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Proano, a Famous Mine of Fresnillo, Mexico

A Remarkable Development of Veins in All Directions and of All Possible Dips, Yielded \$800,000 Annually for 67 Years

BY JOHN A. CHURCH*

In the State of Zacatecas, Mexico, a mile from Fresnillo, there is a low, round hill only 325 ft. high, and 2500x3500 ft. in diameter at the base. It stands nearly alone with wide valleys on all sides, except toward the east, where the country is rolling. This is called the Cerro de Proaño, the Hill of Proaño, from Manuel Proaño, a Spaniard, who found ore there in 1515. It is the seat of remarkable

but they did not prove to be rich enough to be worth working. At least, that is the lesson to be read from the frequent attempts of the old miners to make mines in them both by surface and underground work, but always with rather speedy abandonment.

EARLY HISTORY

How much mining Proaño and his suc-

Zacatecana Mejicana, which worked them until 1872, a period covering the introduction of steam power for pumping and moving the arrastras. The "crime of '72" brought that enterprise to an end, and the mines were located by Señor Órtego. The Compañía Restauradora de Fresnillo began work in 1879, which was continued later by the Compañía de Fresnillo. Both of these concerns treated surface ore and



SCHOOL OF MINES, PROANO

crushing and shearing forces with subsequent mineralization by waters which carried silver with some gold, but appear to have been weak in silica. There is nothing unusual in the situation except that, if we may trust the Mexican miners, this mineralization was confined mainly to the limits of the little hill, and did not extend beyond it except on the west side, and apparently not far there. There are veins in the ground east of the hill in abundance,

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cessors of the very early days did not know, but certain very irregular and narrow openings that are seen at many points are supposed to be their work. Mining is reported in 1715 and vigorous mining in 1751, but the records of production available do not go back further than 1832, when the State of Zacatecas took possession of the mines on the mistaken theory that their product would be a relief to taxpayers. Revolutionary troubles brought that period to a close in 1835, when the mines were turned over to the Compañía

made so much money that they were encouraged to pump out the deep mines, but soon lost their encouragement, closing down in 1903.

The yield of the mines in this working period of 67 years was very considerable, having been as follows: 1832-35, \$6,454,696.84; 1835-72, \$41,341,850.89; 1879-03, \$4,784,030.51; total, \$52,580,578.24. These figures were ascertained by going laboriously over the old mine books, which are in perfect preservation. From the Mexican point of view these books are elabor-

ate and exact, but they lack the figures of cost, which modern practice finds valuable.

The fact that the mines produced a yearly mean of nearly \$800,000 for the long term of 67 years, points both to great activity and to at least a good grade of ore. It is conjectured that a million and a half tons of *patio* tailings are banked up or scattered by the torrential rains over the valley, and these would give an average value of \$35 a ton. The mines were visited early in the last century by several well known metallurgists, who reported

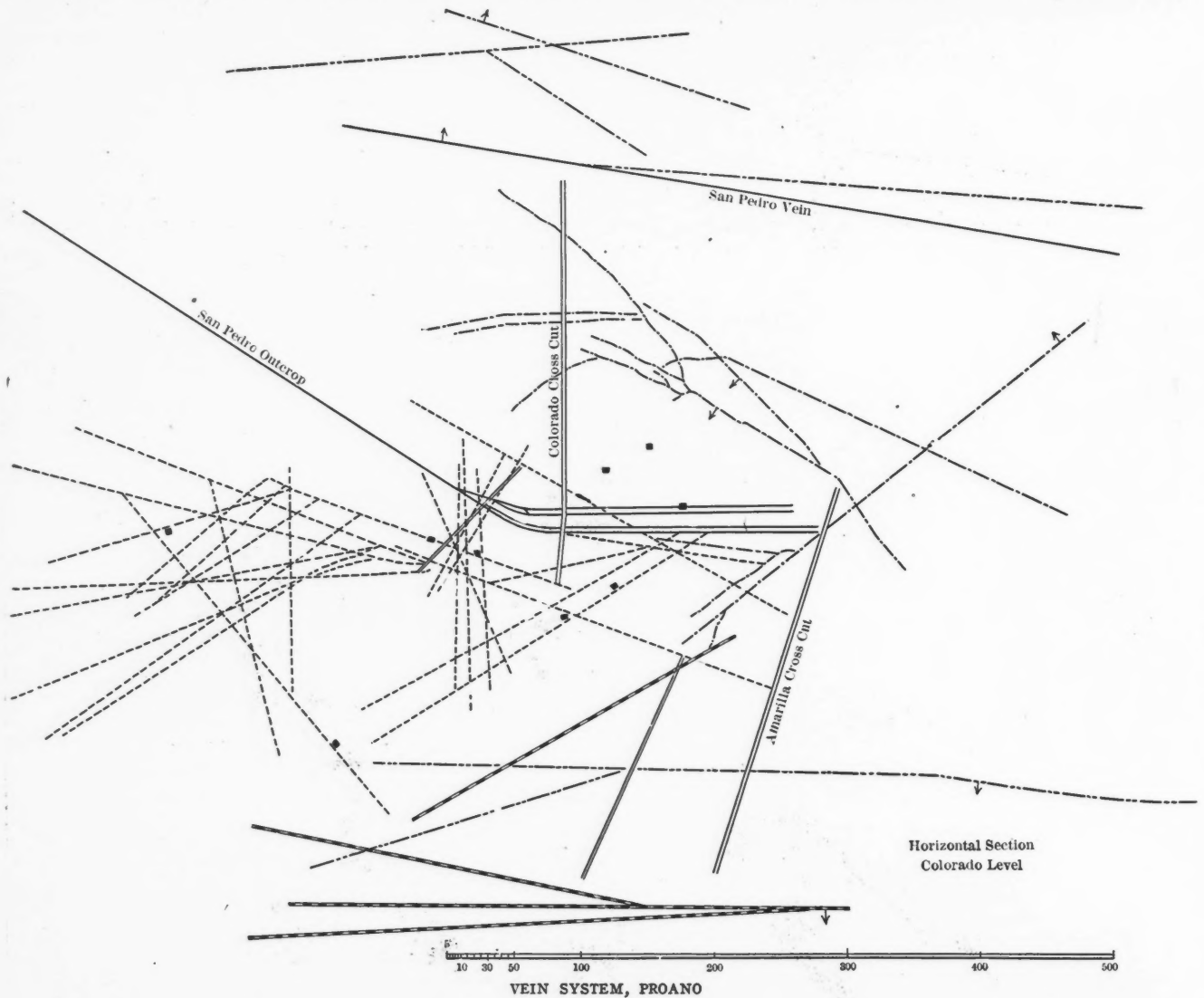
by which in old times it was possible, I presume, to reach every stope and drift in the hill from every other, but these are mostly inaccessible now.

Proaño is notable for two incidental results produced by its wealth. The State built a school of mines there, and young men had the benefit of study in an important field of characteristic Mexican mining. The scale on which this instruction was prepared can be judged by the substantial and graceful building, shown in Fig. 1. It is about 125x150 ft. in size. The other result was the construction of the

must have been about \$300,000 a year. The company paid \$2,437,915.89 in the first 12 years of operation.

GEOLOGY OF THE DISTRICT

The geology of Proaño was studied by Prof. Pascual Arenas, of the National School of Mines in Mexico (City), who says that the hill is composed of "*vacia gris metamorfica*," which is translated "graywacke," and this formation he extends across the valley to the porphyry hills miles away. He gives the following estimate of thicknesses: 1980 m. of gray-



the losses at 25 per cent. In 1840-42 the ore yielded 40.8 oz. per ton, and the loss was 8.75 oz. An assay office was established when the great *hacienda* was built, about 1840, but abandoned for the odd reason that its work did not correspond to that in the large way.

