large market and the force will be increased. J. D. Sargent, who has had experience in marble quarrying in Vermont, is superintendent.

### MEXICO

#### GUERRERO

**Mitchell Mining Company**—A circular from the office of this company, in New York, says, in part: "Recent reports from La Dicha show that we have on hand about 3,250,000 lb. copper in the form of bullion, matte, scrap and roasted ores, with a value at present market price of about \$725,000. We are now shipping the copper bullion (averaging 90 per cent. fine) to the coast, and arrangements are on foot for the sale of this copper. The converter plant is running, and the output varies from 7 to 12 tons per day. We have approximately sufficient capital in the treasury of the company to keep the plant going until completion of La Dicha & Pacific Railroad, and this will be added to from time to time by the sales of additional copper. This places us in a very sound financial condition. . . . Regarding the new properties purchased by the company, and located at Globe, Arizona, said properties are close to a railroad, and are on a producing basis today. The company has ordered a 300-ton smelter with equipment. We were fortunate in getting immediate delivery on the engines and blowers, as well as on the hoisting plants and boilers, and 40-day delivery on the 300-ton furnace. We expect to have the furnace complete, and in operation by January. We are erecting ore bins and chutes at the mines, and until completion of our own smelter have arranged with a local smelter for the handling of our ores. Reports from Mr. Britt, our superintendent, state that we are getting out high-grade ores, and he expects to be in a po-

sition as soon as equipment is up to run from 200 to 300 tons per day. The acquisition of these properties is of great benefit to the Mitchell Mining Company, and a very valuable asset, as we can be producing there, pending completion of the railroad at La Dicha, and with the production at La Dicha will be on a dividend basis much earlier than otherwise. Since acquiring the Globe properties we have made two strikes on them, within the last week, of high-grade orebodies that did not show up before."

## JALISCO

In the arroyo de Tetohuani, or gulch of the Tetohuani river, two days horseback west from Ameca, and about three hours' ride east from Mascota, a remarkable amount of new work is being rushed by the American companies, which has been delayed by unusually heavy rains.

*Lupita Mines Company*—In the arroyo de Tetohuani, this company, of which Frank G. Peck, of Colorado Springs, Colo., is president, and Patrick Fitzgerald, manager, has a 10-stamp mill and amalgamation plant, which it is preparing to enlarge to 20 stamps, and at the same time change over to the cyanide treatment. This company has just made a rich strike of high-grade silver ore in its Socorro-dora claim.

*Santa Lucia*—L. C. Malone and H. H. Cross have transferred their property, one mile from the Lupita mill, to the Santa Lucia Mining Company. This company has a capital of \$250,000, U. S. currency, and its officers are: President, Dr. A. B. Skinner, Atlantic City, N. J.; vice-president, Joseph Cross, Philadelphia; secretary and treasurer, W. M. Fort, Atlantic City, N. J.; general manager, L. C. Malone; assistant manager, H. H. Cross. In all, the Santa Lucia has some 25 pertinencias, which have been worked for several years by Mr. Malone, and on which an 1100-ft. tunnel is being driven to get under the old workings, and cut the six known veins of Santa Lucia, Descubridora, Veta-en-Media, El Llave, San Jorge, and Mirador, at depths varying from 200 to 600 ft. from the surface. It is possible the tunnel may be continued an additional 200 ft. to cut the San Roque vein, on another of Mr. Malone's property. The ore so far encountered will run high in silver with some gold. Owing to the expense of transportation the ores will be treated at the San Geronimo mill, about 200 meters farther up the gulch.

*San Geronimo*—At this mine, in the arroyo de Tetohuani, Thomas W. Lawson is putting up a mill with 10 stamps, of 1000 lb. each, and a cyanide plant. The mill will be run by water-power, from the Tetohuani river. F. W. Page is manager. It was expected to have the mill in operation by the first of the year, but the impossibility of getting in the machinery because of rains and high water has so delayed the work that it will be Feb-

ruary or March before the work is completed. Mr. Lawson has put in his own saw mill for cutting timbers for the mill, and is at the same time furnishing the camp with pine lumber and timbers.

## MICHOCAN

*Compania Metalurgica de Michoacan*—This company, at Ocampo, is installing a complete electrical plant, comprising apparatus from the works of the Westinghouse Electric and Manufacturing Company. The previous electrical installation is being augmented by a steam-engine driven, 45-kw., 250-volt, direct-current generator, which supplies current to the various motors and lights about the smelter. This generator is of a special construction now often used with similar plants where lights and motors are to be operated from the same direct-current generator. What is called a three-wire arrangement is applied, which, by an ingenious invention owned by the Westinghouse company, renders it possible to obtain 250 volts and 125 volts from the one generator. The motors, lightning protection and switch-board apparatus make the equipment complete, and more economical results will be obtained than would have been possible from a steam plant driving a single-line shaft, as has been the former practice with the older plants throughout Mexico.

## SONORA

*Yaqui Smelting and Refining Company*—At a meeting of the board of directors held at Hermosillo, Sonora, recently, A. E. Klauser, of Toledo, was re-elected president; H. R. Klauser, of Toledo, vice-president; H. C. Gerber, of Hermosillo, Sonora, was elected secretary and treasurer. The old board, consisting of H. R. Klauser, H. C. Gerber, Henry Lockhart, Jr., and A. V. Baumann, was re-elected. The company recently engaged as consulting metallurgist, Samuel James, formerly of the Arkansas Valley plant of the American Smelting and Refining Company, at Leadville, Colo. Mr. James, accompanied by the general manager of the company, Henry Lockhart, Jr., and several of the stockholders, recently left for Toledo to resume operations. The Toledo smelter is one of the best constructed independent smelters in Mexico and consists of one reverberatory furnace, one copper and one lead blast furnace; sampling plant; lead refinery; silver refinery; machine and blacksmith shops; electric light and ice plants; laboratories; general store, hotel, etc. The plant was originally built to operate on Barranca "natural" coke, which proved unsuccessful, and recently the company has been importing coke and operating the reverberatory furnace on wood. The company owns its own mines, but also does a large custom business. Toledo will be the terminus of the Cananea, Rio Yaqui y Pacifico (Southern Pacific system) which is now building north from Batamotel to

Toledo and south from the same point to Guadalajara. This road will be completed within a year and will greatly widen the scope of operations of the Toledo smelter, in anticipation of which the company is planning many improvements.

## AFRICA

## RHODESIA

Gold production in November, as reported by the Chamber of Mines, was 48,503 oz. bullion. This makes the totals for the 11 months ending Nov. 30 amount to 372,452 oz. bullion in 1905, and 505,655 oz. in 1906; an increase of 133,203 oz., or 35.8 per cent. The bullion reported this year was equal to 450,033 oz. fine gold, or \$9,302,182 in value.

## TRANSVAAL

Gold production in November is reported at 533,373 oz. fine, of which 515,193 oz. was from the Witwatersrand and 18,180 oz. from the outside districts. The total is a decrease of 7236 oz. from October, but a gain of 115,852 oz. over November, 1905. For the 11 months ending Nov. 30 the total was 4,465,627 oz. fine gold in 1905, and 5,236,450 oz. in 1906; an increase of 770,823 oz., or 17.3 per cent. This is a total value of \$108,237,422 this year.

## Coal Trade Review

NEW YORK, Dec. 26

The outcry against the railroads in the West is strong. Operators everywhere are in trouble, finding it impossible to work regularly or to fill their contracts. Matters are serious over a wide stretch of territory. Practically no mines from Pittsburg to the Missouri are able to work as they wish to, from this cause. The railroads claim that they are doing all they can to better the conditions; but no improvement is apparent. In the Northwest the situation is a serious one.

In the East the car shortage is being felt, though not to the same degree. It is bad enough to disturb the trade, especially just now, when the coming of winter, in earnest, has started up activity in the domestic demand.

East and West, therefore, the coal situation depends chiefly on the railroads, and they are not handling it at all to the satisfaction of either operators or buyers.

## COAL TRAFFIC NOTES

Coal receipts at Boston for the 11 months ending Nov. 30 are reported by the Chamber of Commerce, as follows:

	1905.	1906.	Changes.
Anthracite.....	1,794,058	1,495,728	D. 298,330
Bituminous.....	2,598,099	2,667,433	I. 69,334
Total domestic....	4,392,157	4,163,159	D. 228,998
Foreign coal.....	542,692	607,392	I. 64,700
Total.....	4,934,849	4,760,551	D. 174,298

The foreign coal comes chiefly from Nova Scotia, a small quantity being received from Great Britain.



Coastwise shipments of coal from the principal Atlantic ports for the 10 months ending Oct. 31 were, in tons:

	Anthracite.	Bituminous.	Total.
New York.....	11,240,103	8,525,321	19,765,424
Philadelphia...	1,436,044	3,228,140	4,664,184
Baltimore.....	184,772	2,664,746	2,849,518
Newport News..	.....	2,388,267	2,388,267
Norfolk.....	.....	1,849,780	1,849,780
Total.....	12,860,919	18,656,254	31,517,173
Total, 1905....	14,156,006	17,182,550	31,338,556

The total increase this year was 0.6 per cent. New York includes all the New York harbor shipping points.

Coal receipts at St. Louis for the 10 months ending Oct. 31 are reported at 4,792,168 tons in 1905, and 6,105,658 tons in 1906; an increase of 1,313,490 tons.

Receipts and shipments of coal at Chicago for the 10 months ending Oct. 31 were as follows, in short tons:

	Received.	Shipped.	Consum.
Anthracite.....	1,135,796	458,253	697,543
Bituminous.....	8,569,218	2,207,621	6,361,597
Coke.....	295,168	220,572	74,666
Total.....	10,000,182	2,866,376	7,133,806
Total, 1905.....	8,756,579	2,396,789	6,359,790

The bituminous receipts this year were from the following sources: Pennsylvania, 712,176; Ohio, 691,606; West Virginia, 747,926; Indiana, 2,422,546; Illinois, 3,994,964 tons.

Shipments and receipts of coal at ports on the Great Lakes for the 10 months ending Oct. 30 were as follows, in short tons:

	1905.	1906.	Changes.
Shipments.....	12,168,208	14,791,829	I. 2,623,621
Receipts.....	10,568,761	12,828,276	I. 2,259,515

The difference between shipments and receipts is accounted for by coal consumed on steamships, and by coal delivered to Canadian ports.

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburgh for the year to Dec. 15 were as follows, in short tons:

	1905.	1906.	Changes
Anthracite.....	4,419,103	4,381,885	D. 37,218
Bituminous.....	29,112,328	31,016,051	I. 1,903,723
Coke.....	10,870,157	12,203,565	I. 1,353,408
Total.....	44,381,588	47,600,501	I. 3,218,913

The total gain this year is 7.3 per cent.

The Dominion Coal Company reports shipments from its mines at Sydney, Cape Breton, in November, at 308,367 tons. For the 11 months ending Nov. 30 the total shipments were 2,983,658 tons in 1905, and 3,350,851 tons in 1906; an increase of 367,193 tons, or 12.3 per cent.

**New York** Dec. 26

**ANTHRACITE**

The hard-coal market still suffers from the short car supply. Without this drawback, the market would be unusually active, owing to the present weather. The shortage of cars not only makes deliveries difficult, but has thoroughly disorganized the operation of the mines. Not all November orders are yet filled, and coal for prompt delivery is wholly out of the market. The fine sizes of anthracite are almost so, but no advance on their price

has been seen among the companies, although a dealer with any supply of this fuel could undoubtedly demand an advanced price. Egg is the only coal that is at all abundant.

Prices remain at \$4.75 for broken and \$5 for egg, stove and chestnut; for steam sizes: \$2.80@3 for pea; \$2.25@2.50 for buckwheat; \$1.45@1.50 for rice; \$1.30@1.35 for barley; all f.o.b. New York harbor shipping points.

**BITUMINOUS**

The market for soft coal along the Atlantic seaboard is not much changed. Coal is somewhat harder to obtain, but prices remain the same, or \$2.85 for good steam coal up to \$3 and over for the specialties. Lack of cars is the predominating feature. Water transportation has improved a little, and the discharging of cargoes at Sound and Eastern ports now proceeds with more rapidity, thus releasing some vessels and permitting the reduction of accumulations at tidewater. Export trade is fairly active by dint of advanced freight rates. Labor is scarce at the mines, and, on account of poor car supply, has become exceedingly migratory.

Trade in the far East is active and demand is strong; premiums are paid for spot cargoes. The Sound also is active and is consuming all the coal that can be spared to it. New York harbor is short of coal, and prices are inclined to advance.

Transportation is fairly rapid, but irregular. The supply of cars ranges from one-tenth to one-half of the needs. Vessels in the coastwise market are scarce, and in demand, and freights remain about the same: \$1 to Boston, Salem and Portland, and 85c. to the Sound, with additional unloading expenses, and the loading and discharging clause.

**Birmingham** Dec. 24

Coal operations will practically be suspended for the first part, if not for the whole of this week, in this district. There is need for every ton of coal that can be mined. Much attention is being given to the coke production in this State, and as much as possible the coal is being placed at washers and at the coke ovens. Coke is not plentiful at all, and brings a good price. The last week of the month promises to find additional difficulties in the coal district of the State, on account of the holiday period. The car shortage has grown to be a big trouble.

**Chicago** Dec. 25

The coal market of the last week has been better than most dealers expected. Prices have been about the same as last week, on Western coals, with coals from east of Indiana somewhat weaker, owing to the mild weather and better car supply. Fine coals have taken a firmer position since the diminution of cold waves from

the Northwest has become apparent, and prepared sizes are somewhat weaker. The fact remains, however, that many dealers in Chicago territory are short of domestic coals, anthracite and bituminous, and their needs must be satisfied as soon as really cold weather begins. There is a feeling among retailers and consumers that the winter will be a mild one, and the ordering of adequate supplies will be put off until the need is pressing. Then the railroads will be blamed for not having at hand for immediate use cars enough to supply the demand.

There is a firm and satisfactory demand for lump and egg sizes from the mines of Illinois and Indiana, throughout Chicago territory. The demand for run-of-mine has not been so great this winter as in the autumn, but has strengthened notably since the beginning of mild winter weather. Eastern coals are in fair demand; smokeless holds up well as to both prepared sizes and run-of-mine—the latter having been weak heretofore—and Pennsylvania coals are in better supply, causing a weakening of prices and prospects of better conditions for the consumer in the future. Hocking, which has been scarce and high for several months, is plentiful and the list prices are shaded 10@30c. per ton.

**Cleveland** Dec. 25

The closing of the lake season of navigation brought very little relief to the coal market in this territory. It was expected the addition of this supply to the strictly local trade would cause prices to ease a little. The event seemed to be discounted, and the effect on the market was lost by the necessity of putting the cars immediately into other lines of trade, where there has been a strenuous demand for the past three months. Since the coal market has been dependent upon the car situation for so long, lack of relief from the railroads leaves the market for coal in identically the same position it has been for the past three months. If anything the appearance of cold weather, with its attendant difficulties in operation of roads, has stiffened the coal market, and there is a slightly better tone to prices. Mine-run steam coal is now selling at \$1.50@1.60 at mines, either in Ohio or Pennsylvania, conditions operating to remove the differential. Slack is a little stronger, partly due to the lessened production, with the closing of the lakes and partly due to the increase in demand brought about by the increased use of stoking devices. The price runs about 85c. @ \$1 at the mines. Coke is steady and strong, on the basis of \$4.25 at oven for the best grades of foundry either on contract or for spot shipment. Furnace coke is selling at \$3.50 to \$3.60 at the oven. Domestic coal is unchanged on the basis of \$2.35 at the mines for Massillon selected lump.

**Pittsburg** Dec. 25

**Coal**—The railroad car supply was better last week, and prices have declined on contracts and quotations today are based on mine-run coal at \$1.30@1.40 a ton at the mines. For 1¼-in. coal \$1.50@1.60 a ton is named. All the mines in the district are closed for the holiday, and it is not expected that a great deal of coal will be produced tomorrow, as miners usually take an extra day. All the coal loaded on the rivers has been sent to lower ports, and announcement is made that prices are to be advanced shortly from 10 to 20 per cent.

**Connellsville Coke**—Spot furnace coke advanced to \$3.75 a ton yesterday, but for contracts running through the coming year \$3@3.25 continue to be quoted. Foundry coke for prompt and first quarter remains at \$4@4.25. Production for the week, according to the *Courier*, amounted to 289,310 tons. The shipments aggregated 15,399 cars distributed as follows: To Pittsburg, 5182 cars; to points west of Pittsburg, 8390 cars; to points east of Connellsville, 1827 cars. The production in the Lower Connellsville region amounted to 116,857 tons.

**Foreign Coal Trade**

Dec. 26

Exports of fuel from Great Britain, with coal sent abroad for the use of steamers engaged in foreign trade, were as follows for the 11 months ending Nov. 30, in long tons:

	1905.	1906.	Changes.
Coal.....	43,463,534	51,194,329	I. 7,730,795
Coke.....	685,296	739,117	I. 53,821
Briquets....	1,034,257	1,276,964	I. 242,707
<b>Total exports..</b>	<b>45,183,087</b>	<b>53,150,410</b>	<b>I. 7,967,323</b>
Steamer coal....	15,972,120	16,904,662	I. 932,542
<b>Total.....</b>	<b>61,155,207</b>	<b>70,055,072</b>	<b>I. 8,899,865</b>

This shows a total increase of 14.6 per cent. in coal sent beyond the limits of the United Kingdom. Exports to the United States, included above, were:

	1905.	1906.	Changes.
Atlantic ports.....	52,544	23,639	D. 28,905
Pacific ports.....	75,160	30,741	D. 44,419
<b>Total.....</b>	<b>127,704</b>	<b>54,380</b>	<b>D. 73,324</b>

The larger exports this year were to France, 8,576,257 tons; Italy, 7,313,647; Germany, 6,978,326; Russia, 2,812,069; Sweden, 3,333,994; Spain, 2,453,813; Denmark, 2,274,940; Argentine Republic, 2,214,172 tons.

**Iron Trade Review**

NEW YORK, Dec. 26

Beyond the slackwater, which is inevitable in the holiday season, there is no change in the current of the iron and steel markets. The placing of orders for the second half of next year has gone far enough now to make a good business for that period reasonably certain.

Accounts are now being made up for the year, and presumably most of them will show good balances. With all drawbacks allowed, there has never been a year in the trade when such uniform advances have been recorded.

The total lake ore shipments, when the rail movement is added, will fall little short of that anticipated at the opening of season.

The car shortage and railroad blockades are beginning to embarrass the iron trade, making deliveries slow on orders, and threatening shortage of fuel and raw materials at many points.

**Baltimore** Dec. 24

Included in the exports from the port of Baltimore for the week were 463 tons of steel billets to Liverpool; 994 tons rails and 23 tons splice-bars to Colon.

The imports for the week included 650 tons spiegeleisen and 548 tons ferro-manganese. Receipts of iron ore were two cargoes, 12,000 tons, from Daiquiri, Cuba.

**Birmingham** Dec. 24

The last month of the year will not round up with the best showing for the Birmingham district in the way of pig-iron production and delivery. There is some apprehension that the furnaces will not be able to get the full output during this week. The manufacturers have noted for the last three months that there has been a steady decrease in the iron made as compared to the production last year. The railroad car shortage is still bad. Iron quotations at the end of the year are better and stronger than they were at the start. Spot iron is an unknown quantity. No new business is being received which stipulates delivery during the first and second quarters of the coming year. Quite a number of sales have been made already for delivery during the third quarter of the year.

The home melt in the South is still strong. The cast-iron pipe plants and other industries are still pushing their work. The plants in this district using iron in their daily operation have shut down for the holiday period, but it is announced that the loss of time will be cut as short as possible. All hands in the industrial sections of the South were paid off ten days ago in order that all shopping could be done and delay avoided.