There are two deep shafts, 1200 and 1400 ft., and many that exceed 500 ft. The deep working did not exceed 900 or 1000 ft., but down to that depth it was very extensive. All these deep openings are full of water and though the hill above the water is a veritable honeycomb of irregular openings and connecting passages

largest *patio* in Mexico, and therefore in the world. It is 1150 ft. square, is walled in completely, and has buildings around most of its circuit. It was capable of treating 3500 tons of ore a month, and cost \$340,132.79. It was finished about the time of the war with Texas, and the Government forced loans of \$1,292,713.43 from the company. Coming just while the improvements at the mines were in progress the company found itself \$2,563,675 in debt, but during the next 10 years the output was \$14,951,318. As the costs of mining and treatment were reduced in this *patio* from \$24.28 to \$16.50, the saving

wacke; 290 m. of wavy clay slate; 310 m. of calcareous slate and shale; 1700 m. of metamorphic ("transition") limestone; 590 m. alternations of clay slate, graywacke and limestone; total, 4870 m. This geological column will have to be revised for the "graywacke" that forms the top of the hill is rhyolite, which lies on the slate. The deep shafts are opened at the foot of the hill, and more than half their depth must be in slate. The extension of the rhyolite or "graywacke" over the valley is only supposition for the actual floor of the valley is the recent limestone *caliche*. Prof. Arenas thought the sedimentaries

are Devonian. No fossils are found, but he correlates the Proaño measures with those of Zacatecas.

The rhyolite is a strongly altered aluminous rock, which shows little silica or other inclusions. Analysis of some ore samples gave 70 per cent. insoluble. Burkart says that "in the San Francisco shaft (1400 ft. deep) the dark-colored clay slate alternates with very thin fine grained layers of graywacke which give the rock a banded appearance."

REMARKABLE DEVELOPMENT OF VEINS

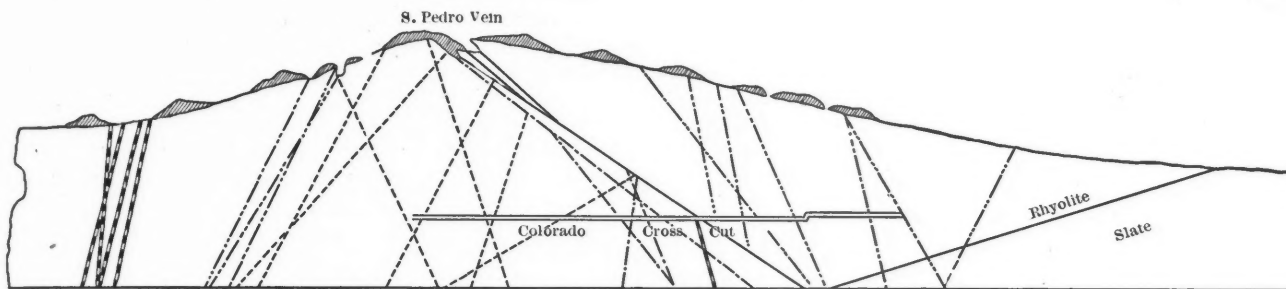
The noticeable characteristic of Proaño is the remarkable development of veins in all directions, and with all possible dips.

both ways, too. The old explanation for this complexity was that veins of similar dip belonged to the same period of formation.

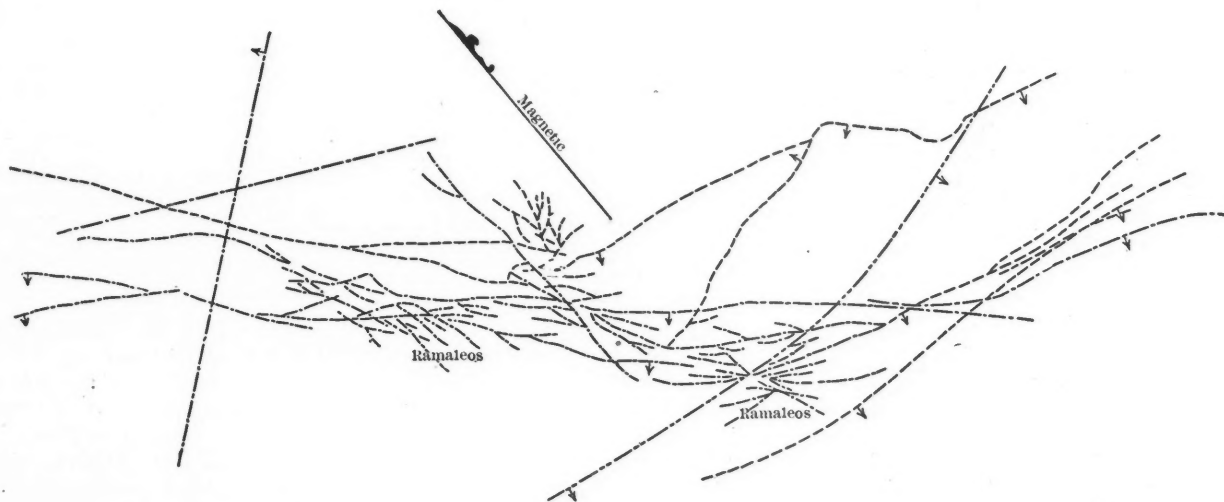
The central and strongest feature of the system is the San Pedro vein, striking N.W., with strong concavity toward the north and dipping north 40-45 deg. This vein cuts across the whole system, and seems to divide the north from the south veins. Probably it is a fault, but Professor Arenas' map does not show veins faulted by it, though it does show veins that stop at the San Pedro. This vein has a well marked hanging, but no foot near the surface. The map fails to indicate the innumerable *ramaléos*, or little irregular

the *ramaléos*, the Veta Principal, Fig. 3, is a good illustration of the conception which Professor Arenas formed of the constitution of these veins. In addition to several veins it shows some bodies of *ramaléos*, and the old records mention some of these as being very rich. I do not believe these are mere fancy sketches. The hill is so honeycombed with openings that Arenas probably had excellent opportunities for observation. He wrote a description of Proaño, which discussed its physical and geological features, and its vein system. We have the two former parts but the third is lost.

I confess I do not know which of the veins he depicts in this "veta principal."



Vertical Section North & South
SECTION, SAN PEDRO VEIN, PROANO



VETA PRINCIPAL, PROANO

Judging from the maps made by Professor Arenas there cannot have been any great movement of blocks upon each other or it would have been impossible to draw the long straight lines by which the geologists expressed their conception of the vein system, and which are justified by the few observations which can be made now. A copy of his map, showing a N-S vertical section and a horizontal section on the level of the Colorado crosscut, 430 ft. deep, is given in Fig. 2.

The whole system of veins may be said to lie in a N.W.-S.E. direction, and they have the extraordinary peculiarity of dipping with the slope of the hill on whatever side they outcrop. There are also many N-S veins, and I presume they dip

stringers, which are especially abundant near the veins. According to the old records they are abundant 1000 ft. deep and within 100 ft. of the outcrop they have permitted impregnation of the foot for a thickness of 160 ft. under the San Pedro and quarries of this width have been opened in the ore there. These quarries are practically continuous, covering 875 ft. in a total length of 1050 ft. They have supplied the *hacienda* with more than 300,000 tons of ore. There is a long tunnel 275 ft. under the outcrop in which the San Pedro vein is 57 ft. thick.

OCCURRENCE OF "RAMALEOS"

The other veins run from 1 to 8 ft. thick and are very persistent in length. As to

It cannot be the San Pedro, which is the most important of all for that dips north and the "principal" southwest. Merrill has lately called attention in the *JOURNAL* (April 6) to this kind of structure. I suppose it will have to be classed as shearing, but the term is not descriptive. Here is a mass of rock which has been explored for half a mile square and found to contain several complexes or fractures which are illustrated well in Fig. 3. The crushing has produced not only the long and nearly parallel lines, but wide short bunches of small cracks which are as limited vertically as they are horizontally. What directed this concentration of effect upon these spots is an interesting question. Shearing

with movement ought to distribute the effects somewhat equally through the mass but these *ramaléos* look as if the rock fragment had been held firmly in place while it was splintered.