**Chicago** Dec. 24

At the beginning of the closing week of the year the iron market is quiet but very firm. The feeling on the part of sellers and buyers alike is that there is no immediate reduction of prices in sight, and that the "stand-pat" policy is the best one under the circumstances. Carload lots of either Northern or Southern for delivery in the first quarter, are in greatest demand, and while it is difficult to give quo-

tations that fairly represent the market, it may be said that on such sales \$23 Birmingham—\$27.15 Chicago—represents perhaps a fair average price. Northern iron, relatively scarcer than Southern iron, brings \$26.50@27 for delivery within the same period.

Contract supplies are being bargained for, at the prices given last week, but they are not actively sought. The desire of selling agents and melters alike is to hold off until it is seen what the imaginary bridge of the new year will lead to. Contracts for the second and third quarters are on the basis of about \$19.50 Birmingham, or \$23.65 Chicago, as last week, the tendency being toward firmer instead of weaker prices. Inquiries of the last week have been heavy, indicating that the business of the first quarter will be a heavy one, on the usual basis of deliveries eight to ten months hence.

Coke remains very scarce, the price of first-class Connellsville being \$6.90, and the supply being uncertain and inadequate.

**Cleveland** Dec. 25

**Iron Ore**—The last season charters for the movement of iron ore down the lakes for the season of 1907 have been placed. The last charter was that made by the United States Steel Corporation on Saturday. All of the tonnage for next year has been placed with the vessel-owners. It is a question just how much ore was placed with the merchant fleets. It is admitted this depends very largely upon the amount that will be produced from the Hill lands. The fleet of the Pittsburg Steamship Company carries about 10,000,000 tons in a year. The estimated output from the company's mines for next year is about 20,000,000 tons. It is estimated that the amount placed with the merchant boats was about 6,500,000 tons. The rates are unchanged at 75c. from Duluth to Ohio ports; 70c. from Marquette and 60c. from Escanaba. No further ore sales are reported.

**Pig Iron**—Interest in the pig-iron trade in this territory centers almost entirely in the amount of material that is being sold for delivery during the second half of next year. It is now admitted most of the material has been sold for first-half delivery while all of the iron for spot shipment has been sold, with the possible exception of a few carlots that are being produced by a few furnaces, in excess of their commitments in the way of contracts. For first-half delivery No. 2 Northern is selling at \$25 at the furnace. For immediate delivery some sales are made as high as \$27. Second-half delivery is selling at \$23@24 in the valleys. Southern furnaces are out of this market. About the same condition applies in the steel-making irons, conditions being almost identical as to supply, price and difficulty in delivery. The furnaces are having some difficulty in filling contracts because

of the car shortage. This bothers Southern furnaces more than Northern.

**Finished Material**—The conditions in finished steel have not changed. A few more of the smaller consumers have used up their iron provided for on contract. They are now in the market buying from Eastern mills at premium prices, since local mills are not able to make deliveries. The materials upon which premiums are paid are shapes, plates and bars. Billets are at a premium also, but when any contracts are placed entailing deliveries later in next year it is seen the prices run off rather easily. The market is excessively strong for the present, but easier for deliveries after 60 or 90 days. Bar iron is away up, partly due to scrap prices and partly due to demand. Bar steel is strong on account of the demand for immediate use.

**New York** Dec. 26

**Pig Iron**—The buying for second-half delivery has been interrupted to some extent by the holidays, but has not stopped entirely. The range of prices is still wide, but very little near-by iron is to be had. Foreign pig is advancing.

Current quotations for pig iron are for New York or parallel delivery.

<b>Northern:</b>	
No. 1 X foundry.....	\$ 26@27
No. 2 X foundry.....	24.50@26
No. 2 plain.....	24@25.50
Forge pig.....	20.50@22
<b>Southern:</b>	
No. 1 foundry.....	23.50@27
No. 2 foundry.....	23@26.50
No. 3 foundry.....	22@25.50
No. 4 foundry.....	21@24.50
No. 1 soft.....	24@27
No. 2 soft.....	24@26.50
Gray forge.....	20@21.50
<b>Basic pig:</b>	
Northern.....	22@23.50
Virginia.....	22@23.25
Alabama.....	22@23.50
<b>Foreign:</b>	
Scotch foundry, ex-ship.....	24.50@25
Middlesboro, No. 1, ex-ship.....	23.50@24
Middlesboro, No. 2, ex-ship.....	22.50@23

City or local deliveries are not included in prices, which are for large lots, on docks or cars. Foreign irons are quoted ex-ship, duty paid.

**Cast Iron Pipe**—For spring delivery \$35@35.50 per ton is quoted for 6-in. pipes, carload lots, at tidewater. Orders are coming in freely.

**Bars**—Bars are strong at 1.845c. tide-water, for common iron, while refined is 1.895c. Steel bars are quoted at 1.745@1.845c., according to size and conditions of orders. Store trade is good at \$2.50@2.75c. delivered.

**Plates**—For tidewater delivery, carload lots, prices are: Tank, 1.845@2.045c.; flange, 1.945@2.145c.; marine, 2.245@2.445c., according to width. Eastern manufacturers have advanced prices \$2 per ton. Some makers are asking \$2 or \$3 per ton premium to secure deliveries.

**Structural Material**—Prices are nominally unchanged, but premiums continue to be paid to secure deliveries. A number

of small contracts have been let. The lowest bid on the Blackwells island bridge contract was \$797,804 by the Buckley Realty Construction Company.

**Rail**—Business here is mainly in trolley rails; light rails are in demand, also.

**Old Material**—Foundry scrap has had the call this week, and is higher, No. 1 machinery selling at \$18.50@19.50. There has been also a call for old rails fit for re-laying, which bring \$28@29 per ton. Heavy steel melting scrap brings \$16.25@17, and is in demand.

**Philadelphia** Dec. 26

**Pig Iron**—An intelligent and consistent review of the iron and steel industry at this time is perhaps more difficult than at any previous date this year. The statements made by our larger consumers of pig iron continue to be contradictory, as measured by the conditions of the market. Nearly every consumer of iron in this territory appears to be willing to buy more iron at the present phenomenal prices and yet the amount of buying has been greatly restricted within a week. The holidays have made no difference and a fair amount of business has been done, the least of it being in Pennsylvania iron and most of it in Southern and foreign. There has been a good deal of pipe iron quietly contracted for in this market and there are necessities for basic pig, but from present appearances the buyers of basic will be obliged to wait. A feverish condition exists and an upward tendency is still apparent almost sufficient to drive buyers out of the market. A good deal of foreign iron is due here, and orders are ready to be placed. No. 1 X foundry is quoted at \$26.50; No. 2 X, \$24; No. 2 plain, \$23.50; forge, \$22.50; basic, \$23; Middlesboro No. 3 on dock, \$23; Scotch on dock \$25.

**Steel Billets**—A great deal of new work has come in within the past month calling for crude steel and this fact has made itself manifest on the market in the shape of negotiations. The average price is \$35 for rolling billets.

**Bars**—There is a large business at the higher prices and a great deal is done on a premium basis. The mills, it is hardly necessary to say, are straining their capacity and the best possible quotation for refined is 1.83½, but higher prices are being paid.

**Sheets**—Sheets have crept up another notch and more business is being offered than the mills are in a position to accept.

**Pipes and Tubes**—Merchant pipe is selling fairly well for the season and boiler tubes are quiet at the recent advance.

**Plates**—The car-builders are urgently calling for the delivery of plate according to contract, and small buyers, especially of boiler plate, are obtaining their supplies with some difficulty.

**Structural Material**—We have had a quiet week at last, during which no very

heavy business was done, but it is learned that January will bring out a number of orders for engineering concerns and contractors, who will want material, regardless of price. A great deal of warehouse and railroad construction work is to be pushed through this winter.

**Steel Rails**—The demand for the last two or three weeks has been for the lighter sections weighing from 25 to 45 lb., and the mills are pretty well supplied with this kind of work. It is taken for granted that there will be an advance on light sections in January, but the mill people have not said yes or no.

**Scrap**—The scrap market is in a very excitable condition, but the excitement must burn out for want of material. Nearly all the desirable scrap has been picked up or has been put under such control that it is practically out of the market. There is no railroad scrap to be had and it is quoted nominally at \$23.50. Some machinery scrap brought \$22, and No. 1 steel scrap is quoted at \$20 and can be had in small lots.

**Pittsburg** Dec. 25

New business for finished steel products is light, but specifications are extremely heavy, and the tonnage on the books is the largest in the history of the trade. Production this and next week will be somewhat curtailed on account of the holidays. All mills in the Pittsburg district are closed for Christmas, but will be put in operation tomorrow with but few exceptions. The most important suspension is at the big Edgar Thomson rail plant of the Carnegie Steel Company. The three mills at these works have been crowded to their capacity all year, and a serious breakdown was threatened unless needed repairs were made. Operations were suspended on Saturday and repair work was at once begun and will be rushed. It is not likely that the plant will be running again for 10 days, possibly two weeks. The Carnegie company has been crowded with rail orders, which it was endeavoring to complete this year, but a large tonnage will go over into 1907. Its capacity for light rails has been sold up for the first half. During the past few days new orders for standard sections were booked, aggregating about 30,000 tons, and included a portion of the 25,000-ton order let by the Harriman lines. Mills are having difficulty in filling orders for sheets and tin-plate. Premiums are paid for prompt delivery, and the demand seems to be increasing despite the fact that December and January always have been regarded as the dull periods of the year. Sheets heretofore ranked in the dull lines, even during busy periods of the steel trade, which was due to the surplus capacity. During the last half of this year the demand has been increased, as sheets are being used for other purposes than formerly, and every sheet mill in the country that has a supply of steel is being op-

erated. The American Sheet and Tin-Plate Company is running all of its 165 mills, and is making additions to some of them, notably at the Guernsey works, at Cambridge, O. The plant at Sharon, Penn., which has been running in the regular way, will be put on the Bray system on Jan. 2, which will double the capacity of the plant. Work on new sheet mills has been begun by the Seneca Iron and Steel Company, at Buffalo, N. Y., and by La Belle Iron Works, Steubenville, O. The leading producer is still operating 232 of its 253 tin-plate mills, and is sold into the second quarter. The expected advance in prices did not come, and there may be no change until early in the new year, and probably will not be made then, unless specifications fall off. The market is strong in all finished lines and established prices are well maintained. There is no likelihood of a decline through the first half as pig iron has been sold at high prices.

**Pig Iron**—Production for December will show a great gain, and is expected to be the heaviest of any month this year. Sharon furnace of the Republic Iron and Steel Company, which has been idle for a long time for improvements, was put in blast on Saturday. Other furnaces have increased production. All the independent furnaces yesterday gave notice to employees of a 10 per cent. advance in wages, and the pay of the furnacemen of the United States Steel Corporation also will be increased on Jan. 1. Pig-iron prices for the second half will be unusual, as the customary differentials in the various grades will not be observed. Yesterday several Valley furnaces announced that they would hold No. 2 foundry for the last half at \$21.50 at furnace. Recently bessemer pig iron for delivery in the last half sold at \$21 and basic at \$20.75. The leading independent interest is quoting these rates for bessemer and basic, but transactions have not been large, consumers hesitating in placing contracts so far ahead. The price of 1000 tons of bessemer iron sold last week and reported at \$23, was \$24.50, Valley furnaces, instead. The total sales of bessemer and malleable bessemer for the month of December likely will reach 15,000 tons, Gray forge continues strong and is quoted nominally at \$20.85, Pittsburg.

**Steel**—A sale of 1000 tons of open-hearth billets was made last week at \$33 and bessemer billets are strong at \$29.50@30. Tank plate remains firm at 1.70c., and steel bars at 1.60c.

**Sheets**—The market shows but little change. The demand is strong and black sheets are firm at 2.60c. and galvanized at 3.65c. for No. 28 gage.

**Ferro-Manganese**—For prompt delivery \$83 to \$84 a ton is quoted but for first quarter \$75 can be done.

BY TELEGRAPH

Pittsburg, Dec. 26—Advances were or-

dered today of \$2 per ton in merchant pipe, and \$4 per ton on boiler tubes.

London Dec. 17

**Iron and Steel Exports**—The exports of iron and steel and of machinery from Great Britain for the 11 months ended Nov. 30 are valued by the Board of Trade returns as below:

	1905.	1906.	Changes.
Iron and Steel...	£29,153,627	£36,396,027	I. £7,242,400
Machinery .....	21,140,838	24,400,081	I. 3,259,243
New ships.....	5,157,187	8,211,837	I. 3,054,650
<b>Total.....</b>	<b>£55,451,652</b>	<b>£69,007,945</b>	<b>I. £13,556,293</b>

The increase in the total was 24.4 per cent., a remarkable gain. The chief items of the iron and steel exports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	916,969	1,498,002	I. 581,033
Wrought iron.....	169,271	183,960	I. 14,689
Rails .....	510,192	439,118	D. 71,074
Plates.....	188,239	248,079	I. 59,840
Sheets.....	371,496	405,697	I. 34,201
Steel shapes, etc.....	196,886	249,222	I. 52,336
Tin-plates.....	330,197	344,253	I. 14,056
All other kinds.....	750,866	909,263	I. 158,397

The total increase in quantities was 843,478 tons, or 24.6 per cent. The exports of pig iron to the United States this year were 248,391 tons, an increase of 85,629 tons; of tin-plates, 54,735 tons, a decrease of 5051 tons.

**Iron and Steel Imports**—Imports of iron and steel and of machinery into Great Britain for the 11 months ended Nov. 30 are valued as follows:

	1905.	1906.	Changes.
Iron and steel...	£7,628,411	£7,809,669	I. £181,258
Machinery.....	4,192,670	4,754,216	I. 561,546
<b>Total.....</b>	<b>£11,821,081</b>	<b>£12,563,885</b>	<b>I. £742,804</b>

The total increase was 6.3 per cent. The chief items of the iron and steel imports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	114,100	81,837	D. 32,263
Wrought iron.....	90,981	100,205	I. 9,224
Steel billets, etc.....	532,136	458,029	D. 74,107
Bars and shapes.....	45,251	53,224	I. 7,973
Structural steel.....	116,128	132,160	I. 16,032
All other kinds.....	304,170	316,335	I. 12,165

There was a decrease in the total quantities this year of 60,976 tons, or 5.1 per cent.

**Iron Ore Imports**—Imports of iron ore into Great Britain for the 11 months ending Nov. 30 were as follows, in long tons:

	1905.	1906.	Changes.
Manganiferous ores.	257,837	281,600	I. 23,763
Iron ores .....	6,428,965	6,925,079	I. 496,114
<b>Total.....</b>	<b>6,686,802</b>	<b>7,206,679</b>	<b>I. 519,877</b>

The total gain was 7.8 per cent. Of the imports this year 178,960 tons manganiferous ore and 5,268,023 tons iron ore came from Spain.

Cartagena, Spain Dec. 8

**Iron and Manganiferous Ores**—Messrs. Barrington & Holt report that shipments for the week were two cargoes, 9050 tons dry ore, and one cargo, 4100 tons manganiferous ore, to Great Britain; one cargo, 5000 tons dry ore, and one cargo, 6650 tons Calasparra magnetic, to Rotterdam. Demand for forward ore is strong,

but sellers are not anxious to close contracts too far ahead.

Quotations for iron ores, f.o.b. shipping port, are: Ordinary 50 per cent. ore, 9s. 9d.@10s.; special low phosphorus, 10s. 3d.@10s. 6d.; specular ore, 58 per cent. iron, 13s.; S. P. Campanil, 11s. 9d. Manganiferous ore, No. 3 grade, 35 per cent. iron and 12 manganese, is 14s. 6d.; no higher grades on the market.

**Pyrites**—Iron pyrites, 40 per cent. iron and 43 sulphur, are 11s. 6d. per ton, f.o.b. shipping port.

## Metal Market

NEW YORK, Dec. 26.

### Gold and Silver Exports and Imports.

At all United States Ports in November and year.

Metal.	Exports.	Imports.	Excess.
<b>Gold:</b>			
Nov. 1906...	\$1,963,757	\$ 8,934,958	Imp. \$6,971,201
" 1905 .....	1,137,318	5,202,790	" 4,065,472
Year 1906...	44,831,203	147,961,827	" 103,130,624
" 1905 .....	44,125,935	46,264,524	" 2,138,589
<b>Silver:</b>			
Nov. 1906...	4,411,830	2,914,157	Exp. 1,497,673
" 1905 .....	5,361,819	4,306,838	" 1,054,981
Year 1906...	53,400,246	39,790,748	" 13,609,498
" 1905 .....	49,316,953	31,246,389	" 18,070,564

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 Dec. 22 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 1,970	\$ 418,537	\$ 471,700	\$ 70,140
1906.....	6,610,435	93,725,615	49,247,639	2,613,296
1905 .....	34,683,733	10,821,686	34,964,216	4,161,314
1904. ....	105,225,869	7,492,337	35,210,691	1,145,420

Exports of gold for the week were to the West Indies; of silver to London. Imports of gold for the week were from Cuba, France and Germany; of silver, from Mexico and South America.

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending Dec. 22, gives the following totals, comparisons being made with the corresponding week of 1905:

	1905.	1906.
Loans and discounts..	\$1,001,025,000	\$1,027,183,300
Deposits.....	977,651,800	971,648,800
Circulation.....	53,096,000	53,525,600
Specie.....	173,005,600	176,627,600
Legal tenders.....	75,699,800	69,565,500
<b>Total reserve.....</b>	<b>\$248,705,400</b>	<b>\$246,193,100</b>
<b>Reserve required.....</b>	<b>244,412,825</b>	<b>242,912,200</b>
<b>Surplus.....</b>	<b>\$ 4,292,575</b>	<b>\$ 3,280,900</b>

Changes for the week this year were increases of \$4,687,500 in specie, \$1,439,300 in legal tenders, and \$4,587,500 in deposits; decreases of \$483,000 in loans and \$25,500 in circulation. The reserve shows a surplus over the legal requirements against a deficit of \$1,699,050 the previous week.

Indian exchange is strong, all the Council bills offered in London having been taken at an average of 16.09d. per rupee. Business in India has been active, and exports large.

The following table shows the specie holding, in dollars, of the leading banks of the world:

	Gold.	Silver.	Total.
New York.....			\$176,627,600
England.....	\$149,973,720		149,973,720
France.....	545,499,230	\$200,107,240	745,606,470
Germany.....	140,120,000	46,705,000	186,825,000
Spain.....	76,800,000	121,435,000	198,235,000
Netherlands.....	27,679,000	28,624,000	56,303,000
Belgium.....	16,666,665	8,333,335	25,000,000
Italy.....	159,200,000	22,650,000	181,850,000
Russia.....	581,700,000	22,540,000	604,240,000
Austria.....	235,610,000	58,825,000	294,435,000
Sweden.....	19,780,000		19,780,000

The returns of the associated banks of New York are of date Dec. 22, and the others Dec. 21. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

The Treasury department took no silver last week. Offers were made at 70.005c. delivered, but all bids were declined.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Dec. 13:

	1905.	1906.	Changes.
India.....	£6,584,921	£14,496,296	I. £7,911,375
China.....	883,590	430,700	D. 452,890
Straits.....	38,299	1,750	D. 36,549

Total..... £7,506,810 £14,928,746 I. £7,421,936

Imports for the week were £60,000 from the Straits, £14,000 from the West Indies, £158,000 in bars and £100,000 in Mexican dollars from New York; a total of £332,000. Exports were £66,200 in bars, and £17,300 in Mexican dollars; a total of £83,500, to India.

The movement of gold and silver in Great Britain for the 11 months ending Nov. 30 was as follows:

	1905.	1906.	Changes.
Gold:			
Imports.....	£36,376,387	£41,846,861	I. 5,470,474
Exports.....	27,084,930	39,428,907	D. 12,343,977
Excess, imports.....	I. £9,291,457	£2,417,954	I. 6,873,503
Silver:			
Imports.....	£11,752,396	£16,292,810	I. 4,540,414
Exports.....	13,065,500	17,829,585	D. 4,764,085
Excess, exports.....	£1,303,104	£1,536,775	D. 233,671

Of the silver imported this year £14,032,451, or 86.1 per cent. of the total, came from the United States.

Prices of Foreign Coins

	Bid.	Asked
Mexican dollars.....	\$0.53	\$0.55
Peruvian soles and Chilean.....	0.48	0.51
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.86	3.89
Spanish 25 pesetas.....	4.78	4.80

SILVER AND STERLING EXCHANGE.

December.	Sterling Exchange.	Silver.		December.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
20	4.83	69 3/4	32 3/8	24	4.83	69 3/4	32 3/8
21	4.83 1/4	69 3/4	32 3/8	25	.....	.....	.....
22	4.83 1/4	69 3/4	32 3/4	26	4.82 3/4	69 3/4	.....

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

Other Metals

Daily Prices of Metals in New York.

December.	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.
20	23 3/4 @ 23 3/4	23 @ 23 3/4	106 1/2	42 1/2	6.00	6.65	6.50
21	23 3/4 @ 24	23 3/4 @ 23 3/4	106 3/4	42 3/4	6.00	6.65	6.50
22	23 3/4 @ 24	23 3/4 @ 23 3/4	.....	42 3/4	6.00	6.65	6.50
24	23 3/4 @ 24	23 3/4 @ 23 3/4	.....	42 3/4	6.00	6.65	6.50
25	.....	.....	.....	.....	.....	.....	.....
26	23 3/4 @ 24	23 3/4 @ 23 3/4	.....	42 3/4	6.00	6.65	6.50

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 quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—The holiday season has, as usual, affected the volume of business. Some retail transactions are reported at fancy prices owing to the scarcity of spot supplies. Consumers as a general rule are well supplied and such orders as they have placed have been for forward delivery. The market closes firm and higher at 23 3/4 @ 24c. for Lake copper, 23 3/4 @ 23 3/4 for electrolytic in ingots, cakes and wirebars. The average price at which business in casting has been done during the week is 22 7/8 @ 23c.

Exports of copper from New York for the week were 1413 long tons. Our special correspondent reports the exports from Baltimore for the week at 621 long tons of fine copper.

Imports of copper and copper material into Great Britain, with exports of copper, were as follows for the 11 months ending Nov. 30; the total imports given being the copper contents of all material, in long tons:

	1905.	1906.	Changes.
Copper ore.....	84,896	86,849	I. 1,953
Matte and precipitate.....	59,342	66,962	I. 7,620
Fine copper.....	64,712	66,532	I. 1,820
Total, copper.....	102,873	108,698	I. 5,825
Re-exports.....	12,826	13,614	I. 1,288
Exports.....	47,828	39,574	D. 8,254
Total exports.....	60,154	53,188	D. 6,966
Balance imp.....	42,719	55,510	I. 12,791

Of the imports the United States furnished this year 5792 tons of matte, an increase of 1204 tons and 24,459 tons of fine copper, a decrease of 2160 tons. Imports of matte and precipitate from Spain this year were 18,334 tons, an increase of 1441 tons. Imports from Chile were 4529 tons matte and 9920 tons copper, showing decreases of 3062 and 6349 tons, respectively.

Imports from Australia were 9938 tons of copper, a decrease of 869 tons.

Copper Sheets—The base price of copper sheets, as fixed by the manufacturers, was advanced 2c., on Dec. 20, to 29c. per lb.; subject to further change without notice.

Copper Wire—The base price of copper wire, sizes 0000 to No. 8, is 25c. per lb. in carload lots, f.o.b. New York, subject to a discount of 0.5 per cent. 10 days. Smaller sizes are priced separately according to size.

Tin—In the absence of a lead from London, the market here has been altogether neglected. Quotations are nominal at 42 3/8 @ 42 3/4 cents.

Imports and exports of tin in Great Britain for the 11 months ending Nov. 30 were, in long tons:

	1905.	1906.	Changes.
Straits.....	30,491	32,910	I. 2,419
Australia.....	3,709	4,528	I. 819
Other Countries.....	1,946	2,830	I. 884
Total imports.....	36,146	40,268	I. 4,122
Re-exports.....	26,757	30,211	I. 3,454
Exports.....	7,077	7,790	I. 713
Total exports.....	33,834	38,001	I. 4,167
Balance.....	2,312	2,267	D. 45

The re-exports are largely of Straits tin to the United States.

Exports of tin from the Straits for the 10 months ending Oct. 31 are reported as below, in long tons:

	1905.	1906.	Changes.
United States.....	13,927	11,994	D. 1,933
Great Britain.....	26,048	29,192	I. 3,144
Other Europe.....	7,043	6,353	D. 690
India.....	871	718	D. 153
China.....	445	338	D. 107
Total.....	48,334	48,595	I. 261

A large part of the tin shipped to Great Britain is in transit to the United States.

Lead—The market is unchanged at 6c. New York.

Imports and exports of lead in Great Britain for the 11 months ending Nov. 30 were as follows, in long tons:

	1905.	1906.	Changes.
United States.....	22,918	17,192	D. 5,726
Spain.....	95,887	102,509	I. 6,622
Australia.....	66,827	48,803	D. 18,024
Germany.....	18,793	16,287	D. 2,506
Other countries.....	3,772	5,666	I. 1,894
Total imports.....	208,197	190,427	D. 17,770
Exports.....	38,703	48,414	I. 9,711
Balance, imports.....	169,494	142,013	D. 27,481

The lead credited to the United States is chiefly Mexican lead, refined in this country in bond.

Spanish Lead Market—Messrs. Barington & Holt report from Cartagena, Spain, under date of Dec. 8, that the price of pig lead has been 88.75 reales per quintal, silver being paid at 14 reales per ounce. Exchange, 27.53 pesetas to £1. The price of lead, on current exchange, is equal to £18 os. 1d. per long ton, f.o.b. Cartagena. Exports for the week were 66 tons desilverized and 509 tons argentiferous lead to Marseilles.

**Spelter**—The market is somewhat quieter, but prices are firmly maintained. The close is steady at 6.65 New York, 6.50 St. Louis.

Imports and exports of spelter in Great Britain for the 11 months ending Nov. 30 were, in long tons:

	1905.	1906.	Changes.
Spelter .....	81,554	84,227	I. 2,673
Zinc sheets, etc.....	19,307	17,611	D. 1,696
<b>Total imports</b> .....	<b>100,861</b>	<b>101,838</b>	<b>I. 977</b>
<b>Exports</b> .....	<b>6,960</b>	<b>7,331</b>	<b>I. 371</b>
<b>Balance, imports</b> ..	<b>93,901</b>	<b>94,507</b>	<b>I. 606</b>

Imports of zinc ores are not reported separately.

**Spanish Zinc Ore Market**—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Dec. 8, that shipments for the week were 2000 tons blende to Stettin and 2000 tons to Antwerp. The market shows no change.

**Zinc Sheets**—The base price is \$8.25 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

**Antimony**—There is no material change. Cookson's, 26@26¼c.; Hallett's, 25@25¾c.; ordinary brands 24@25 cents.

**Nickel**—Quotations for large lots, New York or other parallel delivery, as made by the chief producer, are 45@50c. per lb. for large orders, according to size of order and terms. For small lots, 50@65c. is charged.

**Platinum** — Demand continues strong. Unmanufactured platinum is quoted at \$38 per oz., while \$31.50@32 is paid for good scrap. A further advance is probable.

**Quicksilver**—This metal remains steady, with no material changes. The New York quotation is \$40.50@42 per flask of 75 lb., according to size and conditions of order. San Francisco quotations are \$30@40 per flask for home orders, and \$37@38 for export. The London price is £7 per flask, with £6 18s. 9d. named by jobbers.

Imports of quicksilver into Great Britain for the 11 months ending Nov. 30 were 2,549,586 lb. in 1905, and 2,911,742 lb. in 1906; an increase of 362,156 lb. Re-exports of imported metal were 1,512,438 lb. in 1905, and 1,930,554 lb. in 1906; an increase of 418,116 lb. this year.

**Aluminum**—The chief producer gives list prices for ton lots and over as follows: No. 1, over 99 per cent. pure, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are from 1 to 3c. higher. Granulated metal is 2c. per lb. over price of ingots; rods 1c. per lb. up, according to size.

**Wisconsin Ore Market**

PLATTEVILLE, Dec. 22

The price of 60 per cent. zinc ore remained about the same as last week. A

few of the larger producers are making preparation to close down during the holidays. The scarcity of cars continues to prevent loading of all ore mined.

The production has been for the year all that could be asked for, when it is remembered that the total number of concentrating plants in the entire district only exceed in number by a very few those in the majority of the individual camps of the Joplin district. It is quite readily seen that the output per mill from the Wisconsin district is far in excess of the average mill in the Joplin district.

Drybone, lead and sulphur sold strong at last week's prices.

The different camps of the district loaded ore for the week as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur Lb.
Platteville.....	501,120	30,000	.....
Potosi.....	485,600	42,600	.....
Rewey.....	255,000	41,000	.....
Linden.....	186,200	.....	.....
Cuba City.....	168,460	.....	.....
Buncombe & Hazel Green	127,000	.....	.....
Benton.....	110,600	.....	.....
Mineral Point.....	87,000	36,800	35,000
Galena.....	160,000	.....	.....
Harker.....	64,900	.....	.....
Highland.....	63,000	.....	.....
<b>Total for week</b> .....	<b>2,208,880</b>	<b>150,400</b>	<b>35,000</b>
<b>Year to Dec. 22</b> .....	<b>77,468,600</b>	<b>3,661,535</b>	<b>4,088,910</b>

The tonnage reported from Potosi consists of ore that has been shipped during the last three months. Potosi is comparatively a new shipping point, and promises to become a regular shipper in the near future.

**Missouri Ore Market**

JOPLIN, Dec. 22

The highest settling price of zinc was \$50 per ton for one bin, another brought \$49.50, and several bins sold at \$48.50 per ton. The buying basis was from \$43 to \$47 per ton of 60 per cent. zinc, a few bins selling at the high and low assay price. The average price was \$42.38.

The highest price for lead was \$85, medium grades selling at \$80 to \$84 per ton. The average price was \$81.72.

On account of the large stock in the bins the market was easy and the purchasing agents of several smelters took advantage of this situation to make heavy advance purchases, practically tying up all the reserve stock in the bins. Christmas festivities will reduce next week's output about 20 per cent., as it is the intention of many producers to give their employees all the week, if they desire it. At many of the mines a vote of the miners on Monday is to decide the policy of running or taking a holiday. If as in the past, it is probable that some will take the week, some two or three days, and others only one day off.

With the district value less than \$200,000 below the estimated \$15,000,000 valuation of the year, estimated some months ago in the ENGINEERING AND MINING JOURNAL, it is apparent that estimate will

be borne out by fact, and the value gain will be approximately \$1,500,000 over 1905.

This week 21 camps report shipments, the largest number reporting in one week. In order to accomplish an increase in shipment of 1767 tons over the previous week, coal and cattle cars were brought into requisition.

Following are the shipments of zinc and lead from the various camps reporting for the week ending to-day:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.....	2,700,160	633,120	\$86,708
Joplin.....	3,122,910	339,770	85,757
Galena-Empire.....	1,460,980	131,140	36,417
Duenweg.....	1,016,310	228,520	32,235
Badger.....	891,290	2,800	20,505
Aurora.....	853,780	24,480	17,784
Alba.....	601,410	64,580	16,579
Prosperity.....	433,750	65,230	11,983
Spurgeon.....	403,720	89,550	10,395
Neck City.....	414,520	.....	9,740
Granby.....	483,000	60,000	8,680
Oronogo.....	146,790	66,640	6,108
Baxter Springs.....	140,970	51,060	5,000
Sherwood.....	152,350	16,900	4,197
Carl Junction.....	92,140	.....	2,119
Springfield.....	85,360	.....	2,048
Stott City.....	72,610	.....	1,670
Cave Springs.....	74,740	.....	1,644
Carthage.....	55,000	.....	1,293
Sarcoxi.....	52,010	.....	1,144
Zincite.....	44,760	.....	1,030
<b>Totals</b> .....	<b>13,238,460</b>	<b>1,773,420</b>	<b>\$363,636</b>

51 weeks..... 547,079,390 75,765,020 \$14,817,479  
Zinc value, the week, \$290,570; 51 weeks, \$11,839,416  
Lead value, the week, 72,466; 51 weeks, 2,978,066

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc.

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January...	52.00	47.38	January...	61.50	75.20
February...	52.77	47.37	February...	57.62	72.83
March.....	47.40	42.68	March.....	57.20	73.73
April.....	42.88	44.68	April.....	58.00	75.13
May.....	43.31	40.51	May.....	58.27	78.40
June.....	40.75	43.83	June.....	57.80	80.96
July.....	43.00	43.25	July.....	58.00	74.31
August.....	48.83	43.56	August.....	58.00	75.36
September.	46.75	42.58	September.	58.00	79.64
October....	47.60	41.55	October....	63.86	79.84
November..	49.55	44.13	November..	68.67	81.98
December..	49.00	....	December..	76.25	....

**Chemicals**

NEW YORK, Dec. 26

**Copper Sulphate**—The market is strong. Demand has been fairly brisk and prices have again been advanced, following the upward trend of copper metal. We quote \$7.25 per 100 lb. in carload lots, and \$7.50 for smaller quantities.

**Nitrate of Soda**—There is nothing new to report in the nitrate market this week. Prices remain unchanged at \$2.55@2.60 for spot delivery with futures selling 10c. lower.

**Sulphur**—Messrs. Emil Fog & Sons, of Messina, Sicily, furnish the following statistics; they are in the tons of 1030 kg., which are the custom of the trade:

	1905.	1906.	Changes.
Exports, October,	24,874	22,516	D. 2,358
" 10 mos.	391,116	351,120	D. 39,996
Stocks, Nov. 1....	416,088	500,123	I. 84,035

The October exports included 5109 tons to the United States in 1905, and 331 tons in 1906; a decrease of 4778 tons.

**British Chemical Trade**—Exports of heavy chemicals from Great Britain for the 11 months ending Nov. 30 were as follows, in cwt. of 112 lb. each:

	1905.	1906.	Changes.
Bleaching powder.....	849,094	907,906	I. 58,812
Muriate of ammonia.....	91,267	116,971	I. 25,704
Soda ash.....	1,381,113	1,702,254	I. 321,141
Bicarbonate of soda.....	394,397	373,707	D. 20,690
Caustic soda.....	1,383,212	1,461,323	I. 78,111
Soda crystals.....	184,322	171,189	D. 12,733
Soda sulphate.....	682,250	904,720	I. 218,470
Sulphuric acid.....	78,801	86,317	I. 7,516

Exports of copper sulphate were 54,957 long tons in 1905, and 41,609 tons in 1906; a decrease of 13,342 tons.

Imports of chemicals and raw materials into Great Britain for the 11 months were, in long tons:

	1905.	1906	Changes.
Nitrate of potash.....	8,554	10,190	I. 1,636
Nitrate of soda.....	94,672	101,557	I. 6,885
Phosphates.....	3-7,741	412,283	I. 24,542
Sulphur.....	18,991	24,062	I. 5,071
Pyrites.....	620,348	678,493	I. 58,145

Estimating copper contents of pyrites, the total imports of sulphur were 267,030 tons in 1905, and 295,459 tons in 1906; an increase of 28,429 tons.

**Mining Stocks**

NEW YORK, Dec. 26

The general stock markets have recovered in some degree from last week's overturn in Wall street. It is manifest, however, that speculation has been excessive, and that further liquidation must come before long. The holidays this week are giving some welcome rest to an excited and erratic market.

The general situation has naturally affected the market for mining stocks, and those securities have not been active, nor in much demand.

The Anaconda Copper Company has declared its dividend for the fourth quarter. It is \$1.75 per share, an increase of 25c. over the preceding quarter. This leads to some speculation as to the next Amalgamated dividend.

Boston Dec. 24

The mining-share market was doing splendidly until upset by the break in the New York list late last week. New records were made during the week, and the situation was and is one of increasing strength. Buyers of copper shares are obliged at present to pay in full for their purchases or in large part, if carried on margin account, which certainly strengthens the position of these stocks. This is due largely to the stringency of the money market at the year's end. Speculation continues to be in specialties. Last week Trinity, Rhode Island, Tecumseh and one or two others were the favorites. Calumet & Hecla, Wolverine, Mohawk, Osceola, Tecumseh and possibly one or two others made new high records. Increased

dividends were also made, and withal the technical position of the market for copper mining shares is all that could be desired.

Calumet & Hecla reached the \$900 mark, which is \$5 above its best record in 1900. The company has exercised its option on the Superior, and is said to have on hand an option on the Hussey tract. Wolverine advanced \$7.50 to \$180, on investment buying. Mohawk touched \$80, and Osceola rose \$12 during the week to \$150, but fell back to \$140 on disappointment on the dividend declaration last Saturday. The rate was \$6 semi-annually when \$8 was looked for. Tecumseh touched \$30, up \$3, for the week. This company will go into the new LaSalle Copper Company, together with the LaSalle and Caldwell tracts. Three Tecumseh shares will receive four shares of the new stock.

Tamarack rose \$8.50 to \$119.50. The directors announced a semi-annual dividend of \$3 last Saturday, the same as a year ago. The increase in the Anaconda dividend to a 28 per cent. basis on the par was without effect as the market was in a highly nervous state. Trinity moved up \$4.75 to \$17.25 on immense speculation, and a large amount of printer's ink, by its president, Thomas W. Lawson. According to all the testimony, control of this company is being sought by one of the large smelting companies. Rhode Island did stunts and advanced almost \$3, to \$8.12½. Its location being contiguous to the Tecumseh brought about this advance.

Greene has continued in the fore, and sold up \$1.75 during the week to \$32.75. The consolidation with the Cananea Central is now expected to prove beneficial to the former. An extra \$1 dividend by the St. Mary's Mineral Land did not bring any response in the stock. Sales are few and far between. Amalgamated Copper varied from \$113.50 to \$111.12½, during the week. The action of Anaconda directors in increasing the dividend rate is thought to presage an increase in the Amalgamated dividend next month. Nipissing sold off to \$12.12½ on the curb, notwithstanding declaration of the same dividend.

The Cumberland-Ely Mining Company has increased its capital and offers 100,000 shares at \$12.50 to stock of record Dec. 28. The stock is offered at \$12 on the curb.

Colorado Springs Dec. 21

Cripple Creek stocks on the local mining market have been exceedingly active during the entire week with a rapid rise in prices in the whole list up to Wednesday, which was the highest of the week. Profit-taking caused a noticeable decline toward the last of the week. The market, however, shows remarkable strength not only in the mines list, but also in the prospects. El Paso, Elkton, Acacia, Gold Dollar and Work were the most active traders of the week.

**Monthly Average Prices of Metals**

**SILVER.**

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January.....	60.690	65.288	27.930	30.113
February.....	61.023	66.108	28.047	30.464
March.....	58.046	64.597	26.794	29.884
April.....	56.600	64.766	26.108	29.984
May.....	57.832	66.976	26.664	30.968
June.....	58.428	65.394	26.910	30.186
July.....	59.115	65.106	27.163	30.113
August.....	60.269	65.949	27.522	30.529
September.....	61.695	67.927	28.528	31.483
October.....	62.034	69.533	28.637	32.148
November.....	63.849	70.813	29.493	32.671
December.....	64.860	.....	29.977	.....
Year.....	60.352	.....	27.839	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, 0.925 fine.