ABSENCE OF MARKED FAULTING

It is plain from this sketch that Professor Arenas did not discover marked faulting, for I am convinced that this is a map made from measurements, and not a fancy sketch except as to the *ramaléos*, which are beyond the reach of accurate surveying. The crossing veins could not be drawn as they are if they faulted each other.

Auld and Buchan, English engineers, who examined the mines when the State sought the aid of English capital in 1834 say "more than 50 perfectly distinct" veins have been found, and that the dip at the surface was 70 to 80 deg., but lessening with depth. Even then the workings were very large for they say: "In fact there can be no other mines in Mexico which present such strong evidence of large production in the past. The *Cerro* (hill) is perforated in every direction and almost its whole surface is composed of what once formed its interior" (referring to the dumps). There are 35 shafts on the hill, and the openings underground must be very extensive.

These interesting mines have been taken over by Philadelphia parties, and their development will be worth watching. While the vein formation is somewhat like that of La Luz, in having its origin in *ramaléos*, there is a marked difference in the abundance of quartz filling in one and the almost entire absence of it in the other case.

Graphite Kettles for Galvanizing

An article in the *Brass World and Platers' Guide* (June, 1907) describes the use of graphite kettles for melting spelter. Iron kettles are rapidly attacked by the melted spelter and not only is the kettle finally ruined, but the spelter itself becomes saturated with iron and has to be sold for dross. The use of the graphite kettles will obviate this difficulty.

The method in use for holding the kettles is quite novel. In order to prevent the graphite on the surface from burning out, a second kettle of sheet or cast iron is made to fit over the outside. A space of a few inches is left all around the outside between the two kettles. This space is filled with molten lead which effectually prevents the air from coming in contact with the outside of the kettle and thus burning out the graphite.

Kettles that have been in use for six months were recently taken out and they had deteriorated but very little.

Zinc Mining near Monterey, Mexico

SPECIAL CORRESPONDENCE

Perhaps no other district in Mexico is being so thoroughly worked by the various zinc companies as that including Monterey. Here the most remarkable deposits of zinc carbonates are being found, and in all conceivable forms. Already five different companies have their buyers with headquarters in Monterey—the Edgar Zinc Company, the Cockerill Zinc Company, the New Jersey Zinc Company, the American Metal Company, and the Metallgesellschaft of Frankfurt am Main.

The last named company has recently bought the mines and *hacienda*, with the railroad connecting, of the Mines Viejas, at Guadalupe, Villadama, about 30 miles north of Monterey on the Mexican National Railroad.

This property has been worked for many years for an estate under the management of James Morlan, then of Monterey. It was also leased by him for several years to the Guggenheim Exploration Company, whose manager threw over the dump ore containing 40 to 50 per cent. zinc. Soon after the Guggenheims turned their lease back to Mr. Morlan it was learned what the heavy material going over the dump was, and the property became the first heavy shipper of zinc ore into the United States.

About this time a hasty examination of the property was made by Pope Yeatman for the New Jersey Zinc Company, but he seemed to think the price too high. From then on the old workings were thoroughly re-prospected and from the miles of the old drifts and stopes a large tonnage was obtained by stripping the sides, the zinc seeming to lie between the lead, which had largely been removed, and the surrounding limestone in the fissures and fractures of which the ore occurs. About the same time that Pope Yeatman visited the Minas Viejas, some two years ago, the Cruz del Aire mine, then but a prospect, near Sabinas Hidalgo, about 25 miles east of the Minas Viejas, was examined by C. A. Bohn, who found the lead changing to zinc in the majority of the workings and recommended the property as a zinc producer. The work there since has shown the correctness of his conclusions.

The greatest credit for the opening of this section is due to Louis Lyon, who, in searching the field for the Lanyon Zinc Company in the spring of 1905, found the large deposits of zinc ore on the properties of Pablo de los Santos, near Sabinas Hidalgo, known as the Vallecillo. This property is now shipping about 10 tons a day of zinc ore, in addition to several carloads of lead ore. The mines of the Vencedora group, which until recently have been leased to the Mines and Metals Com-

pany of Monterey, are also to be worked by Pablo de los Santos, who has a contract for his zinc ore with Kansas City smelters.

Besides the Cruz del Aire, which continues its regular shipments, the mines of La Paz and Pachona add largely to the output of the district, though the latter is limited almost wholly to lead and silver ores.

The Escape of Arsenical Fumes into the Atmosphere

In Cornwall, Devonshire, and the West of England generally, there are 20 works where arsenic is produced or refined. Of these, two are devoted exclusively to the production of pure white arsenic, from the crude arsenic obtained at the roasting furnaces at the mines. In view of the present agitation relating to the discharge of noxious gases, etc., into the atmosphere, it is of interest to note the results of tests made by the inspector appointed by the government under the Alkali Act. There are 10 refining furnaces, at six works, and the arsenious acid per cubic foot of escaping gases averaged 0.040 grains. At 19 mechanical calciners at seven works where the ore (chiefly tin ore) is roasted to remove the arsenic, the arsenious acid per cubic foot of gases escaping averaged 0.047 grains. At nine places, there were altogether 31 hand calciners, or kilns, where the arsenic was removed, and the effluent gases contained on the average 0.033 grains per cubic foot. At all these works the contents of arsenic in the discharged gases varied considerably, and the figures given in the tests ranged from a trace to 0.084 grains per cubic foot.

The arsenic works also discharge sulphurous fumes, and the tests at all the above works show that on the average about two grains per cubic foot of effluent gases escape into the atmosphere. It must be remembered, in considering these figures that the output of each plant is small, and that the actual quantity of arsenic and sulphur escaping into the atmosphere is of no importance to the community. The works are far apart and the neighbors are quite unaware of any nuisance. Under the new Alkali Act of 1907, the government inspectors will be given extra powers to deal with these works, and will probably give some trouble to the owners, though as a matter of fact, the works require no supervision at all from the point of view of the public health.

Recent determinations by E. C. Soper showed that the temperature of the products of combustion in a 60-ft. rotary cement-burning kiln was about 1300 deg. C. as they escaped into the chimney, this corresponding to a loss of 24 per cent. of the fuel supplied to the kiln.

Mining and Metallurgy in South Wales

Excellent Coal Deposits and Iron Ores Have Attracted a Variety of Industries to This Part of Great Britain

BY EDWARD WALKER

South Wales owes its industrial activity to the excellence and variety of its coal deposits. In the coalfield, which extends 50 miles' from east to west and 20 miles from north to south, there is a greater variety of coal to be found than in any other coalfield. Anthracite similar to that produced in Pennsylvania, smokeless steam coal used by the navies of the world, several grades of bituminous coal, coking coal, and gas coal running 33 per cent. of volatile matter, are all found and produced in large quantities. In portions of the coal measures ironstone is found and in earlier days it was smelted. The iron and steel works which were founded