**COPPER.**

Month.	NEW YORK.				LONDON.	
	Electrolytic.		Lake.		1905.	1906.
	1905.	1906.	1905.	1906.		
Jan.....	15.008	18.310	15.128	18.419	68.262	78.869
Feb.....	15.011	17.869	15.136	18.116	67.963	78.147
March.....	15.125	18.361	15.250	18.641	68.174	81.111
April.....	14.920	18.375	15.045	18.688	67.017	84.793
May.....	14.627	18.457	14.820	18.724	64.875	84.857
June.....	14.673	18.442	14.813	18.719	65.881	83.994
July.....	14.888	18.190	15.005	18.585	66.887	81.167
Aug.....	15.664	18.380	15.725	18.706	69.680	88.864
Sept.....	15.965	19.033	15.978	19.328	69.637	87.831
Oct.....	16.279	21.203	16.332	21.722	71.406	97.269
Nov.....	16.599	21.833	16.758	22.398	74.727	100.270
Dec.....	18.328	.....	18.398	.....	78.993	.....
Year..	15.590	.....	15.699	.....	69.465	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2240 lb., standard copper.

**TIN IN NEW YORK.**

Month.	1905.	1906.	Month.	1905.	1906.
Jan.....	29.325	36.390	July.....	31.760	37.275
Feb.....	29.262	36.403	Aug.....	32.866	40.606
March.....	29.523	36.662	Sept.....	32.096	40.516
April.....	30.525	38.900	Oct.....	32.481	42.862
May.....	30.049	43.313	Nov.....	33.443	42.906
June.....	30.329	39.280	Dec.....	35.836	.....
			Av. year.	31.358	.....

Prices are in cents per pound.

**LEAD IN NEW YORK.**

Month.	1905.	1906.	Month.	1905.	1906.
Jan.....	4.552	5.600	July.....	4.524	5.750
Feb.....	4.450	5.464	Aug.....	4.665	5.750
March.....	4.470	5.350	Sept.....	4.850	5.750
April.....	4.500	5.404	Oct.....	4.850	5.750
May.....	4.500	5.685	Nov.....	5.200	5.750
June.....	4.500	5.760	Dec.....	5.422	.....
			Av. year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £16,850 per long ton; February, £16,031; March, £15,922; April, £15,959; May, £16,725; June, £16,813; July, £16,525; August, £17,109; September, £18,266; October, £19,350; November, £19,281.

**SPELTER.**

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan....	6.190	6.487	6.032	6.337	25.062	28.225
Feb....	6.139	6.075	5.989	5.924	24.594	28.844
Mar....	6.067	6.209	5.917	6.056	23.925	24.563
April..	5.817	6.078	5.664	5.931	23.813	25.781
May....	5.434	5.997	5.284	5.846	23.694	27.000
June..	5.190	6.096	5.040	5.948	23.875	27.728
July..	5.396	6.006	5.247	5.856	23.938	28.800
Aug....	5.708	6.027	5.556	5.878	24.675	26.938
Sept..	5.887	6.216	5.797	6.066	26.375	27.563
Oct....	6.087	6.222	5.934	6.070	28.225	29.075
Nov....	6.145	6.375	5.984	6.225	28.500	27.781
Dec....	6.522	.....	6.374	.....	28.719	.....
Year..	5.822	.....	5.730	.....	25.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2240 lb.) good ordinary brands.

STOCK QUOTATIONS

BOSTON

Dec. 22

SAN FRANCISCO

Dec. 19.

NEW YORK. Week Dec. 22. Table with columns: Name of Company, High, Low, Clg., Sales. Lists various mining and industrial companies like Alaska Mine, Am. Nev. M. & P. Co., etc.

BOSTON. Table with columns: Name of Company, High, Low, Clg., Sales. Lists companies like Adventure, Allouez, Am. Zinc, Arcadian, etc.

SAN FRANCISCO. Table with columns: Name of Company, High, Low, Clg., Sales. Lists companies like Comstock Stocks, Belmont, Golden Anchor, etc.

NEW YORK INDUSTRIALS. Table with columns: Name of Company, High, Low, Clg., Sales. Lists companies like Am. Agri. Chem., Am. Smelting & Ref., etc.

BOSTON CURB. Table with columns: Name of Company, High, Low, Clg., Sales. Lists companies like Ahmeek, Ariz. Com'l., Black Mt., etc.

MANHATTAN STOCKS. Table with columns: Name of Company, High, Low, Clg., Sales. Lists companies like Indian Camp, Jumping Jack, etc.

PHILADELPHIA Dec. 22. Table with columns: Name of Company, High, Low, Clg., Sales. Lists companies like American Cement, Cambria Steel, etc.

NEVADA MINING STOCKS. Dec. 26. (Revised by Weir Bros. & Co., New York) Table with columns: Name of Company, High, Low, Last. Lists companies like Tonopah Mine of Nevada, etc.

New Dividends. Table with columns: Company, Payable, Rate, Amt. Lists companies like Am. Smelting & Ref., American Cement Co., etc.

PITTSBURG Dec. 22. Table with columns: Name of Company, High, Low, Clg., Sales. Lists companies like Crucible Steel, Republic I. & S., etc.

GOLDFIELD STOCKS. Table with columns: Name of Company, High, Low, Last. Lists companies like Sandstorm, Kendall, Red Top, etc.

Assessments. Table with columns: Company, Delinq., Sale, Amt. Lists companies like Best & Belcher, Deadwood, etc.

St. Louis Dec. 22. Text listing prices for various commodities like Adams, American Nettle, Central Coal and Coke, etc.

BULLFROG STOCKS. Table with columns: Name of Company, High, Low, Last. Lists companies like Montgomery Shoshone Con., Tramps Con., etc.

MANHATTAN STOCKS. Table with columns: Name of Company, High, Low, Last. Lists companies like Manhattan Con., Manhattan Dexter, etc.

COLORADO SPRINGS Dec. 22. Table with columns: Name of Company, High, Low, Clg., Sales. Lists companies like Acacia, C. C. Con., Dante, etc.

LONDON. (By Cable.) Dec. 26. Text listing prices for various commodities like Dolores, £1 6s. 3d., etc.



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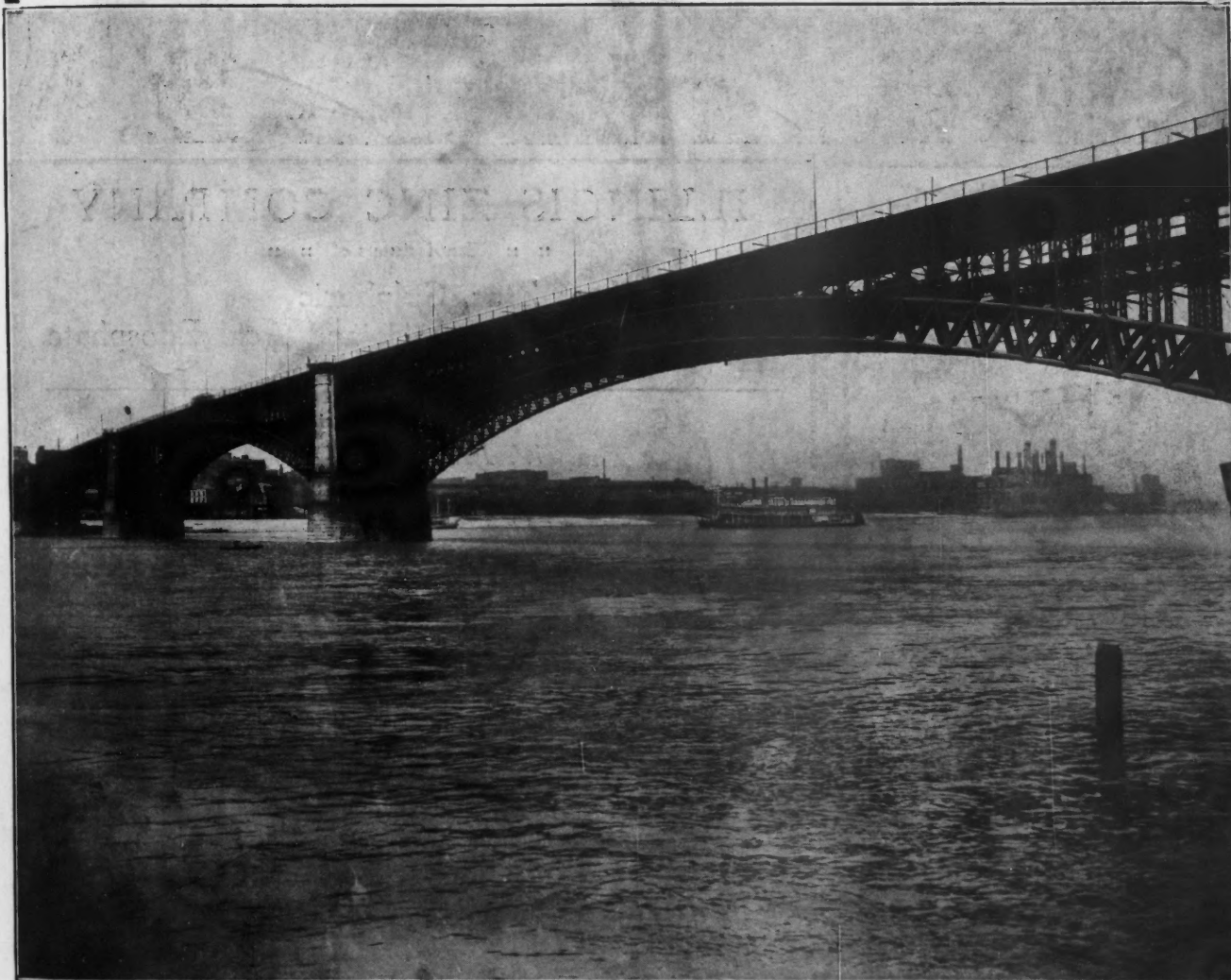
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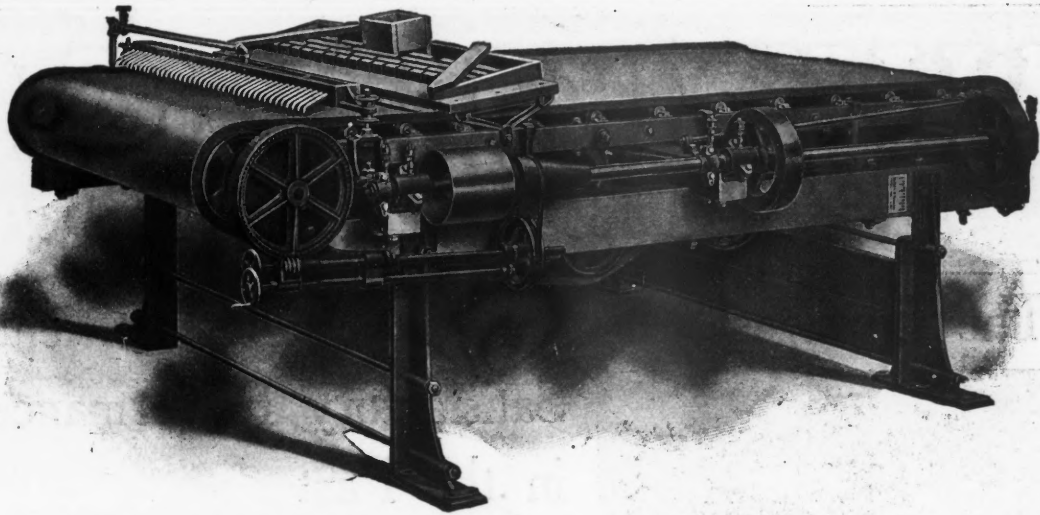
MODERN EQUIPMENT.	EXPERT ORGANIZATION.	LARGE STOCK.	PROMPT SERVICE.
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The Gardner Electric Drill & Machinery Co.,  
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 MANUFACTURERS OF

## Electrically Driven ROCK DRILLS.

Write us for Circulars and Full Information and for Testimonials from Twenty-five Satisfied Users of Our Machine.

New York Office,	143 Liberty Street,
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THIS CUT SHOWS OUR STANDARD SIX FOOT

## Frue Vanner

It represents the latest improved ideas. When desired, we make the entire frame of Iron to withstand the attacks of wood-destroying insects.

## Chalmers & Williams

Office: Railway Exchange, Chicago.

Works: Chicago Heights, Ill.

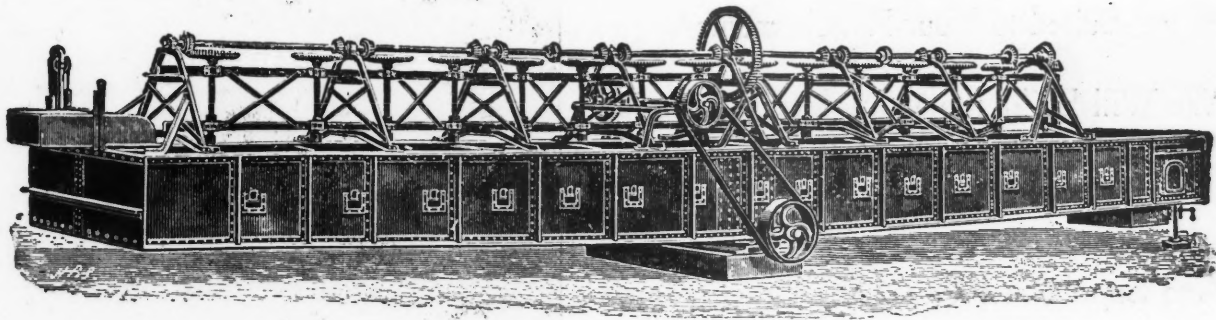
Dooly Block, Salt Lake City.

Pacific Coast Representative: The Hewitt Machinery Co., San Francisco, Cal.

Sales Agents for the Green Rotary Pressure Blowers.

## There Are No Chains Or Drags

On the "EDWARDS" Patent Mechanical Ore-Roasting Furnaces.



And for economy in labor, fuel and maintenance, you can't beat it. One mine roasting over 8,000 tons of sulphide ore per month uses six and says: "We are roasting approximately *12 to 15 per cent. more ore with the same amount of labor, fuel, etc.* The roast is the best we have ever seen."

IT WILL PAY YOU TO KNOW ALL ABOUT THIS MACHINE.

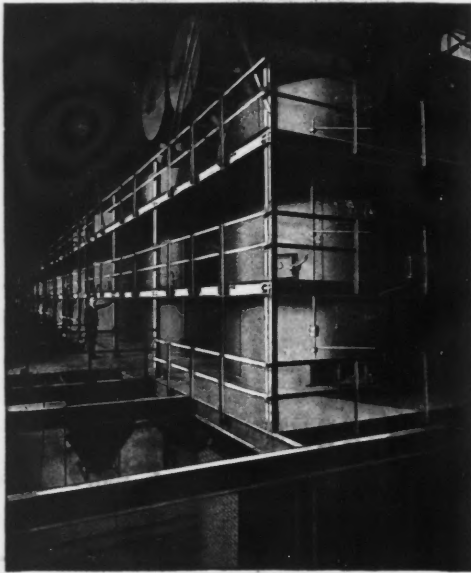
CHISHOLM, MATTHEW & CO., COLORADO SPRINGS, AGENTS  
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# ALLIS-CHALMERS CO

## MILWAUKEE WIS U S A

The Strongest Guaranty of Future Efficiency is



Satisfactory Performance  
in the Past

In What Mining District Can You Find Machinery With A Better Record Than That Built By The Allis-Chalmers Co ?

Not Only in the Complete Equipment of Mines, Mills, Smelters and Plants of All Kinds for the Extraction of Metals from Ores

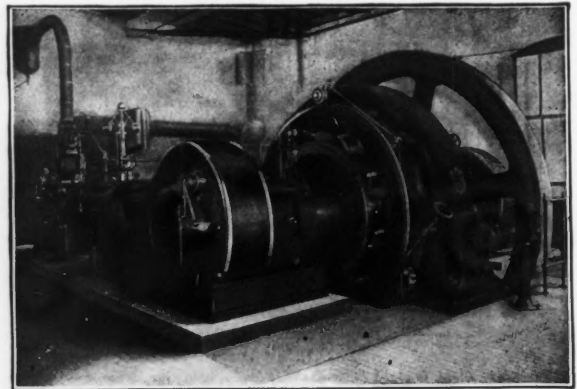
But Also in Furnishing the Power and Electrical Machinery Auxiliary to Them

### WE LEAD THE WORLD

Choose the Type of Prime Mover Best Suited to Your Requirements

We Will Build the Complete Generating Unit Especially Adapted to the Service

And Supply All Other Electrical Apparatus, Such as Motors, Controllers, Transformers, Etc.



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Canadian Representatives: Allis-Chalmers-Bullock, Ltd., Montreal.

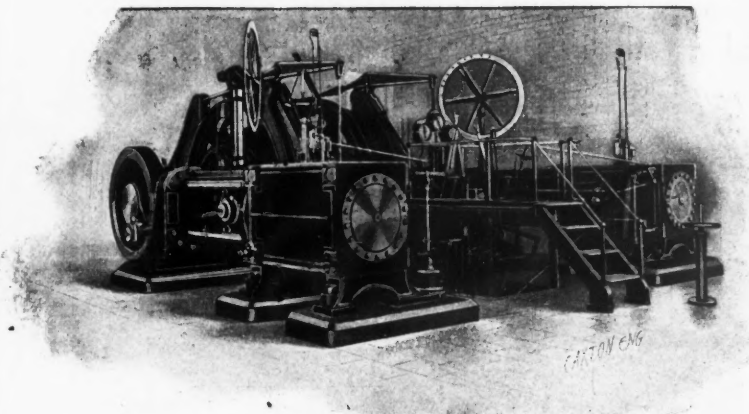
**THE WELLMAN-SEEVER-MORGAN CO.**  
 WELLMAN-SEEVER-MORGAN ENGINEERING DIVISION      WEBSTER, CAMP & LANE DIVISION



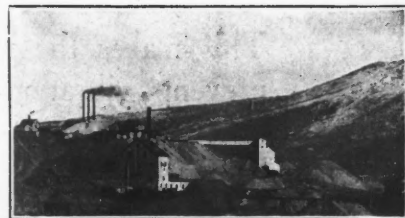
PORTLAND GOLD MINE



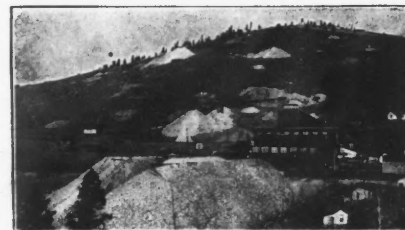
VINDICATOR CONSOLIDATED GOLD MINE



DIRECT ACTING HEAVY DUTY CORLISS HOIST WITH REELS



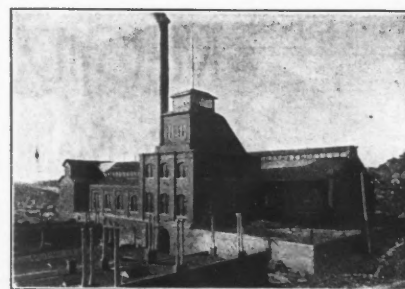
INDEPENDENCE AND STRONG MINES



ELKTON CONSOLIDATED GOLD MINE



AJAX GOLD MINING CO.



GOLD COIN, MINING AND LEASING CO.

**DIRECT ACTING HOISTS**  
 IN THE  
**CRIPPLE CREEK DISTRICT**

These views show shafthouses, etc., of some of the Cripple Creek District Mining Companies who use our hoists, also one of the hoists. In this district alone are nine of our large first motion hoists; in fact, practically every Corliss first motion hoist in Colorado is of our make.

We build First Motion Hoists, Geared Hoists—Steam or Electric, Haulages, Headframes, Triples, Cages, Skips, etc., and equip complete hoisting plants.

Send us your inquiries and specifications and let us bid on them.