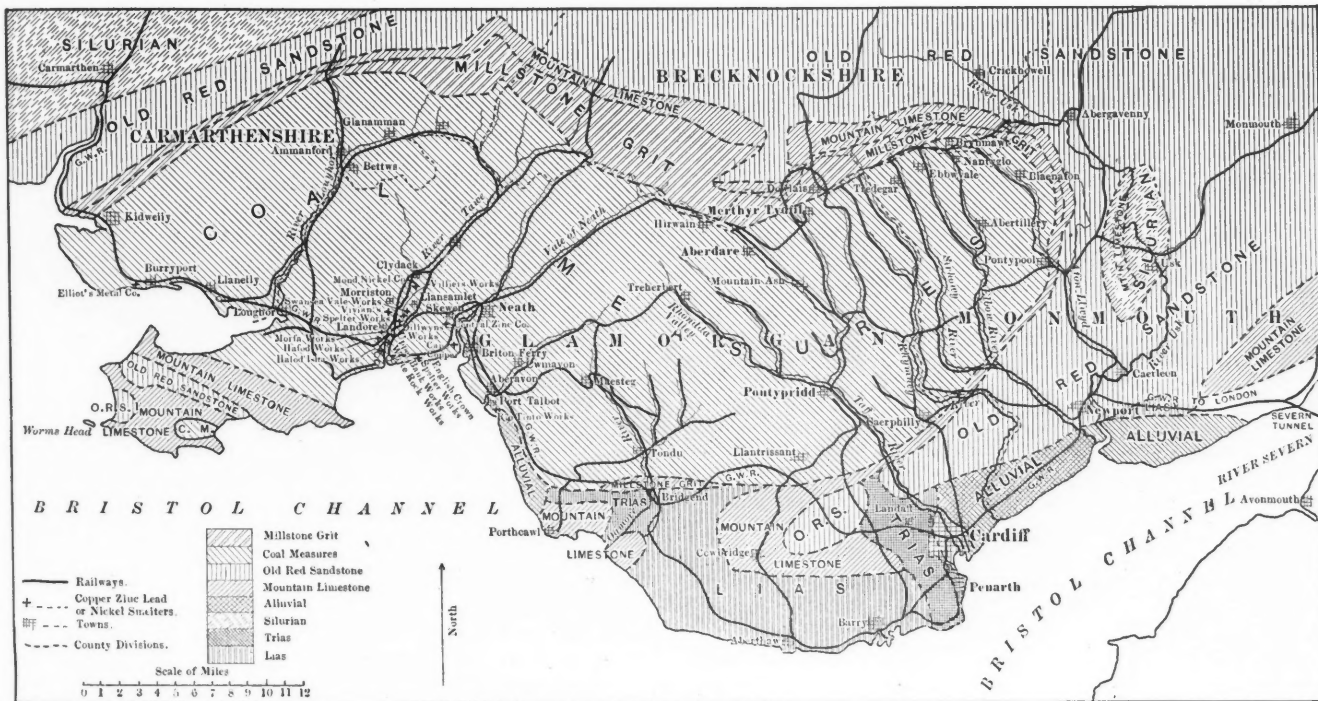
tor in the prosperity of the district, for it enables ores of all sorts to be imported cheaply from any part of the world.

THE SOUTH WALES COALFIELD

The geology of the South Wales coalfield is very similar to that of the other British coalfields. The coal measures lie on the millstone grit, under which again come the mountain limestone and the old red sandstone. There are three series, the upper, the Pennant grit, and the lower. The upper is composed of sandstones and shales; the Pennant grit is entirely sandstones; and the lower is mostly shales. There are in the three series a total of 75

many bands of fireclay and of ironstone. As already mentioned, the blast furnaces now use no local ore, but obtain it from Spain and from the midland counties of England. The chief iron producers are Guest, Keen & Nettlefolds, at Dowlais and Cardiff, and the Ebbw Vale Company at Ebbw Vale. A great deal of money has been spent in recent years by these two companies and the iron and steel practice is well up to date. As, however, the works do not admit strangers, I am not able to give any account of modern steel practice in South Wales.

South Wales is admirably suited for an export trade in coal. There is a perfect



GEOLOGICAL MAP OF SOUTH WALES

to work the ore now depend entirely on ores imported from Spain and elsewhere, and on ores mined in the central counties of England, and do not use any local ores. The abundance and cheapness of fuel attracted other industries to South Wales, such as the smelting of copper, lead, zinc and nickel ores. Tin-plates are made in the Swansea district, and the industry is most conveniently situated; for steel, fuel and acids are obtainable locally, and Cornwall, where tin is smelted, is only a short distance across the British channel. The fact that the coalfield and the works and manufactories clustering around it are on or near the seaboard is an important fac-

different seams of coal, and the total thickness of the series is 7000 ft. The lower series is the most important, as it contains the steam coals for which South Wales is noted. To the northeast of the coalfield, along the outcrop from Neath valley to Llanelli, there are deposits of anthracite similar to those of Pennsylvania. In the Merthyr district is found the famous smokeless steam coal. All sorts and varieties are found in other parts of the coalfield. It should be mentioned that the household bituminous qualities are not equal to those found in the Northumberland and Durham districts in the north of England. In the lower series there are

network of railways, and the ports include Newport, Cardiff, Penorth, Barry, Port Talbot, Briton Ferry, Swansea, and Llanelli, all well equipped with dock accommodation and continually extending. At the present time considerable extensions are being effected at Cardiff and Swansea.

COPPER SMELTING IN THE SWANSEA DISTRICT

Swansea has been a metallurgical center for over three hundred years, though its industry did not become of any special importance until the Cornish copper ores began to be produced in large quantities, a hundred and fifty or so years ago. Cor-

nishmen, such as the Vivians, Williamses, and others, then came over and established works to treat their ores. Afterward English firms such as the Elingtons and Grenfells, established works in the district. For a long time the industry flourished and Swansea practice became a standard. Copper works abounded in Swansea, and in the valley behind where the villages of Landore, Llansamlet, and Morriston, are situated. Further to the east works were established at Briton Ferry, Neath, and Aberavon, and to the west at Llanelly and Pembrey. In those days the ores were roasted in the open, and the desolation of the district was proverbial. About 50 years ago the supply of Cornish copper ores began to decline, but about the same time large quantities of ore and matte began to flow in from North and South America, South Africa, Australia, and other places, and for another 20 years the copper industry continued to be prosperous. Ever since then the supply of copper ore has been declining, and the custom smelters, which are still in existence, cannot obtain as much as they want. At the present time the only custom smelters treating copper ores that have survived are Vivian & Sons, at Hafod, Williams, Foster & Co., at the Morfa works, both at the back of Swansea, and Elliotts' Metal Company, at Pembrey. There are two other copper producers there, the Cape Copper Company at Briton Ferry, which treats ores and mattes from its own mine, and from the Namaqua and Tilt Cove mines, and the Rio Tinto Company, at Port Talbot, where the company's bessemer bars and precipitate are refined.

CAUSES OF DECADENCE

The cause of this decadence of Swansea as a copper smelting district, is to be found to some extent in the metallurgical history of South Wales. Fifty years ago Swansea had pretty much a monopoly in custom smelting, and as is the case with most monopolies, the profits were very large. In fact, in buying ores, the Swansea smelters had it all their own way. They also kept their methods of smelting so secret, that nobody felt equal to starting any opposition. The sellers of the Cornish copper ores do not seem to have kicked much about the low prices obtained for their ores, but the American and Australian producers soon found that the smelters were getting a larger proportion of profit than suited them. Consequently copper smelting was studied in various centers in America and elsewhere, and the methods of treatment were re-invented, or re-constituted, and then improved. It is possible that I am too severe on the old Swansea smelters in attributing this spread of the knowledge of copper smelting entirely to the objection of their customers to continuing to pay their high charges. It may be that the immense deposits found in America led the Ameri-

can metallurgists to pursue investigations, and evolve new methods, and to establish modern custom smelters that could draw away business from Swansea. Whatever the cause, this spread of the knowledge of copper smelting changed the circumstances under which Swansea worked. The establishment of works at most of the principal mines, and of custom smelters in all parts of the world, has subjected Swansea to fierce competition. None but the best managed works could survive, and one after another the others dropped out of the running. As a matter of fact, those which are still in existence have to depend on their rolling mills as much as on their smelting plants for the profit they make. Probably two-thirds of their output of copper and brass sheets, tubes, and wire, is made from bought ingots and only one-third from copper smelted by themselves.

THE ACTIVE CONCERNS

Vivian & Sons, at Hafod, smelt all sorts of ores and mattes, and at their rolling mills at Port Talbot make finished products of copper, brass and yellow metal. Their auriferous copper is used in making copper sulphate, the sulphuric acid being produced on the spot from roasted ores. At Williams, Foster & Co.'s works no auriferous or argentiferous ores are bought. Carbonates are smelted in reverberatories with mattes, and the slags, mixed with low-grade sulphide ores, are smelted in cupolas. Elliotts' Metal Company makes a specialty of gold- and silver-bearing ores and has an electrolytic refining plant. This company finishes its products at Birmingham, where the precious metals are used in making Elkington's gold and silver plate. The firm of Nevill Druce & Co., at Llanelly, continues to operate its rolling mills, though its smelting works are practically closed down.

Some of the custom smelters still adhere to their old policy of rigidly excluding strangers from their works, though nowadays there is no secret practice of any wide application to protect. Others extend their courtesy to visitors and candidly confess that, owing to the difficulty in obtaining ores, they do not feel justified in making large capital outlays, but confine themselves to studying economy and adapting, wherever possible, new ideas to their present plants.

The Swansea smelters confess that they get only what may be called job lots. Trial shipments from new mines come in large quantities. If a mine succeeds, Swansea thereafter gets the matte, and finally only bessemer bars. At the present time a good deal of ore and matte comes from Chile, but gradually the supplies of ore are diverted to the west coast of the United States and the matte to New York.

It is very likely that the Swansea smelters could give the world some interesting information as to economies in practice adopted during recent years, but none of

them cares to give away what they consider their only remaining stock-in-trade.

The other two copper smelters, viz., the Cape Copper Company and the Rio Tinto Company, that have works in Swansea district, possess mines of their own and work under more cheerful circumstances. I propose in future articles to give illustrated descriptions of the two works.

THE SMELTING OF LEAD AND NICKEL ORES

There are now only two producers of lead, viz., Vivians & Sons at their White Rock works, Landore, and Elliotts' Metal Company at Pembrey. Both make a specialty of silver-bearing ores, but the supplies of lead are not extensive, and it is doubtful if the plants are anything like fully employed.

Of nickel producers there are two. One is the Anglo-French Nickel Company at Swansea, which used to be called H. H. Vivian & Co., and is under the control of Vivian & Sons. The company has had a chequered existence, but recently has turned the corner. The other is the Mond Nickel Company, at Clydach, six miles north of Swansea, where the copper-nickel mattes from the company's mines in Ontario are refined by the Mond process. Neither of these works admits visitors.

I shall deal with zinc smelting in Swansea district in a future article.

Oil and Gas in the Appalachian Region

The comments on the map of the Rogersville quadrangle in the southwestern part of Pennsylvania, just issued by the United States Geological Survey, include the following notes:

A more or less definite relation of oil and gas to geologic structure in the Appalachian region has long been recognized, and the evidence at hand seems to warrant the following generalizations regarding structural distribution in the Pennsylvania and northern West Virginia fields:

1. When not affected by other conditions, accumulations of oil and gas show a definite relation to structure.
2. When both oil and gas occur they are distributed according to their densities, the oil being in the lower and the gas in the higher portions of the strata.
3. When salt water and oil are present the oil generally lies above the water level.
4. When salt water is absent the oil occurs more irregularly.
5. Gas occurs most commonly above the upper level of the oil.

Structure is not the only condition determining the occurrence of oil and gas. The structure may be favorable and yet neither oil nor gas be found. The chief requisite condition is the existence of rock of such character as to act as a reservoir.

Milling "Sheet Ground" Ore in Joplin District

A Large Proportion Is Now Derived From This Class of Ore, the Low Grade of Which Necessitates Milling on an Increased Scale

BY DOSS BRITTAIN*

The territory known as the Joplin district extends from Alba and Neck City on the north to Granby on the south, a distance of 40 miles; and from Baxter Springs on the west to Aurora on the east, a distance of 75 miles. With few exceptions the structure and specific gravity of the ores are of remarkable uniformity. Consequently it is logical that the single system of concentration exemplified in the "Joplin mill" should be universally employed in the district.

THE MILLING SYSTEM IN GENERAL

The crushing machinery consists of breaker and rolls. The breaker, a modi-

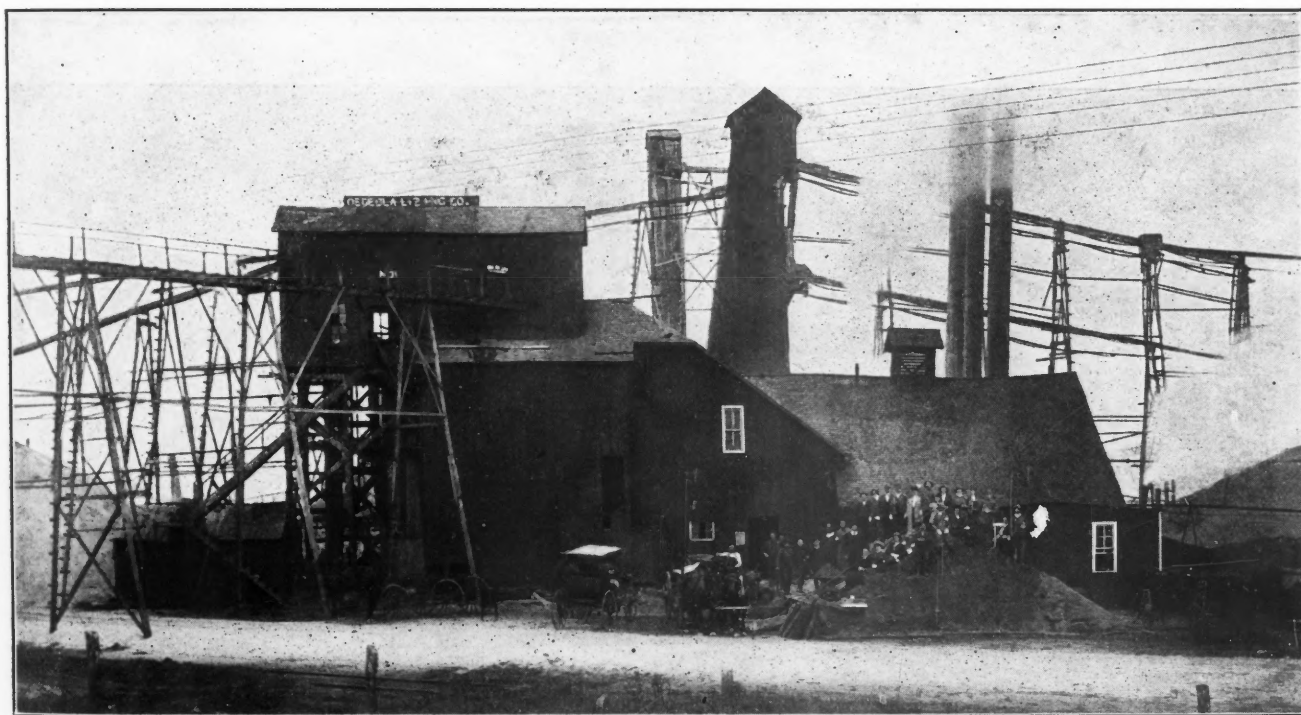
slightly modified in each particular mill to conform to the particular conditions. In general the Cooley jig contains a series of double cells or compartments entirely separated from each other, and each slightly lower than the preceding one in the series. Each half of every double compartment is rectangular, varying from 22 to 38 in. in width and from 32 to 48 in. in length. A horizontal sieve of woven wire, or perforated metal, divides the front cell of each double compartment into upper and lower compartments. The depth from the top of the first end wall of the front cell to the sieve varies from 8 to 9 in., while the same dimension

are used to catch the ore too fine for the sand jig.