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                                  London, Eng., 47 Victoria St., S. W.      San Francisco, Atlas Building.  
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**SELLING AGENTS: Denver, Hendrie & Bolthoff Manufacturing and Supply Company.**

# POWER AND MINING MACHINERY COMPANY

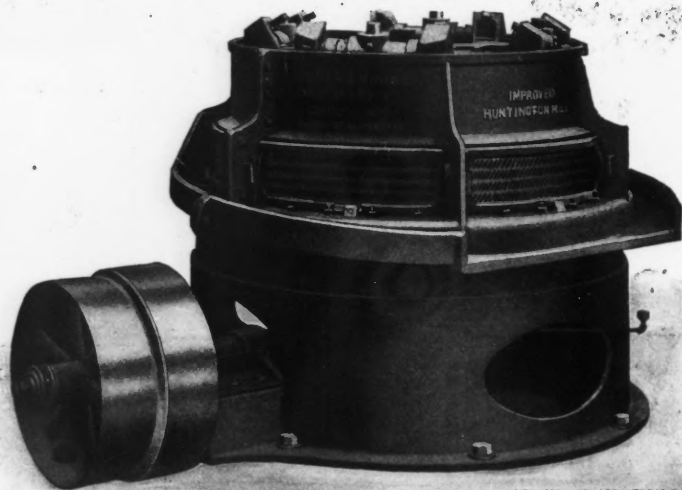
## Our Improved Huntington Mill

is the only one built with an iron base

This makes the machine self-contained and readily accessible;  
prevents vibration and greatly increases the capacity. . . . .

(Write for Bulletin No. 27)

—  
Perfect  
Alignment  
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Small Power  
Required  
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COMMERCIAL ART STUDIO CHICAGO

Complete Equipments for

### Mining, Milling and Smelting

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# NORDBERG



## HALT!!!

### Consider!! Investigate!!

From its inception, over fifteen years ago, Nordberg Manufacturing Company has been pre-eminent as a specialist in the design and construction of steam economizing machinery—hoists, pumps, stamps, power engines, compressors.

It has been our constant—and we believe successful—endeavor to give our customers machinery of better design and construction, and of greater durability than could be procured elsewhere.

The duty of 194,930,000 foot pounds of work developed per million heat units supplied to the engine, is Nordberg's record, and the World's record. (See Prof. O. P. Hood's paper before American Society of Mechanical Engineers, December, 1905, also the "Mining World," Chicago, Ill., December 15, 1906.)

**We affirm our readiness to guarantee a higher steam economy in compressing air than any other builder of air compressors in the world.**

We will back our guarantee by agreed cash forfeitures.

HOISTS,  
COMPRESSORS  
and  
BLOWING  
ENGINES

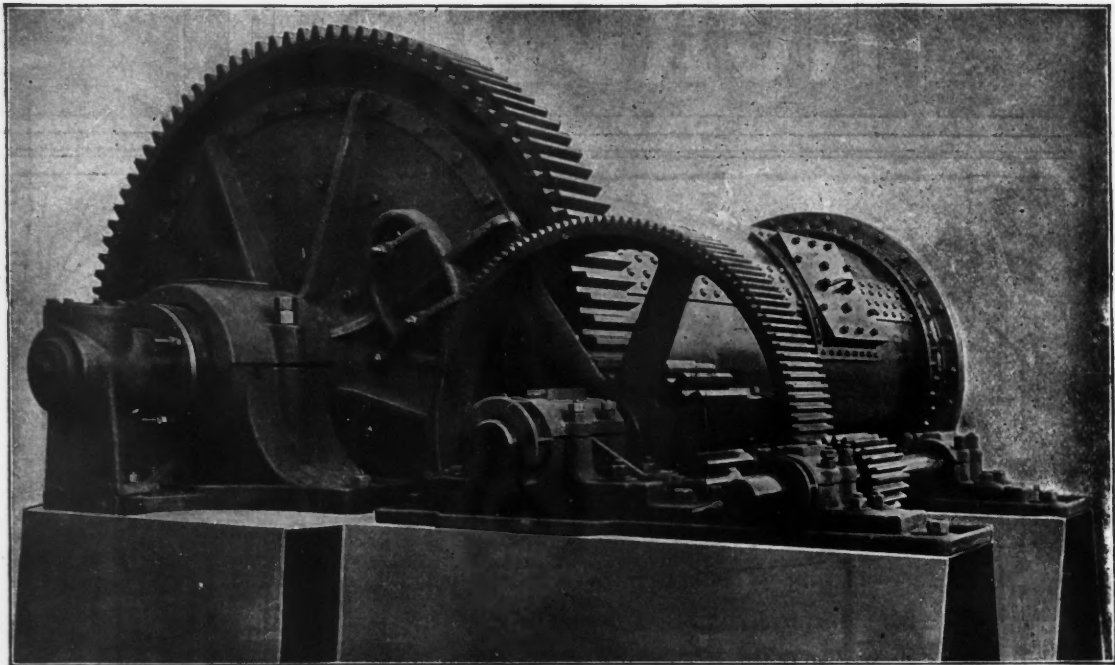
PUMPS,  
POPPET VALVE  
and  
CORLISS  
ENGINES

## NORDBERG MANUFACTURING COMPANY

Milwaukee Wisconsin U.S.A

DESIGNERS AND BUILDERS OF HIGH GRADE MACHINERY

# TUBE MILLS



TUBE MILL WITH GEAR DRIVE FOR DIRECT CONNECTED ELECTRIC MOTOR.

**LOWEST OPERATING COST OF ANY FINE CRUSHING MACHINE MADE.**

For wet or dry crushing. In wet crushing the Mill acts as a classifier, passing the finer slimes directly through the mill and only crushing the coarser particles to the desired fineness, thus saving power.

We support the shell by means of heavy hollow trunnions forming a part of the heads of the shell and resting in a substantial pedestal bearing. This form of support is the simplest, most convenient for erection and alignment, and a great improvement over complicated forms of roller supports, or similar devices UNDER the shell, which are difficult of alignment and when worn throw the shell out of its proper position and tend to break the gears.

A special feature of the Tube Mill manufactured by us is the use of MACHINE CUT GEARING instead of gears with cast teeth. The machine cut gears insure quieter running, a saving in power and smoother operation of the mill.

We furnished and installed the first Tube Mills in Colorado. Ask for our Bulletin No. 1027.

## WE ALSO MANUFACTURE

**ELECTRIC HOISTS.** Complete standard line from 1-2 to 3000 h. p. Any capacity, any power circuit. Hoists designed for special purposes.

**CRUSHING ROLLS WITHOUT SPRINGS.** Absolutely uniform product. No oversize. Simple; strong; low in price.

**MINE TIMBER FRAMERS.** One Framer will take the place of 20 carpenters, do the work in one-tenth the time, do it accurately. The only Standard Mine Timber Framing Machine made.

**THE LARGEST STAMP MILL IN COLORADO** is being built by us. All steel buildings, two-mile wire-rope tram. All machinery driven by electric motors.

**SMELTING FURNACES.** Silver-Lead and Copper Furnaces. Some of our furnaces have a record of 19 months' continuous operation without shutdown.

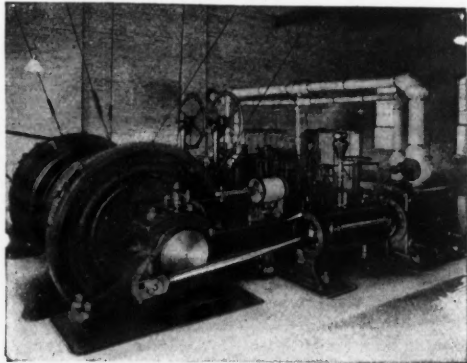
**OUR ENGINEERING DEPARTMENT** is thoroughly conversant with the most modern Mining and Milling practice, and we are prepared to plan and construct complete Mining and Milling plants.

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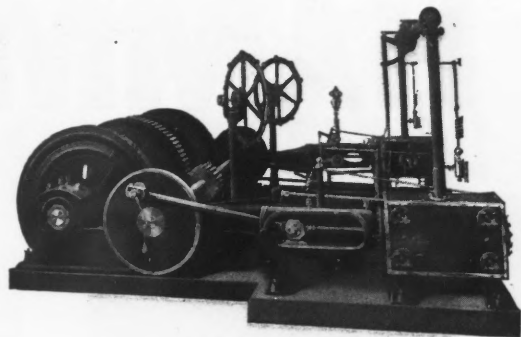
**The Denver Engineering Works Co.,**  
DENVER, COLO., U. S. A.



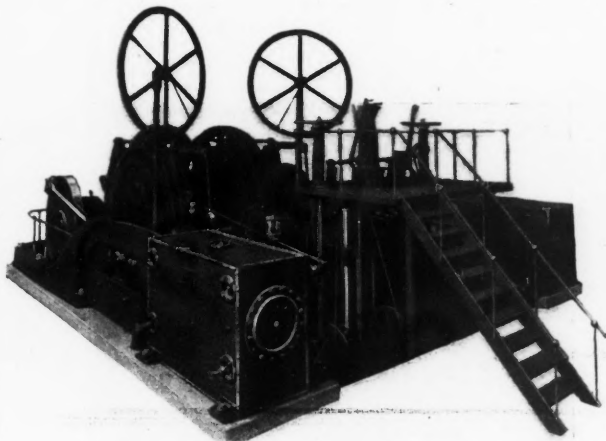
# Sullivan Hoisting Engines



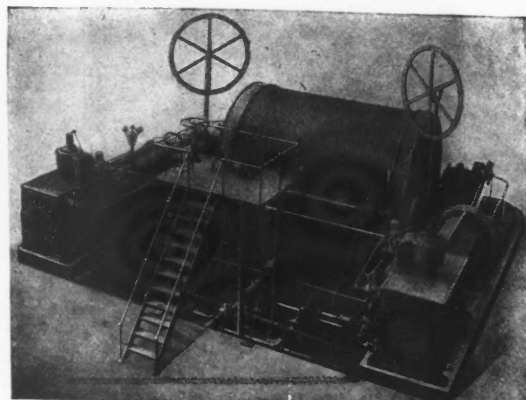
One of three Sullivan Plants at the Mines of the Cleveland-Cliffs Iron Co., Ishpeming and Negaunee, Mich.



Corliss Geared Hoist  
Built for Santa Eulalia Exploration Co  
Chihuahua, Mexico.



One of two Sullivan Flat Rope Reel Corliss Hoists  
Built for Copper Queen Mining Co., Bisbee, Arizona.  
Capacity of this plant, 3000 feet.



5000-foot Hoist of Centennial Copper Co.,  
Calumet, Mich.  
Hoisting speed, 4000 feet per minute.

Our experience as builders of heavy duty hoisting plants covers a period of 20 years. Sullivan hoists embody the latest engineering practice and comprise numerous patented features of Sullivan design, which render them the safest and most reliable engines on the market. Specifications sent upon request.

AIR COMPRESSORS  
ROCK DRILLS

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DIAMOND DRILLS

## SULLIVAN MACHINERY CO.

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# THE "LITTLE JAP" AND "LITTLE IMP" HAMMER DRILLS



Trimming walls with The "Little Jap"

The "Little Imp" Hammer Drill is supreme in the "valveless" class. It has but one moving part, resulting in extreme simplicity. Both piston and cylinder are hardened and ground—an exclusive feature resulting in the practical elimination of all wear.

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Economy in air consumption is as essential in the hammer drill as in the heavier rock drill. Ingersoll-Rand hammer drills, like the Company's standard rock drills, have a higher air economy than any other types, resulting in a 25 to 40 per cent. fuel saving for a given number of drills, or enabling a given compressor to run a correspondingly greater number of drills. Combined with this greater air economy are a greater drilling capacity and a greater endurance, making these machines the standards of commercial economy in drills of their type.



The "Little Imp" with Air Feed Attachment.

ROCK DRILLS

AIR COMPRESSORS

COAL CUTTERS

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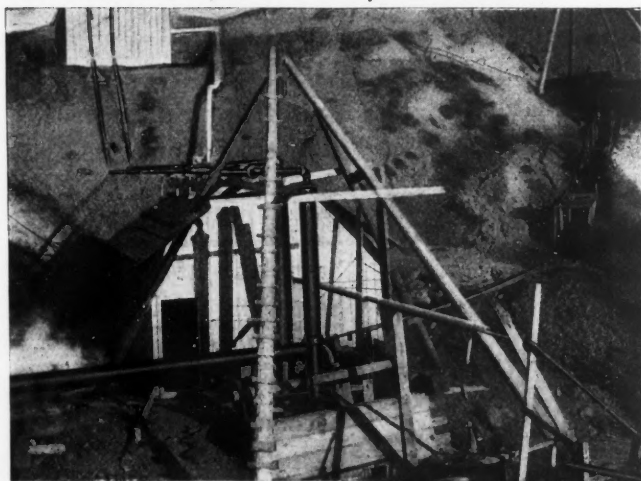
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THE INGERSOLL-RAND  
**“RETURN-AIR”  
 PUMPING SYSTEM**



“Return-Air” System in the Great Western Mine of the Crystal Falls Mining Co., Crystal Falls, Mich.

The “Return-Air” System is simple in construction and installation, wholly automatic in operation. It pumps any fluid—clear, muddy, gritty or acid water, acids, solutions, sand or marl—and in all service it shows the highest operating economy. No other system is so easily managed or maintains such a high efficiency indefinitely.

The Most Economical Method of Pumping by Compressed Air.

It utilizes instead of wastes the expansive power of the compressed air. This unique and exclusive feature gives it a *higher economy than any other pneumatic pumping system.*



Pumping Sand with the “Return-Air” System in the Quarry of the United States Silica Co., Ottawa, Ill. This illustration shows the tank end of the system which is usually submerged when pumping liquids.

“ELECTRIC-AIR” ROCK DRILLS

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Amalgamating Machinery.	Cupelling Furnaces.	Ore Dryers.
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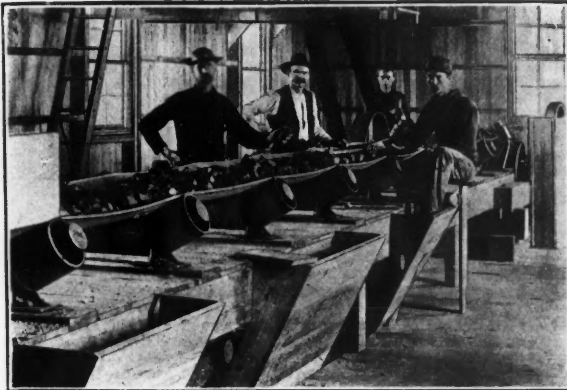
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CALL OR WRITE US

OUR SERVICES ARE AT YOUR COMMAND

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Robins Picking Belt Conveyor handling ore.

The construction of  
**ROBINS SORTING  
BELT CONVEYORS**

is such that the material carried lies on the belt in a thin, wide-layer, thus rendering picking an easy matter. By the

**Robins System**

the speed of sorting is increased and the labor required is greatly reduced.

*Write for Bulletin.*



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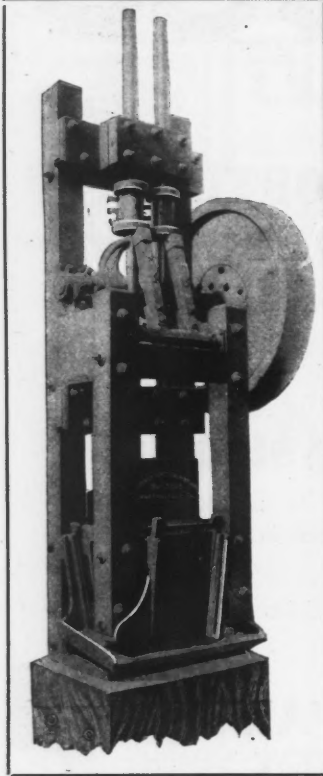
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Atlas Engines and Boilers, Blaisdell Air Compressors, Jeffrey "Badger" Rock Drills, Shaw Eclipse Air Hammer Rock Drills and Drill Sharpeners, Chalmers & Williams General Mill and Mining Machinery, Stamp Mills, Frue Vanners, Ore Feeders, Kilbourne & Jacobs Ore Cars, Skips and Cages, Electric Hoists, Steam Hoists, Air Drill Hose and Couplings.

We also have Small Power Hammers, Pneumatic Tools, Forged Pipe Flanges, Manhole Flanges, Manhole Crabs, Boiler Hangers and Lugs. The Largest Sample Room of Machinery on the Pacific Coast. SEND FOR CATALOGS

**SAN FRANCISCO**  
503 MONADNOCK BLDG. WAREHOUSES 22 ND & INDIANA STS.



**HAVE YOU REALIZED  
THAT**



the crushing capacity of all stamp mills is measurably governed by the character of the ores, and as it is generally a fact that the ores usually encountered in the early stages of opening and developing gold-bearing quartz mines are easily disintegrated by the stamping process, it naturally follows that the combination of heavy stamps with a quick drop and a large area of screen discharge should assure a maximum crushing capacity.

With its large screen area, a drop of 110 times per minute to each stamp, it will at once be conceded that the maximum crushing capacity has been attained, having no intermediate stamps to interfere with the alternating drop, the ore is more evenly distributed upon the dies, which feature also permits a more even flow of pulp. The ore thus being reduced to a uniform fineness without sliming, it passes through the screens, that are inclined outward, preventing the openings from being clogged. Further crushing is a detriment, as it only has a tendency to flour the quicksilver or slime the ore, making the work of saving the values on concentrators more difficult; we contend that the combination of these mills insuring the ore being crushed to a uniform fineness, is a great consideration where concentrators are used, as it undoubtedly assists them to do more effective work.

This mill is particularly designed for prospecting, development or permanent work, and serves well the purpose for which it is intended, embracing in its design all the best features of mills now on the market; and other valuable features that are entirely new. For low-grade ores, where great output is necessary, these mills have proved to be the most economical and satisfactory.

The Hendy Triple Discharge Two-Stamp Mill is simple, strong and substantial. Its first cost is cheaper. It costs less to erect, being self-contained, and complete within itself; no skilled labor is required in its erection. It requires less power to drive per ton of ore crushed. It will neither slime the ore nor flour the quicksilver. It will discharge its pulp in a uniform size. It is distinctly intended for economically milling ores extracted in prospecting and developing gold-bearing quartz mines. It is an up-to-date mill.

**Joshua Hendy Iron Works** SOLE MANUFACTURERS **San Francisco, Cal.**

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**ELECTRIC and  
COMPRESSED AIR.**



Compressed Air.

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Interest You—Write for Copy.

**COAL AND ROCK DRILLS, COAL  
HANDLING MACHINERY, COAL CRUSHING,  
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**ORE SMELTING  
EQUIPMENTS**

**ORE MILLING  
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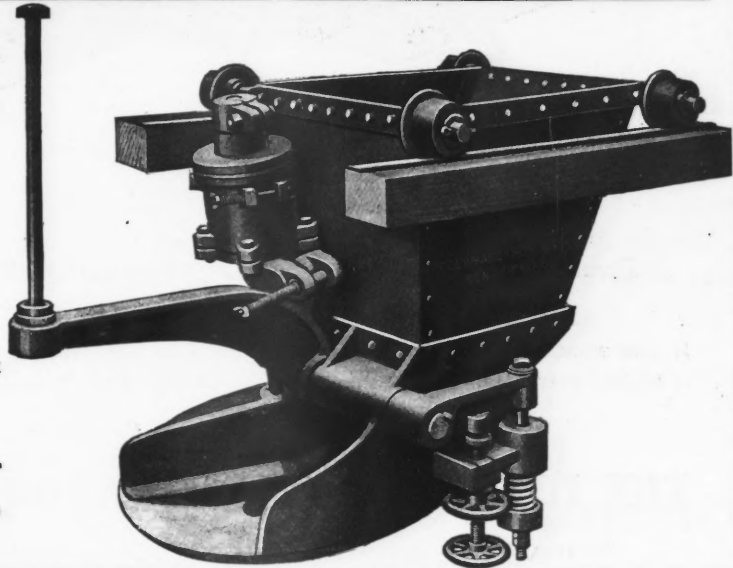
**DENVER, COLORADO, U. S. A.**

## Perfect Improved Challenge Ore Feeder.

**Improvements Effecting  
Greater Simplicity,  
Greater Durability,  
With Fewer Wearing Parts,  
Reducing the Weight,  
Reducing the Price,  
Gears are Dispensed With.**

**This Feeder is so automatic in its work  
as to require very little attention.**

Send for Pamphlet describing this  
new type of Challenge Feeder.