The sizing screens which prepare the ore for the jigs are of $\frac{3}{4}$ in. to 1 mm. mesh. Two general types have come into use in the district, viz.: the trommel, the first introduced, and the "shaker" or Cohen screen, both of which may sometimes be found in the same mill. They are usually 36x42 in. and are made of woven wire or perforated steel.

THE COURSE OF THE ORE

After being hoisted from the mine the ore is deposited upon a platform or in a hopper several feet above the crusher. If



OSCEOLA MILL, NO. 1, NORTH OF WEBB CITY

fication of the Blake, is run at 400 to 500 r.p.m. The rolls consist of two iron cylinders geared to each other and driven by a belt. Each cylinder consists of a central core of iron fitted with an axle, and a shell fastened with wooden wedges upon the core. The rolls vary in diameter from 14 to 36 in. and in width from 12 to 16 in., depending upon their particular use in the mill.

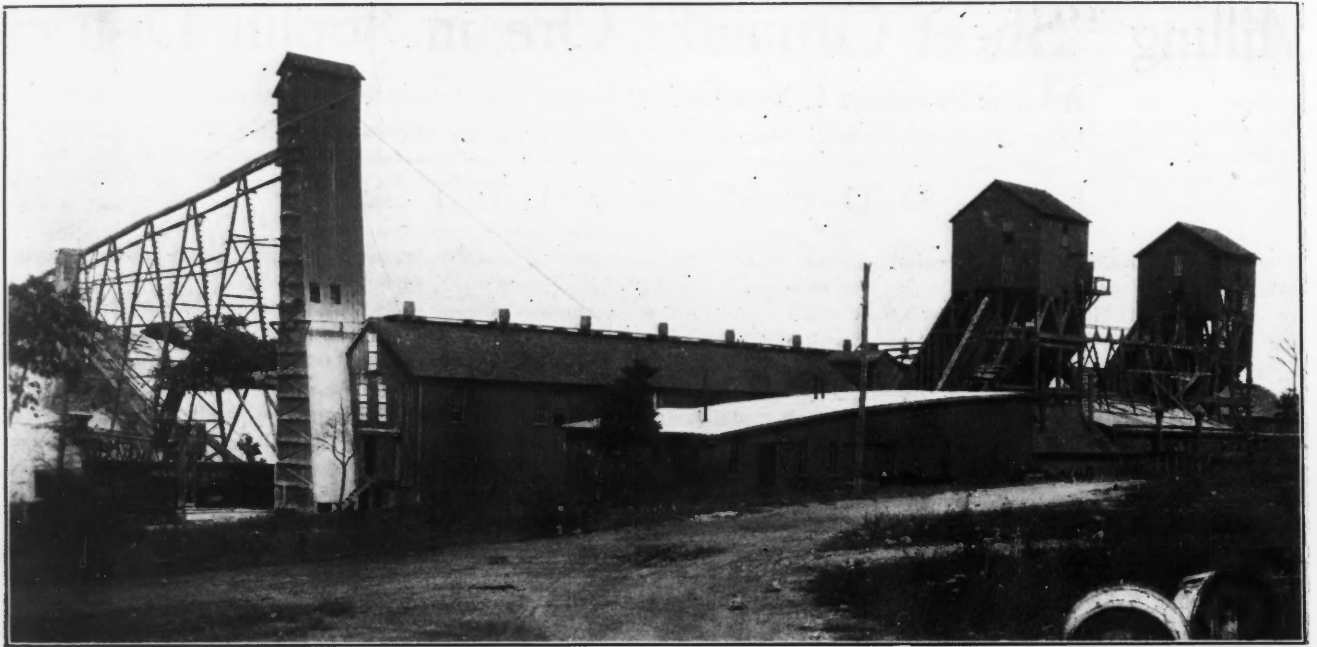
The separating machinery consists of jigs and tables. The type of jig which has found universal use in the Joplin district is known as the Cooley jig. It is

of the lower cell is 5 to 6 in. The mesh of the screen varies from $\frac{1}{8}$ to $\frac{1}{16}$ in. in diameter. The back compartment of the double cell is designed wholly for the perpendicular movement of a closely fitting plunger operated by an eccentric.

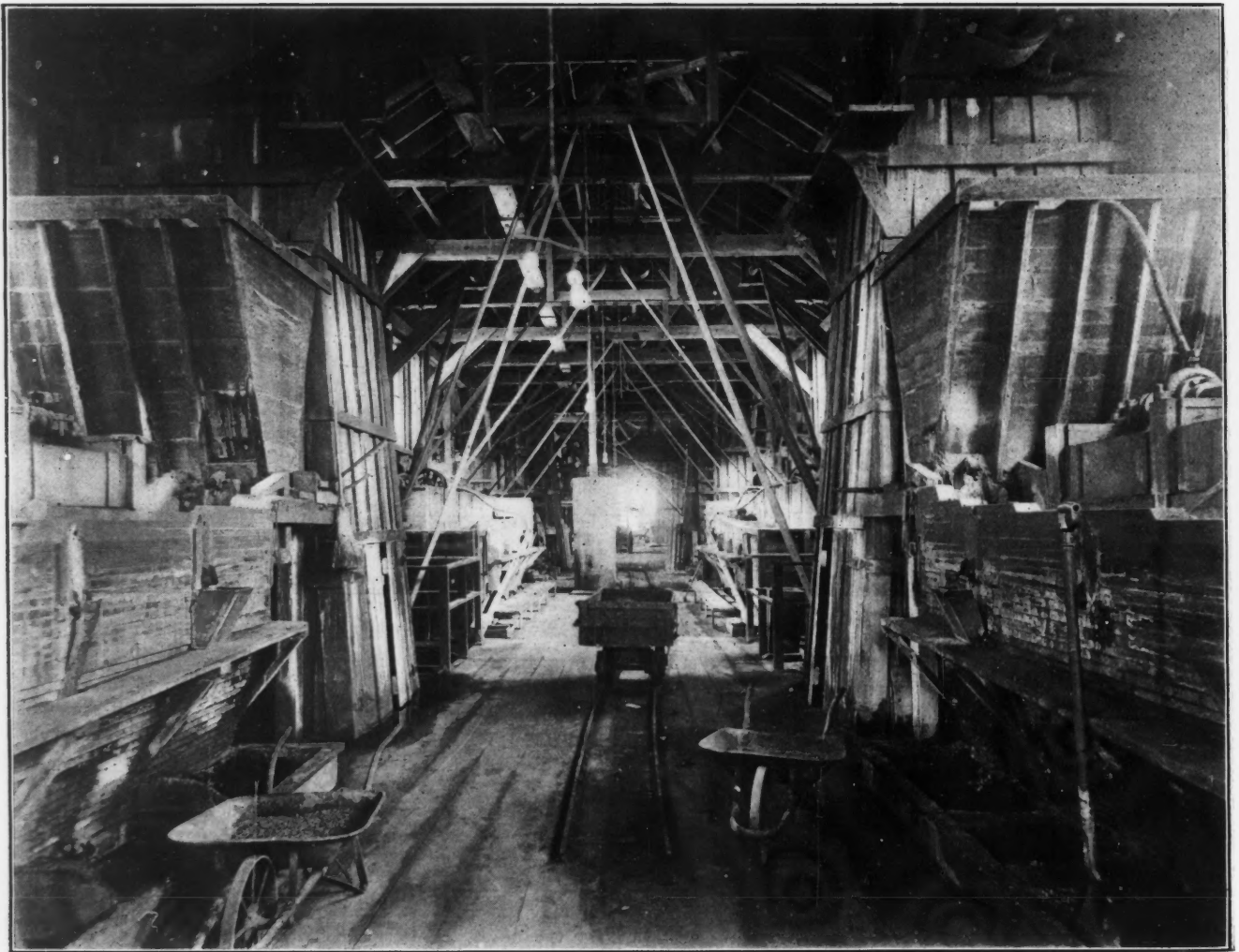
"Rougher" jigs, those used to separate roughly the coarser gangue from the ore, usually consist of five cells; the "cleaner" jigs, used to concentrate the ore coming from the rougher jigs, usually have six, while the "sand" jigs for the finest ore handled regularly by jigs have seven, the number of cells increasing with the fineness of the ore particles and their tendency to escape concentration. Tables

platform is used the crusher is fed by shovelers. The objection to this method is that more men are required than otherwise and the crusher runs a large portion of the time without ore, thus producing a waste of time and money so great that the platform has almost entirely given way to the hopper with automatic feed. For best results the capacity of the hopper should be about twice that of the mill so that when the ground work is suspended for a day the mill need lose no time and *vice versa*. The hopper is located at the entrance of the shaft so that the buckets can be readily emptied within easy access of the crusher. The amount