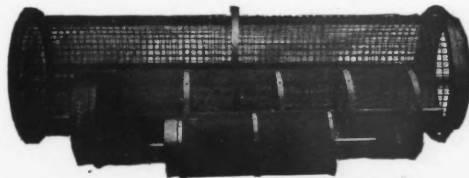


**COLORADO IRON WORKS CO.,  
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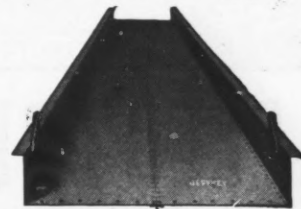
## ARE YOU INTERESTED IN COAL SCREENS AND CHUTES? Note the Jeffrey Types.



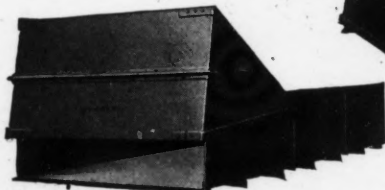
Standard Bar Screen.



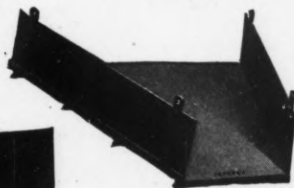
Revolving Screens Made in Any Size.



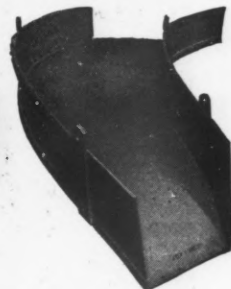
Substantial Coal Chute.



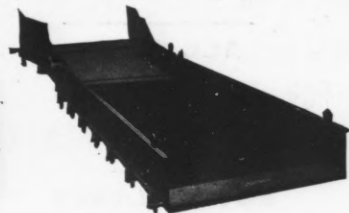
End Cut-Off.



Angle Chute.



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## THE DEISTER CONCENTRATOR



*Equal Capacity to the Largest Tables. 1-5 (actual) H. P. Required for a Speed of 320 R. P. M.  
Weight, 1,000 lbs. Floor Space, 8 ft. x 8 ft.*

If you want to make MORE MONEY from your Ore Milling, you need the DEISTER CONCENTRATOR. A higher extraction and cleaner concentrate with the "Deister." May we hear from you on the subject?

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**THE DEISTER CONCENTRATOR CO., Fort Wayne, Ind., U.S.A.**

Deister Miners Supply Co., Fort Wayne, Ind., Distributors for the Republic of Mexico.

THE PIONEER MINING MACHINERY HOUSE OF THE WEST.

**THE HENDRIE & BOLTHOFF MFG. AND SUPPLY CO.**

DENVER, COLO.

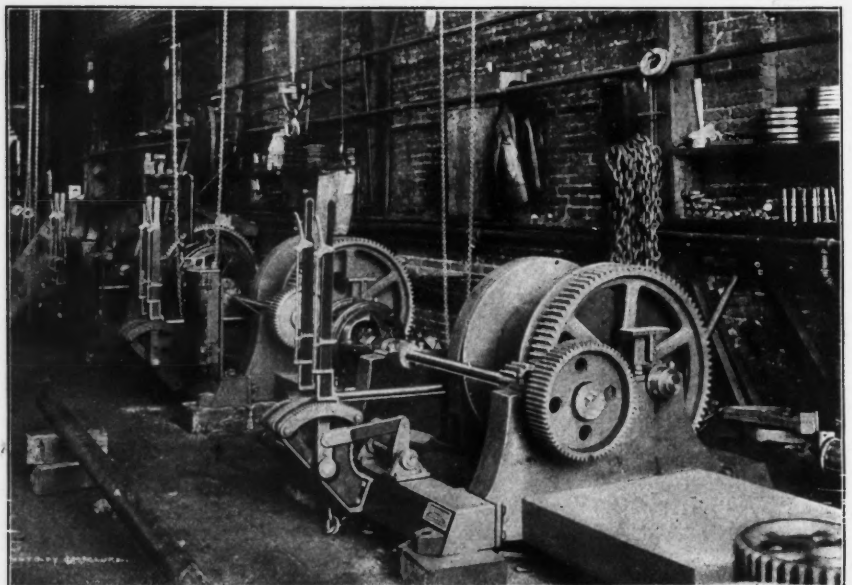
STEAM ELECTRICAL AND HYDRAULIC ENGINEERING — MINE AND SMELTER SUPPLIES.

## ELECTRIC HOISTS

**ALL SIZES  
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**A SPECIALTY IN WHICH  
WE EXCEL**



THREE HOISTS ON ERECTING FLOOR.

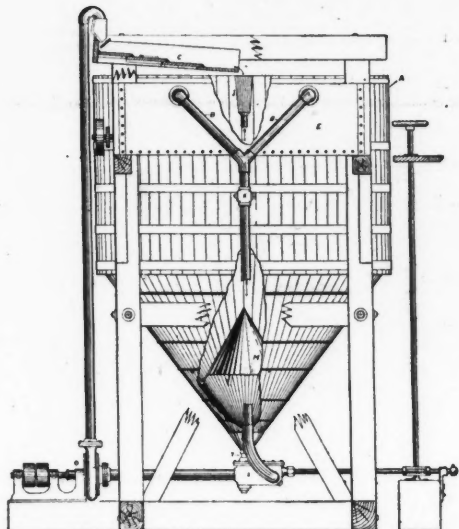
**H. & B. HOISTS Are In Use In All Parts Of The World**

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## Agitation and Electrical Precipitation



The Garvin method requires less power, cyanide, water, labor and space in the handling of a given amount of ore than any other. The entire treatment is practically automatic and continuous.

Values are recovered from average cyaniding ores in six to ten hours, when ground to required mesh and treated in the Garvin machines.

We are prepared to treat from 100 lbs. to five tons of ore at our testing works and make determination for you on percentage of recovery, time, cyanide and power required.

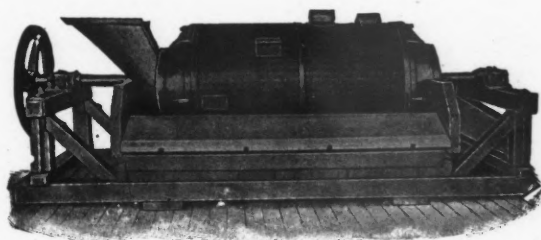
Patents granted in U. S., Canada and Mexico and pending in other countries.

Full Description mailed on application.

## Garvin Cyanide Extraction Company,

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## *New Century Disintegrating Screen*



A revolving Grizzly, a revolving Screen, an Elevator and a Crusher Feeder, all in one. Washes Boulders of Rock, Ore, Baryta, etc., free from mud or stiff clay; acts as a log washer. Fed directly from cars or tubs and automatically discharges the washed boulders to the crusher, and elevates the fine material out of the tank. Made very heavy and durable. Write for information and prices.

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COAL WASHING  
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**AMERICAN CONCENTRATOR CO.**  
**NEW CENTURY**  
JOPLIN, MO., U.S.A.

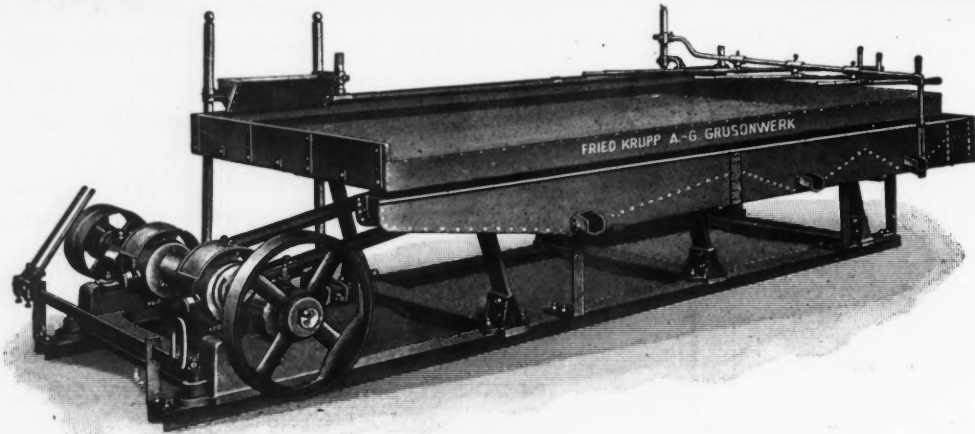
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ORE FEEDERS  
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Particularly Adapted for Concentrating Coarse and Fine Sands as well as Slimes

\* This Table has Given the Most Satisfactory Results \*

More than 300 Tables Have Been Sold in 3 Years



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CRUSH TO  $\frac{1}{2}$  INCH.

**BECAUSE**

the jaws do not open and shut at the bottom, but remain the same distance apart.

**THEREFORE**

if the jaws are set  $\frac{1}{2}$ -inch apart, all of their output must be crushed to this fineness before it can get through.

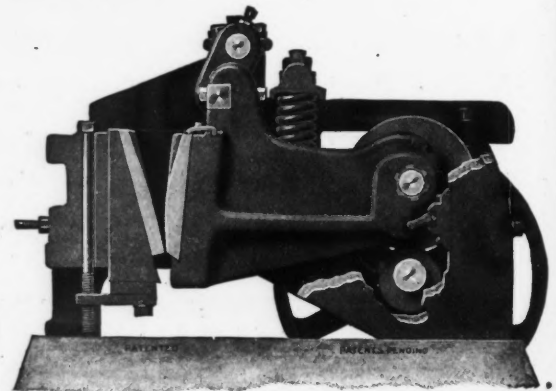


**THEY DO NOT CLOG**

Because the jaw has a long Rolling motion, passing over the ore caught between the jaws and dropping it out afterwards.

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STURTEVANT MILL CO., 110 Clayton St., Boston, Mass.



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Do you use Hollow Rock Drill Steel?

Do you use International Rolled Hollow Rock Drill Steel?

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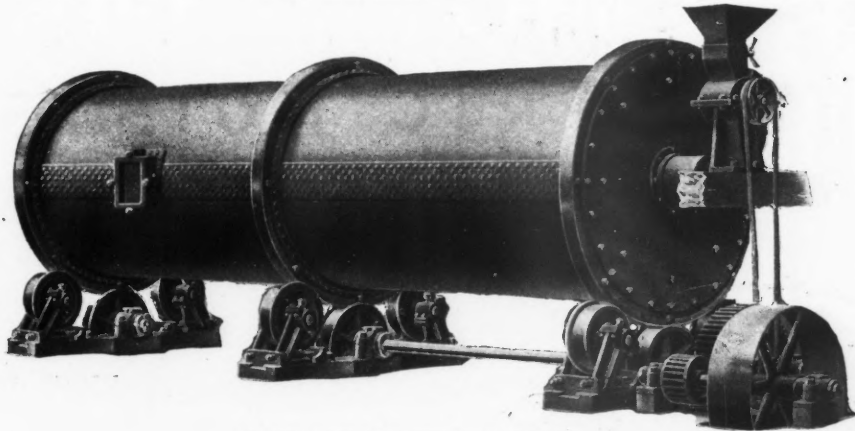
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Largest Tube Mill ever built in the world.

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Because they are so constructed that they  
Save **30%** in horse power over any other.  
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But don't you believe it. There's a heap of difference between the Danville Hoist and any other make.

As much difference as between a perfect diamond and a diamond with a flaw in it.

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One of them lifted 2,530 tons of coal in eight hours; that's 5.27 tons a minute.

They have thirty years of experience behind them. And you can't buy a better hoist than Danville.

Just clip out this ad and write "Prove it."

Just a word or two about Danville Engines.

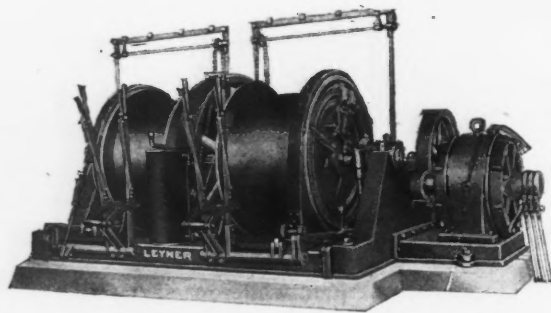
They are built right in our own shop.

There is no scrimping of weight, no hasty assembling of parts. They are a modern engine with modern improvements, and honestly made throughout.

DANVILLE FOUNDRY & MACHINE COMPANY,  
DANVILLE, ILL., U. S. A.

## HOISTING ENGINES

We have received an order for  
THE LARGEST NUMBER OF  
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We believe the above to be true. It consisted of seventeen (17) hoists ranging from 15 H. P. to 75 H. P. and

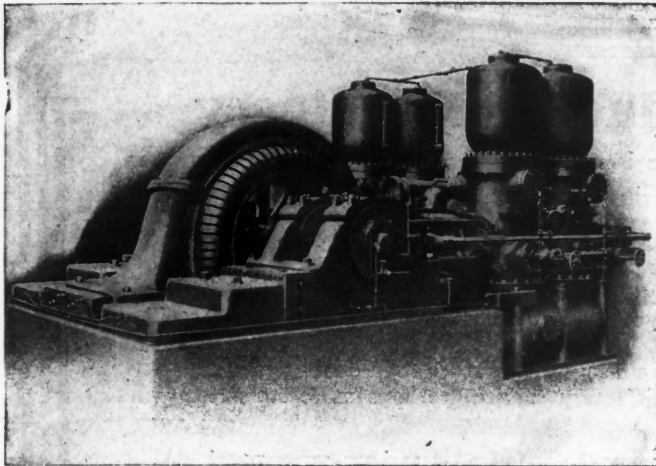
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FOR TWELVE

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## Motor Quality Tells

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We make all kinds of motors  
for all kinds of work.

Westinghouse 800 H.P. Induction Motor Driving Blake Mfg. Co.'s Duplex Electric Express Pump for Mining Service. Capacity: 1600 Gallons at 195 R. P. M. against a head of 1550 ft.

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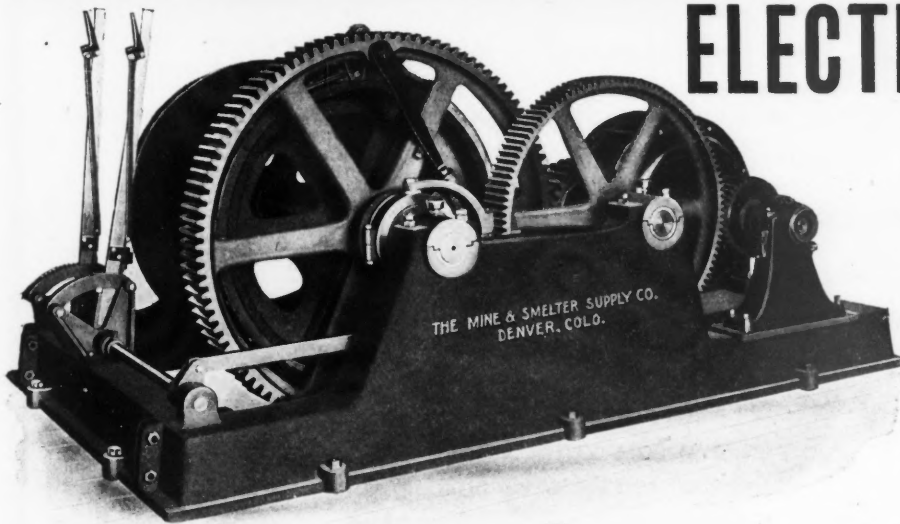
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### PROMPT SHIPMENT:

H.P.		LOAD—LBS.	SPEED
11	Single Drum	- 1500	240
15	" "	- 1800	270
20	" "	- 2000	300
25	" and Dbl. Drum	2500	300
40	" " " "	2500	350
75	" " " "	4100	500

These sizes, with 440-volt, 60-cycle, 3-phase motors, are available for shipment in 7 to 15 days. Load and hoisting speed may be changed to suit requirements.

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For upwards of half a century we have been identified with the mining industry as designers and manufacturers of the mechanical equipment for Mining, Milling, Smelting and Handling ores.

Our products have acquired a world-wide reputation for efficiency and durability and our aim has always been to serve our customers promptly and accurately.

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The strain on the bearings of a gyrotory crusher is so great that if dust reaches them, or if imperfectly lubricated, they are certain to be quickly destroyed and the machine laid up for repairs. The bearings of the "Austin" are enclosed in a double chamber—absolutely dust proof—and are lubricated by a constant circulation of live oil forced through the main eccentric bearing—which is the life of the machine—by an automatic pump operated directly by the gyrotory movement of the main shaft. The lubrication must be perfect because the flow of oil is constant and positive.

In all other gyrotory crushers there is only the discharge diaphragm to separate the dust from the bearings and gears and a side door opens directly into the chamber containing the bearings. Dust gets into this receptacle readily and destroys the gears.

In all other gyrotory crushers the oiling is done by hand. The machine must be stopped or the door opened when in operation to oil the bearings, exposing them directly to dust, and one can never tell whether the machine is perfectly lubricated without opening the door. Careless or negligent employees sometimes forget and the bearings are rapidly destroyed or the machine must be stopped to cool.

Immediately below the crushing head in the "Austin" is placed the discharge diaphragm with dust collar the same as in any other gyrotory crusher. Below this partition is another diaphragm also provided with dust collar around the shaft and a dust cap covering the pinion, contained in no other crusher, enclosing the bearings in a double dust proof chamber and making it simply impossible for dust to reach the bearings.

At the bottom of the frame in the "Austin" is an oil cellar which is filled with oil to the level of the center of teeth in the main gear.

An automatic pump draws up pure oil from this cellar, forces it through the eccentric and counter shaft bearings and any oil thrown fr in the teeth of the driving gear is caught by the cap and carried back to the cellar.

At the bottom of the cellar is a drain by means of which the impure oil can be removed, insuring absolutely perfect lubrication, because every part of the bearings operate continuously in a bath of pure oil.

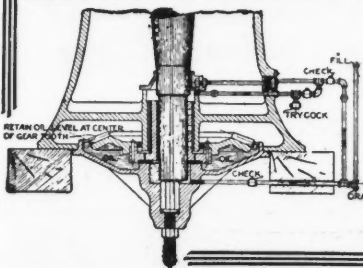
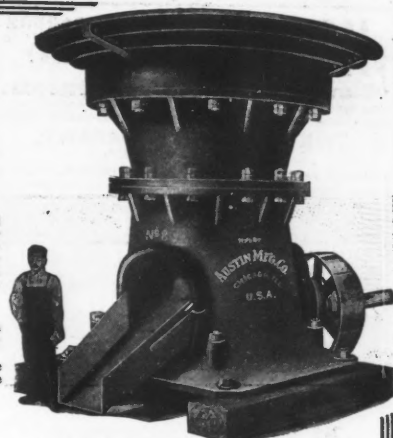
One never has to expose the bearings of the "Austin" to dust when in operation. There is no anxiety about the bearings becoming heated and the entire plant laid up for repairs. Fill the oil cellar to the required height and the machine runs oil itself, since no oil can escape from the oil cellar, and therefore maintains a constant level.

The "Austin" lasts longer than any other gyrotory crusher because of this superior mechanical construction.

Sizes for all requirements.

We are the world's largest builders of rock and earth handling machinery.

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Patented November 14, 1899.

Awarded Gold Medals Centennial Exposition, Portland, 1905.  
Universal Exposition, St. Louis, 1904.

### Produce Homogeneous Cupels

having great power of absorption.

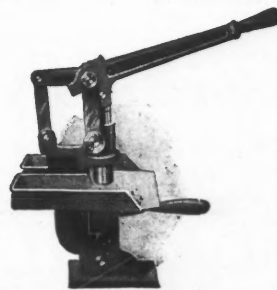
PERFECT FACES, UNBROKEN EDGES,  
WILL NOT CRACK OR FISSURE.

Send for our Blue Book of Modern Assayers' Appliances.

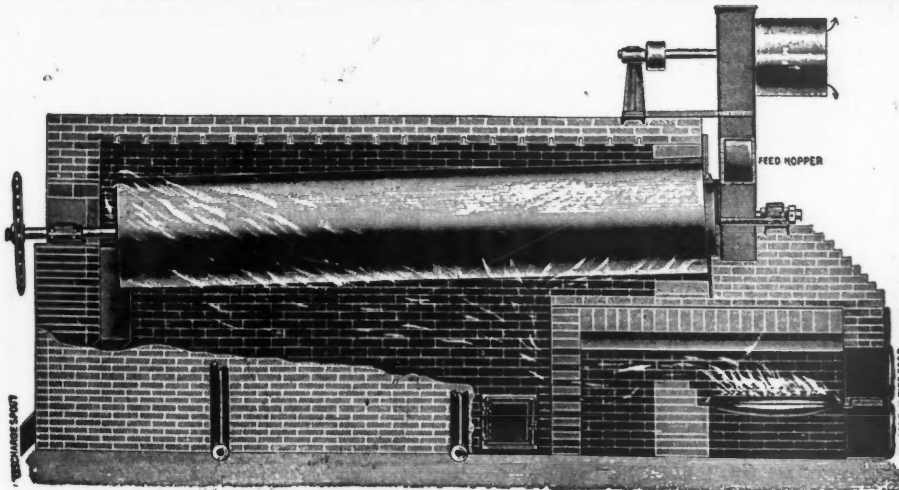
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Automatic Pattern.  
Capacity 600 Cupels an Hour.



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For drying ore products, gypsum, coal, etc., etc. We make the largest variety in the world. Direct heat and steam.

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**HOSKINS** HYDRO-CARBON  
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**Blow Pipes and Assay Furnaces.**  
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FOR THE  
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**SOUTHERN**  
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Particulars on Application  
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**Patent Improved**  
**Double Log-Ore Washer.**

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The McLanahan Patent Improved Double Log-Ore Washer is simple in construction, durable and works successfully on all grades of material. Let's talk it over.

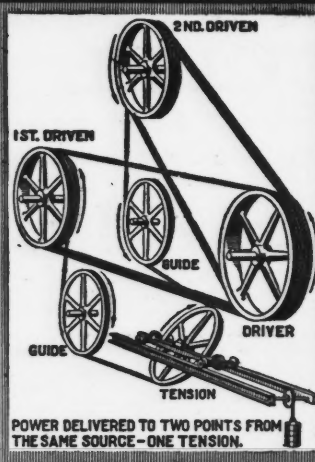
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Makes best pulp for Cyaniding.  
100 Tons per day.  
Uses less than 25 H.P.  
Minimum Repairs.

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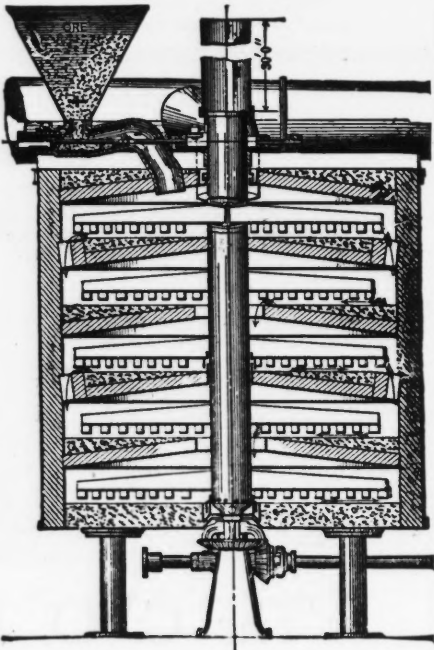
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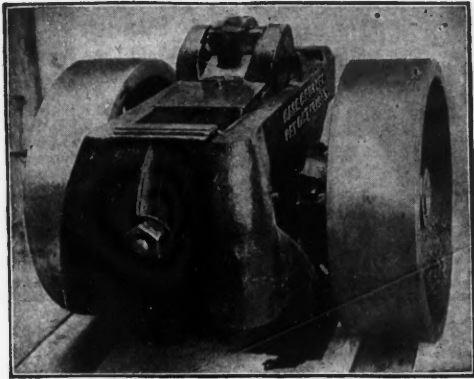
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PATENTED.

Large size. Power Only. Jaws 4½" by 3".  
Capacity 250-300 lbs. per hour. Easily  
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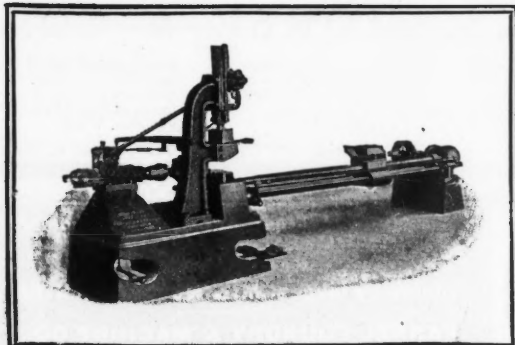
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## Improved Drill Maker and Sharpener.

This machine forges new drills from the  
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Copies of this poster will be sent free to all users of valves who will write us for them, mentioning this paper.

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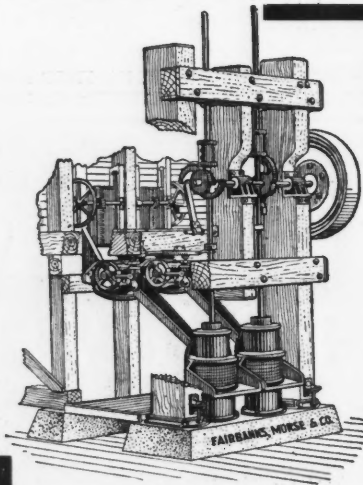
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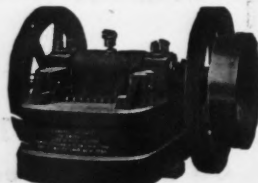
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FARREL

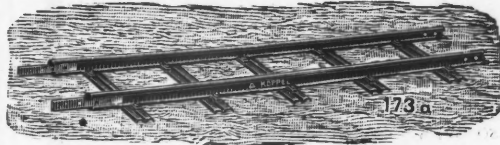
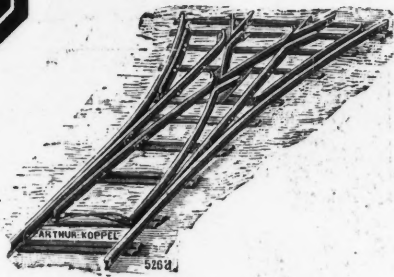
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In use by largest MINING COMPANIES

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**EARLE C. BACON, Engineer**  
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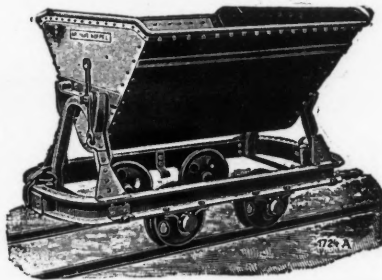
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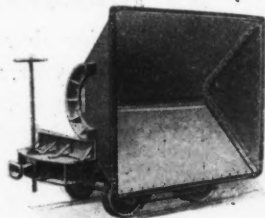
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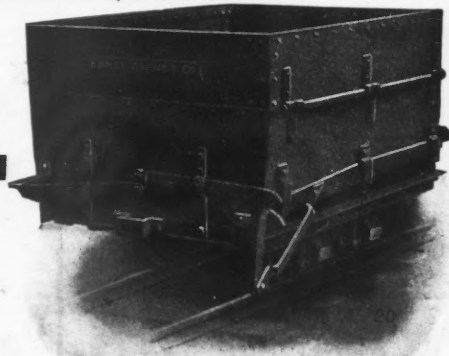


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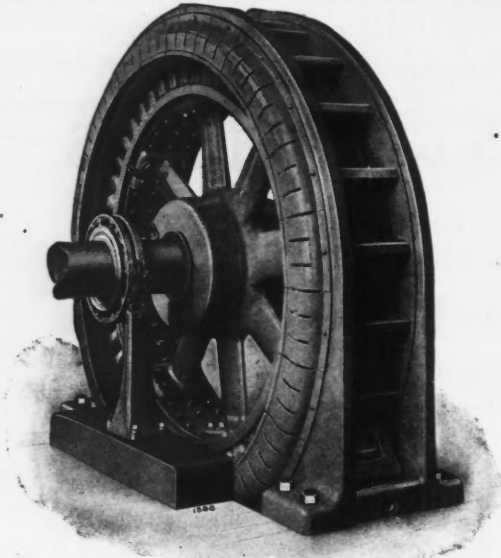
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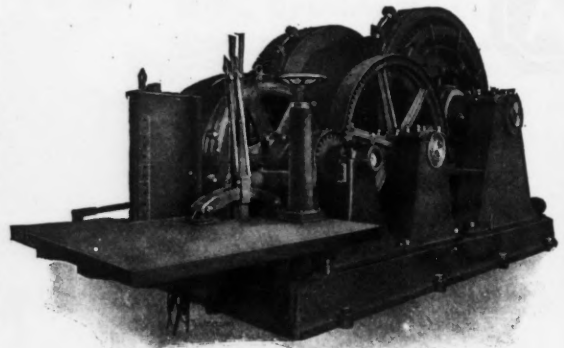
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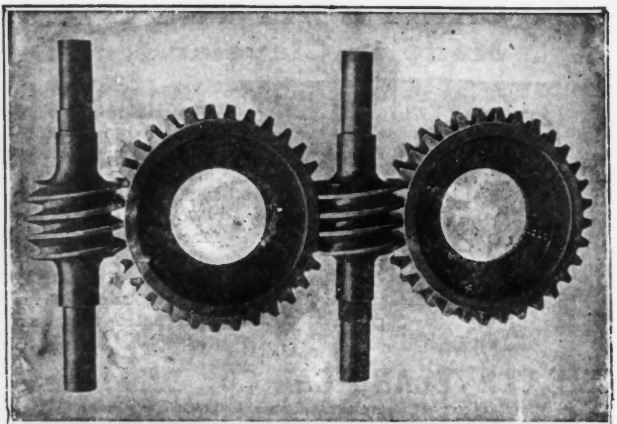
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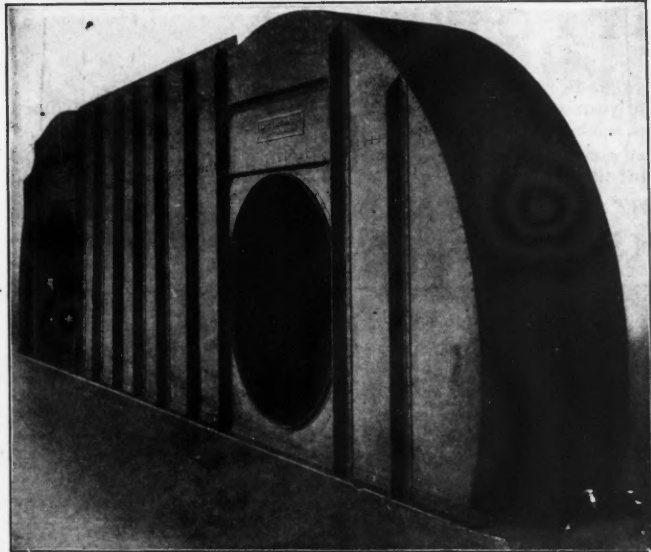
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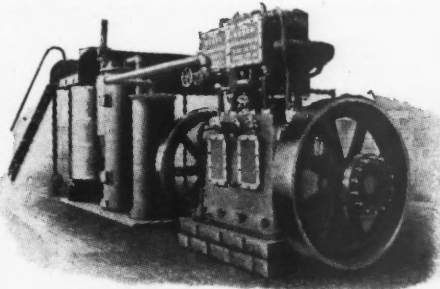
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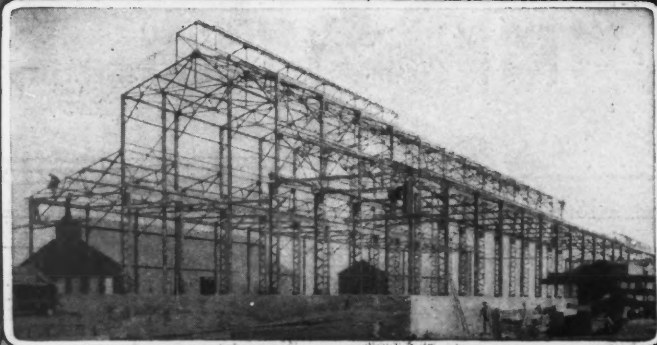
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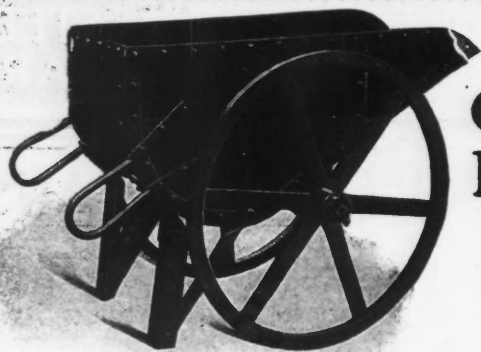
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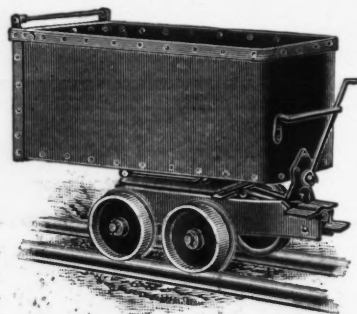


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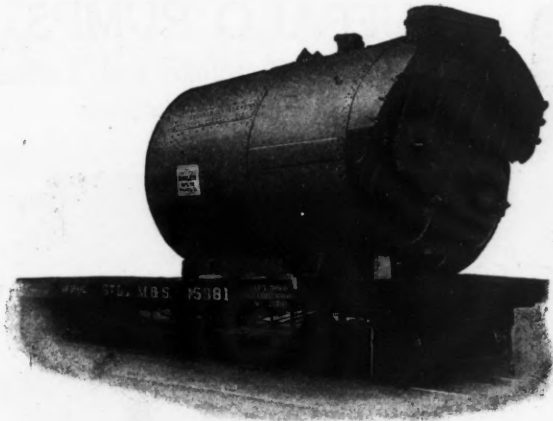
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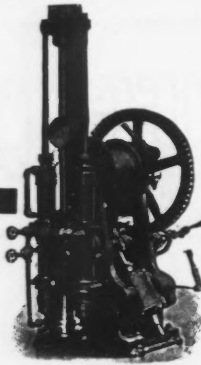
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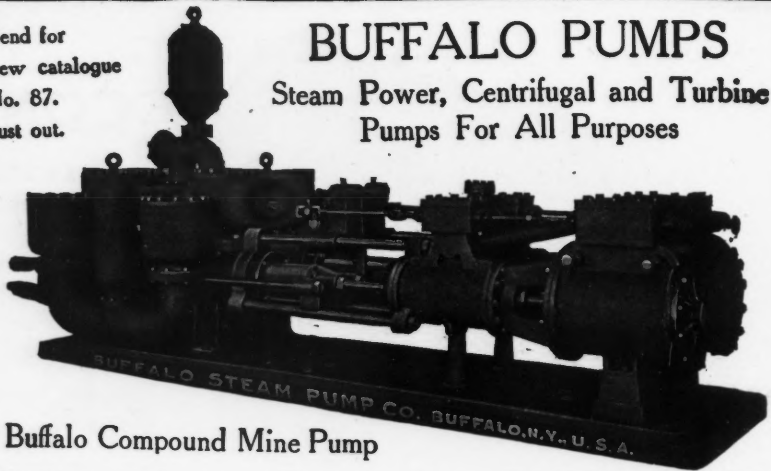


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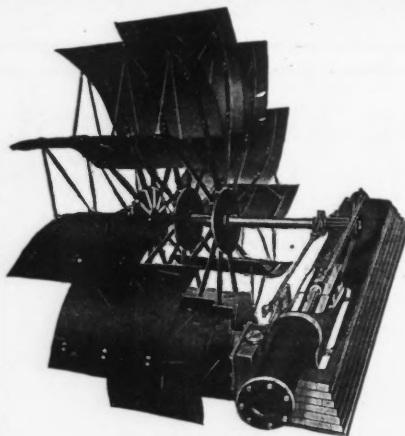
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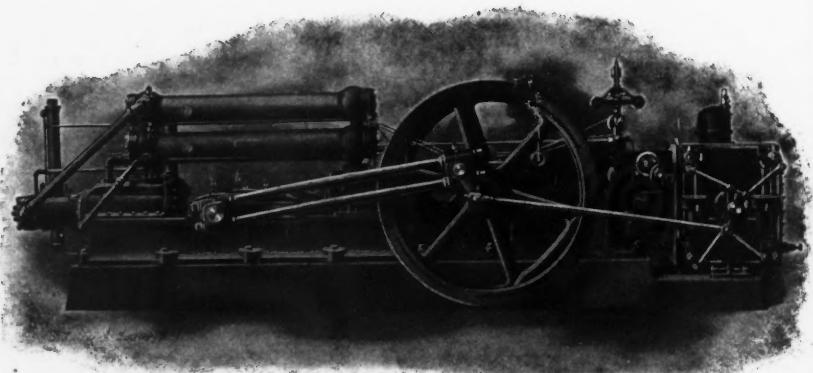
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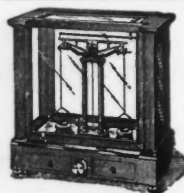
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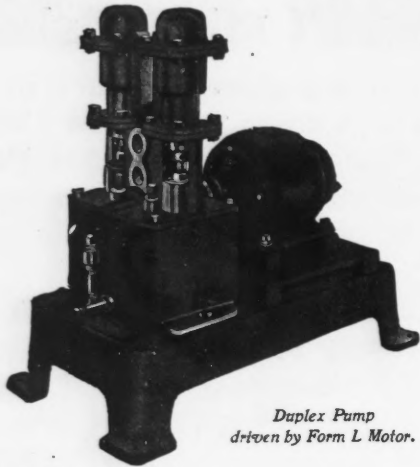
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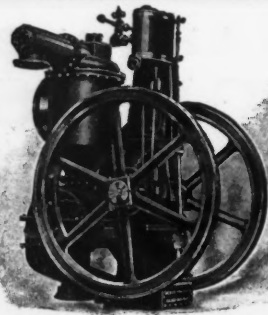