*Joplin, Mo.



YELLOW DOG MILL, THE UNDERWRITERS LAND COMPANY



JIG ROOM OF YELLOW DOG MILL

of material passing through the hopper is gaged by a gate operated by a wheel and gear, which is attended to by one man.

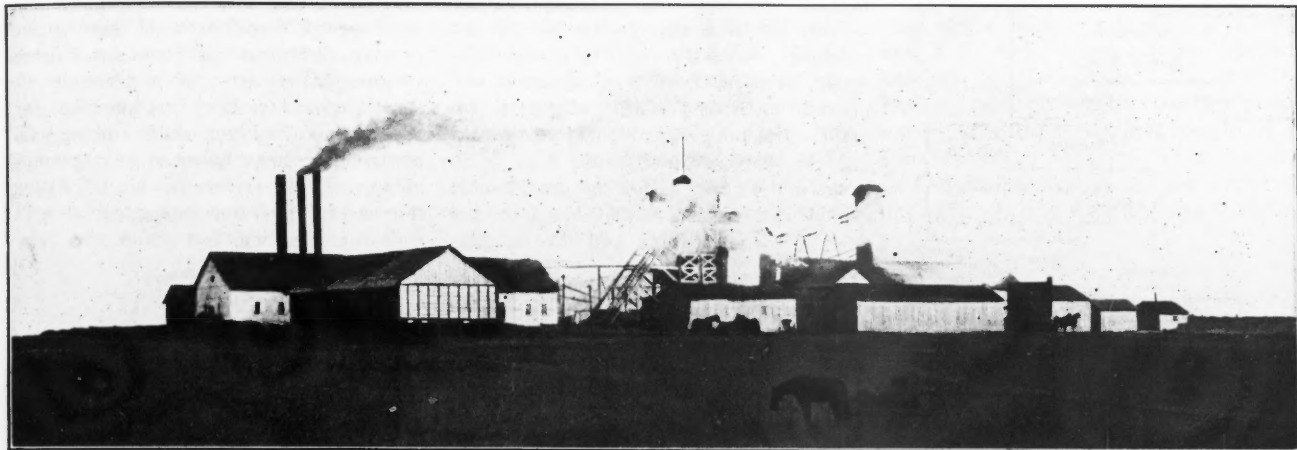
The ore is carried to the crusher by means of a grizzly of perforated metal with $\frac{3}{4}$ -in. holes, which is suspended on rods and is vibrated by an eccentric.

passes to a screen, the oversize going back to the rolls, the undersize passing to the rougher jig. The overflow from that goes to the tailing elevator, while the chat ore, viz., that consisting of a portion of ore with rock attached, goes to chat rolls and again over the rougher. The hutch, viz., the ore from the

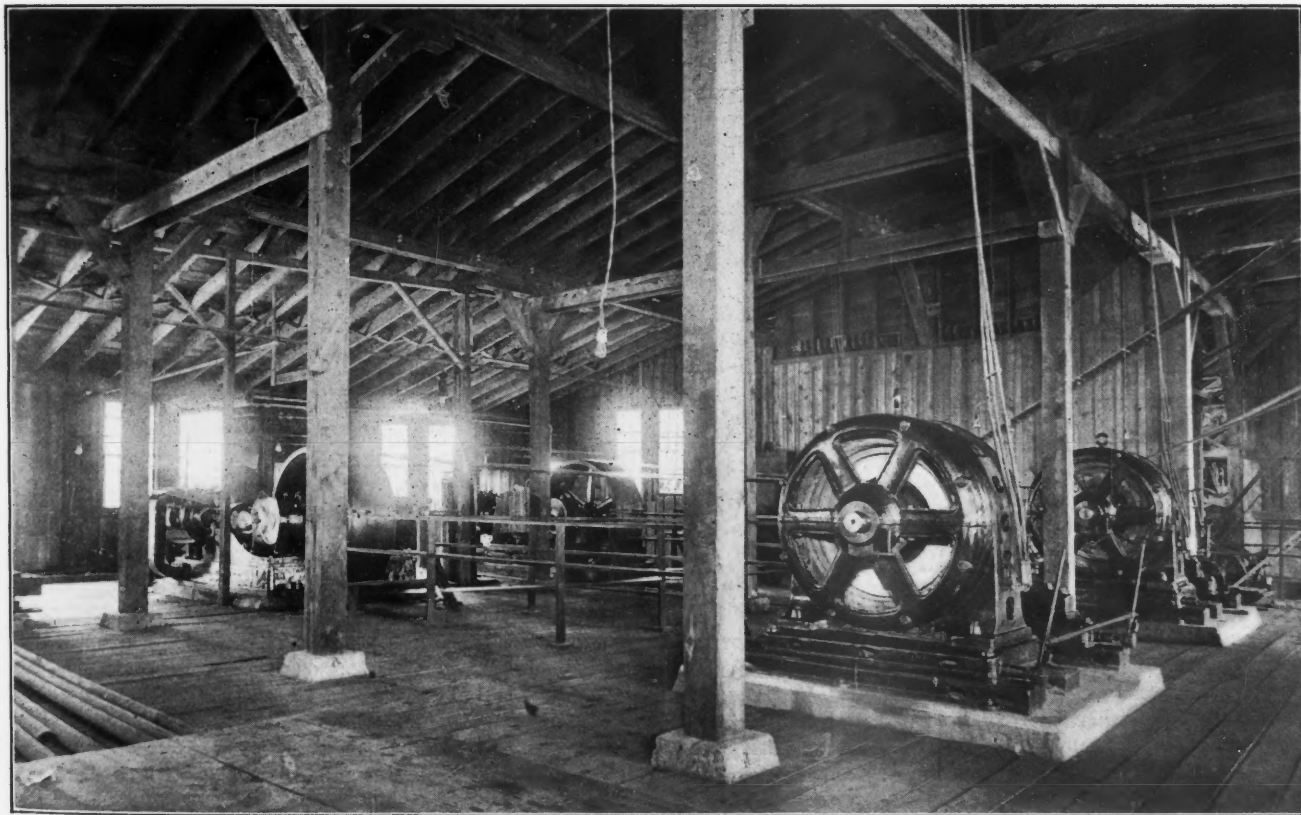
piles become so large that a second tailing elevator is necessary, in which case it is operated independently of the mill by a motor of its own.