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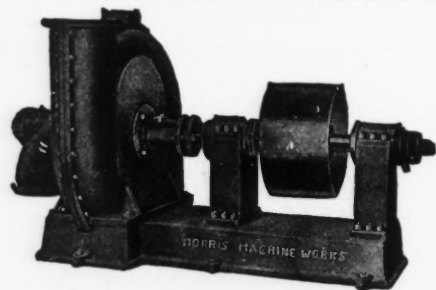
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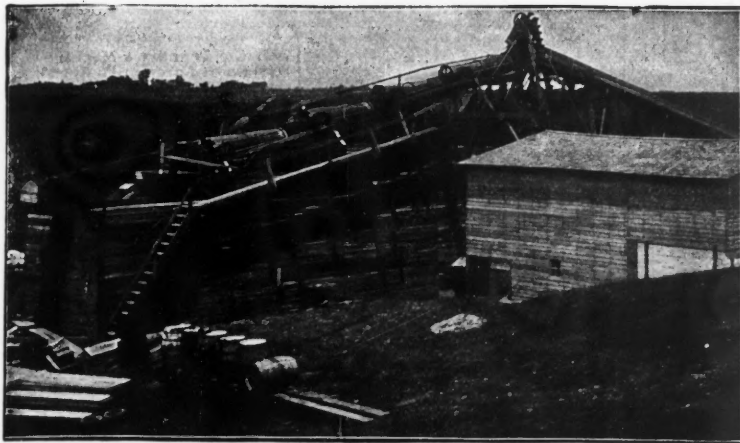
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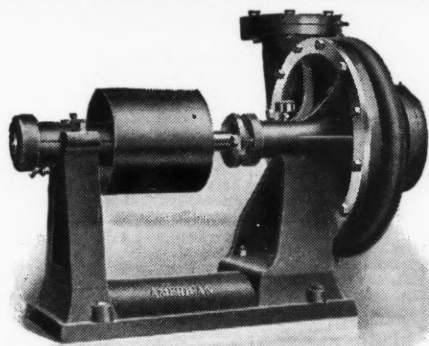
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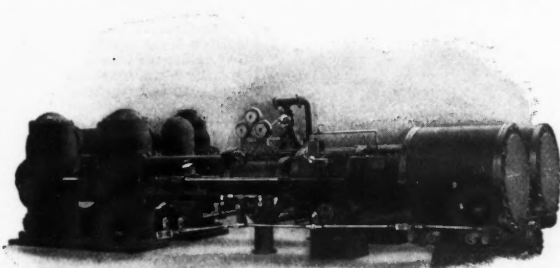
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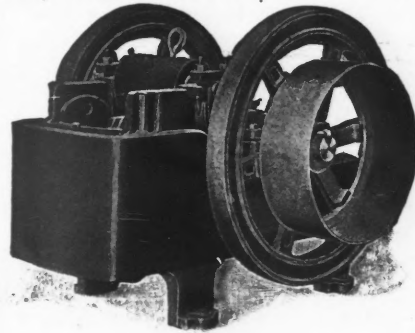
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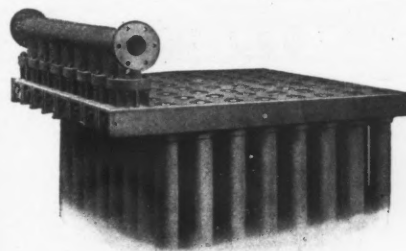
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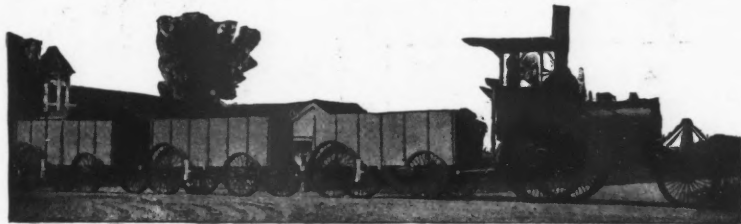
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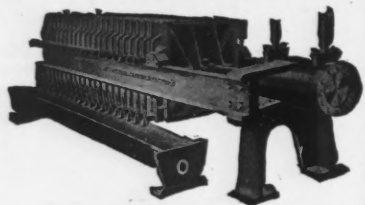
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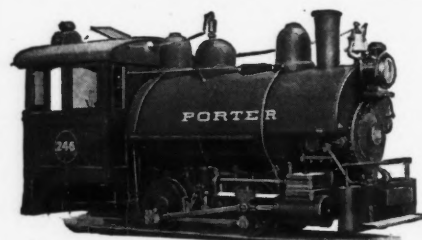
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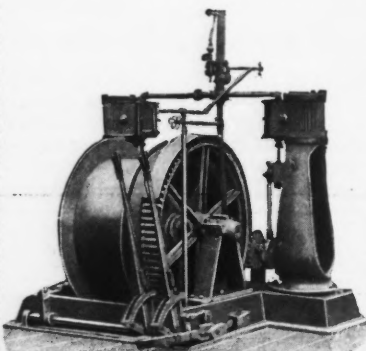


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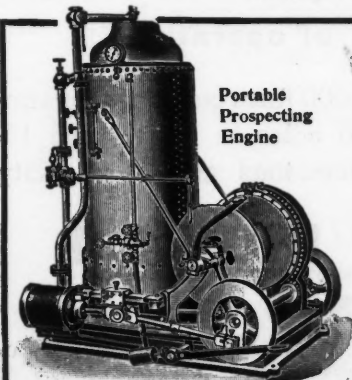
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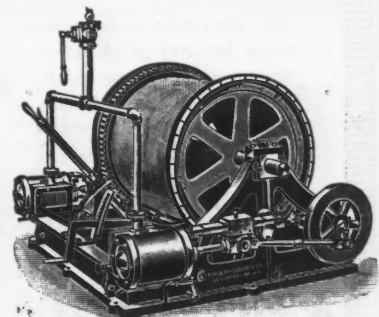
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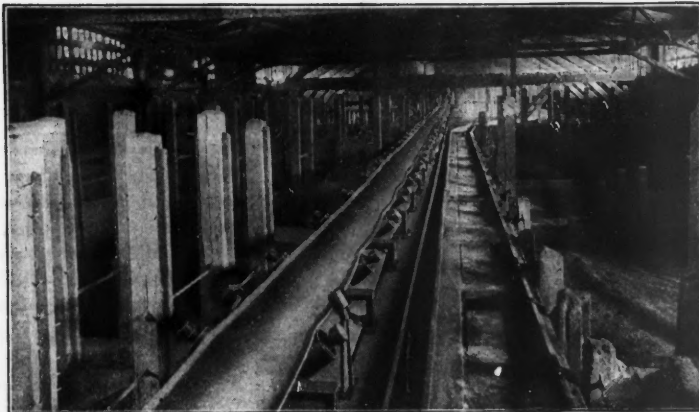
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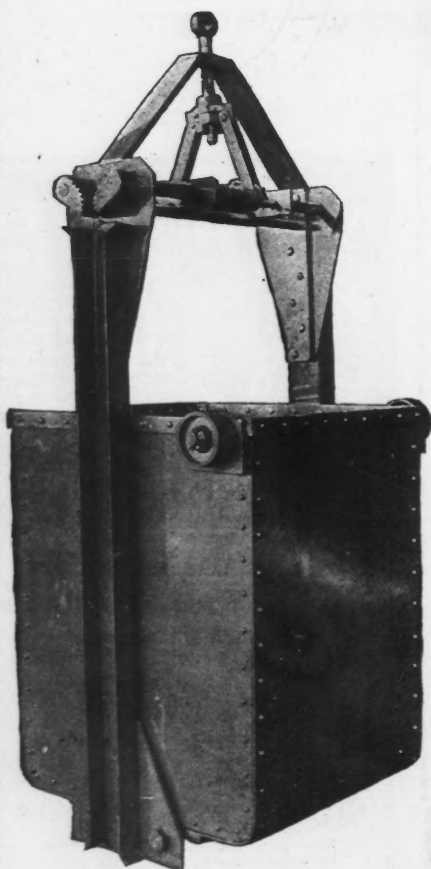
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## THE Emerson Steam Pump BEST IN THE WORLD



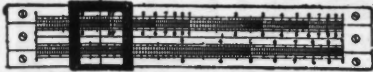
for all operations where reliability is essential. They have no packing glands, stuffing boxes, rubbing surfaces, exhaust pipe, rocker arms, pulleys, belts, fly wheels, priming pipes; no adjustments, make no noise. We cut out all the troublesome parts that are necessary adjuncts to other pumps. It has more points of merit and less of demerit than any other. They will handle gritty material without damage to themselves that would destroy other pumps in short order. There is nothing made so reliable, nothing so simple or that will stand rough usage or exposure to all kinds of weather or that requires so little attention or so few repairs. Our catalog explains it in detail. Ask about our Quick Cleaning Strainers and Foot Valves. They are great, too.

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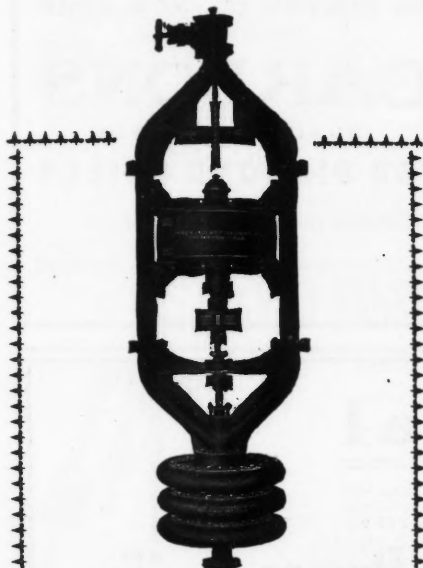
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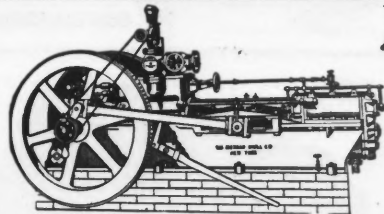
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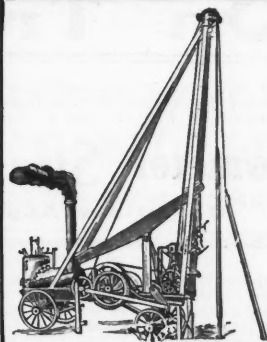
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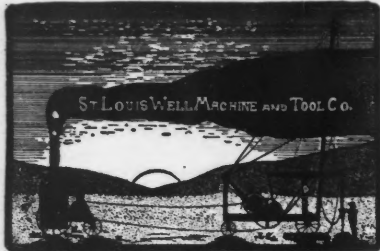
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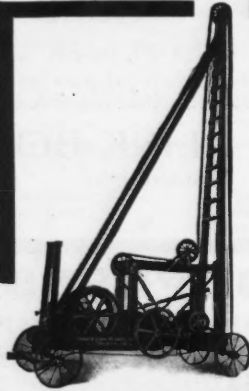
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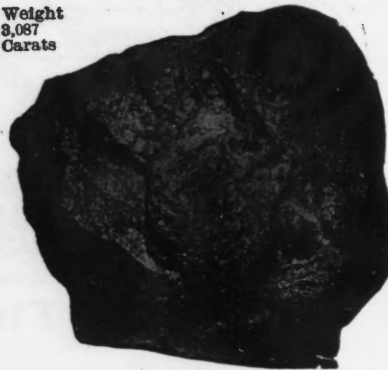
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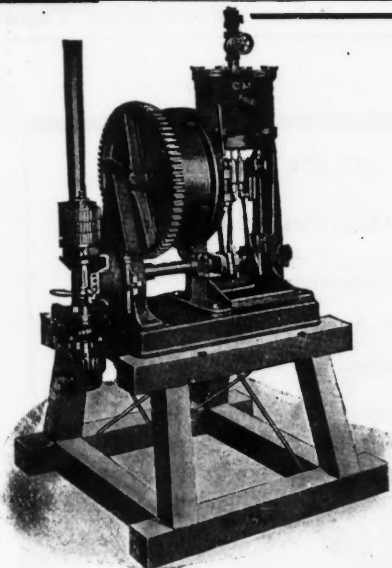


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## DIAMOND DRILLS

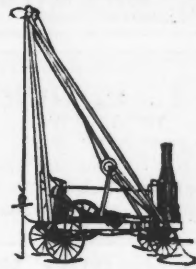
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Convenient, Strong  
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Murphy Drill with handle.

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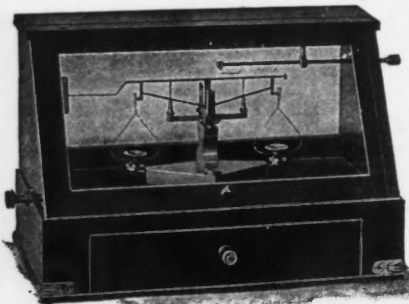


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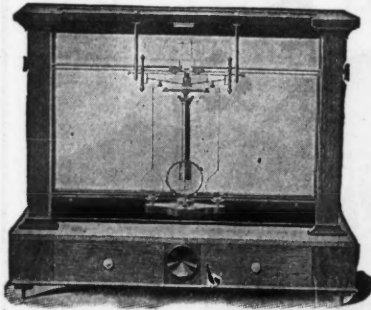
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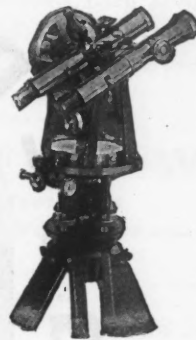
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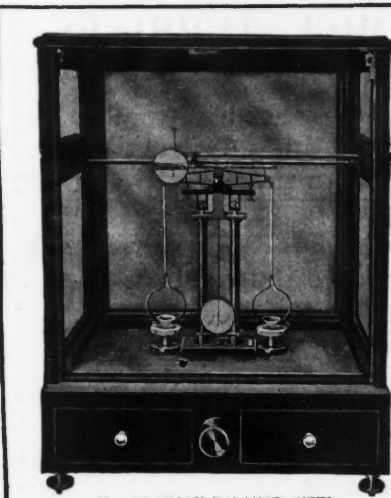
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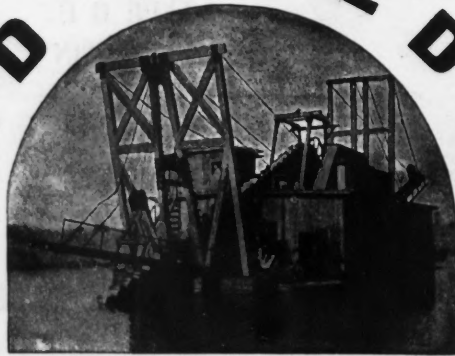
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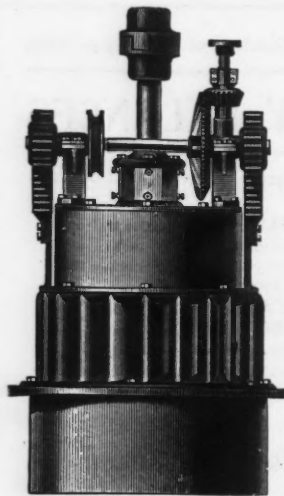
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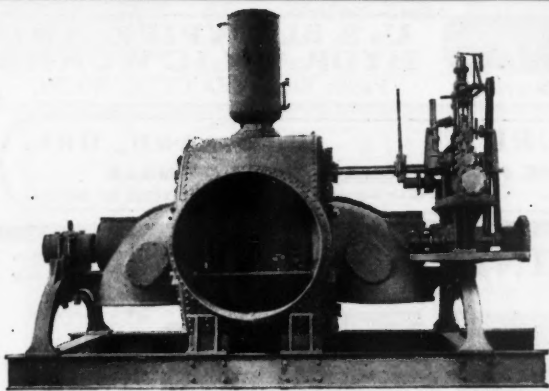


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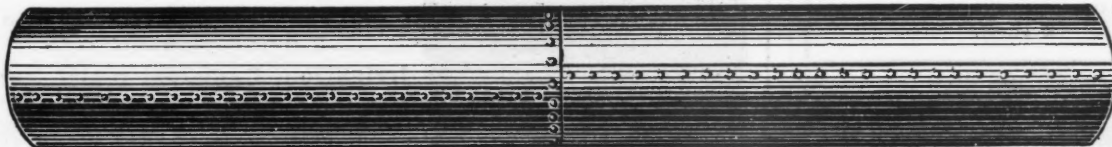
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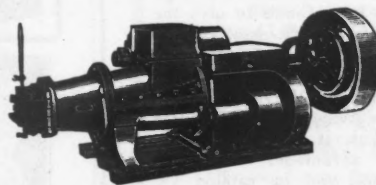


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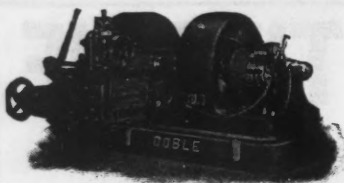
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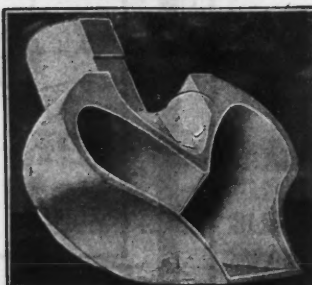
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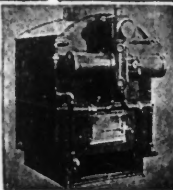
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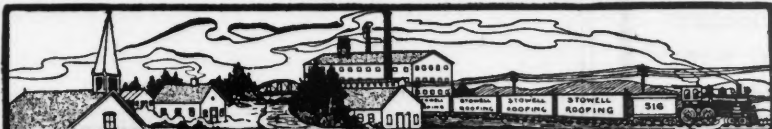
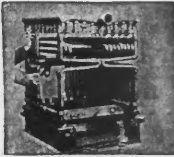
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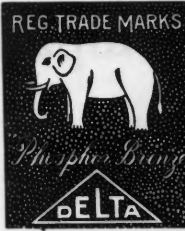
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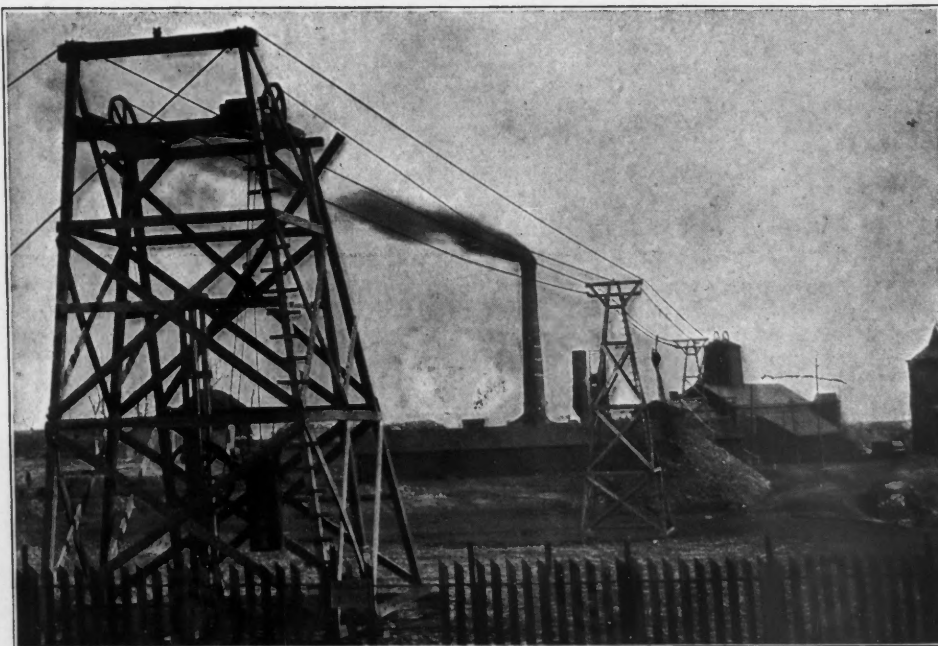
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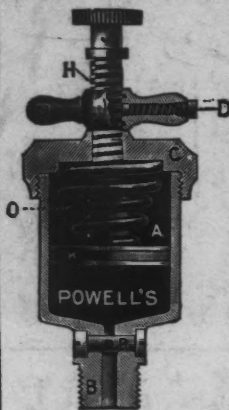
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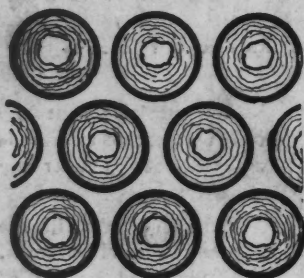
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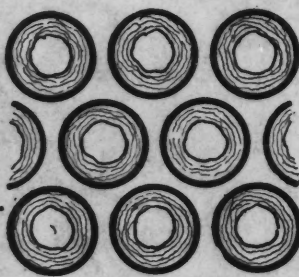
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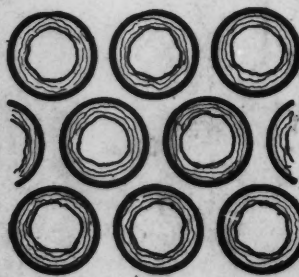
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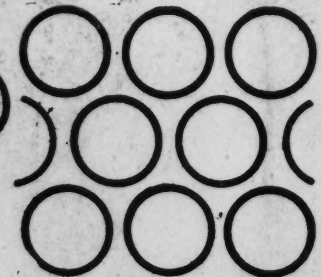
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