CHARACTER OF THE "SHEET GROUND"

The most successful mill practice is that which separates the largest percen-



PORTLAND MILL NORTH OF WEBB CITY



POWER PLANT OF YELLOW DOG MILL, SHOWING 200-H.P. MOTORS AND AIR COMPRESSORS

From the grizzly the ore, which may be in pieces 10 in. in diameter, goes to the breaker and is reduced so that the greatest dimension does not exceed 5 in. and the smallest $\frac{3}{4}$ in. Water is fed into the breaker in sufficient quantity to carry the ore readily to the rolls. The rolls crush to $\frac{3}{4}$ in. From them the ore

spigots of the jigs, is carried to the cleaner jig. The hutch from the cleaner is saved, while the overflow passes to the settling tank for the sand jigs or tables and the chat goes to the tailing tower, as does also the overflow from the sand jig, from which the hutch is saved.

It frequently happens that the tailing

tage of ore with the least degree of crushing. Almost all of the Joplin ores, however, are found embedded in rock as irregular masses or finely disseminated through it, the latter condition almost universally obtaining in the section of the district known as "sheet ground." In this formation the ore lies in beds or

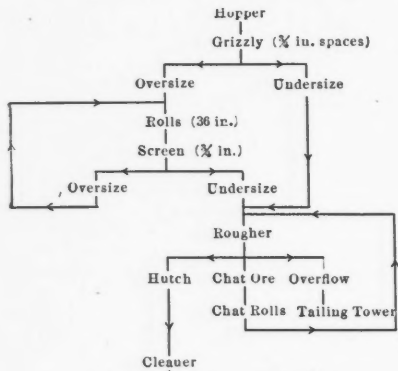
sheets, which vary in thickness from that of a knife blade to 20 ft. and with a few breaks (due either to pillars of barren clay or boulders of limestone) seem to underlie at a depth of 150 to 200 ft. all

city itself is underlaid with the same character of deposit, the easterly and westerly limits of the area being yet undetermined. Although the orebodies are of great extent they are of very low grade, the highest being 15 per cent. and the average from 3.5 to 4 per cent. No ore below 2 per cent. can be handled at a profit under present conditions. The fineness of the ore dissemination increases the difficulty, owing to the fine crushing necessary and the resultant waste, even in the use of the most improved methods. These obstacles, together with the greater difficulty of breaking the hard ground, make mining in it an undertaking requiring considerable capital and render watchfulness on the part of the mill force and the installa-

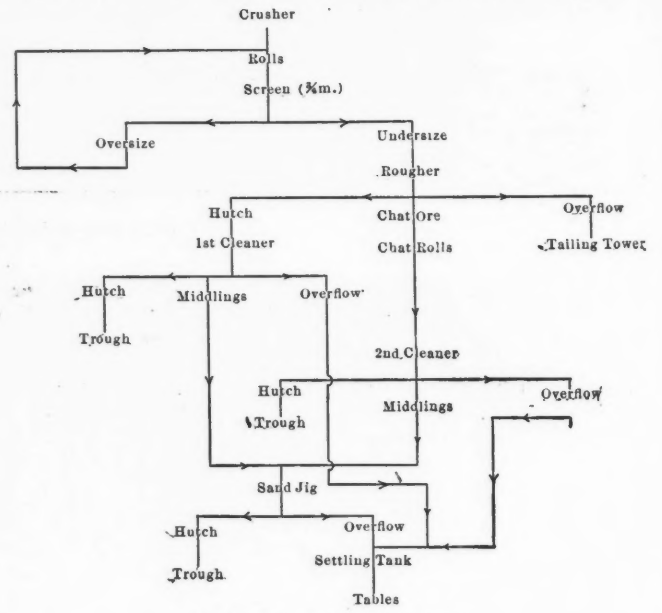
tion of expensive machinery essential factors to successful mining. To offset these disadvantages, however, is the certainty of result when once the ore has been discovered. Instead of the capricious wealth and ephemeral life of the pocket formation, the sheet ground furnishes the lower grade but longer lived mine, and even now is the most substantial feature of the mining industry in the Joplin district.

REQUIREMENT OF LARGE MILLS

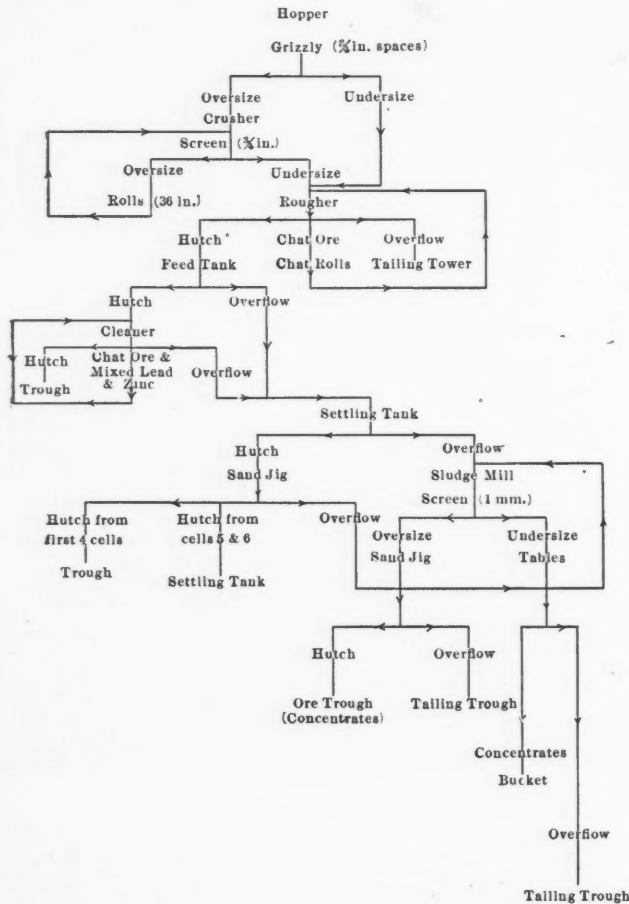
As a result money has flowed into this special department of mining and by far the most vigorous development in the district has taken place in the sheet-ground territory within the last 18 months. Drilling, shaft sinking, mill construction have gone on at a remarkable pace. Experience has already shown the careful operator one cardinal principle of handling low-grade ore, viz.:



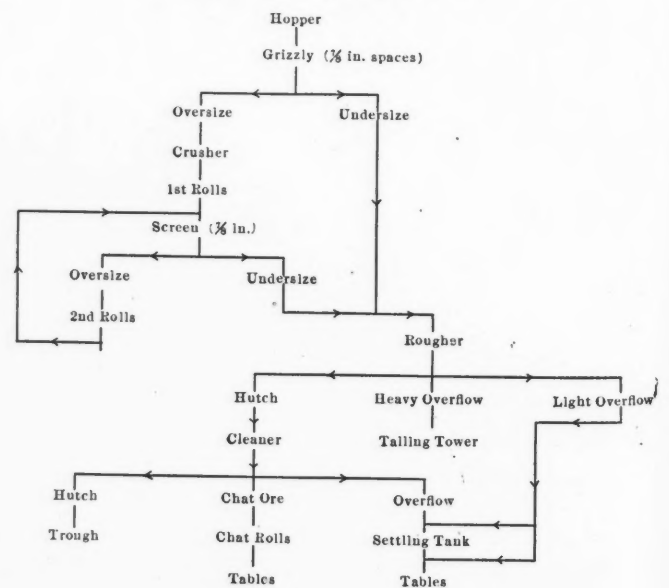
USUAL FLOW IN JOPLIN TYPE OF MILL



ORE FLOW OF PORTLAND MILL



ORE FLOW, THE YELLOW DOG MILL



ORE FLOW, OSCEOLA, NO. 1

the territory between Webb City and Oronogo and south of Webb City for a distance of 3.5 miles. Indeed recent investigations would go to prove that the

tion of expensive machinery essential factors to successful mining. To offset these disadvantages, however, is the certainty of result when once the ore has

the construction of a large mill. Only recently one of the finest 250-ton mills of the district closed its doors forever against 2 per cent. ore, the management

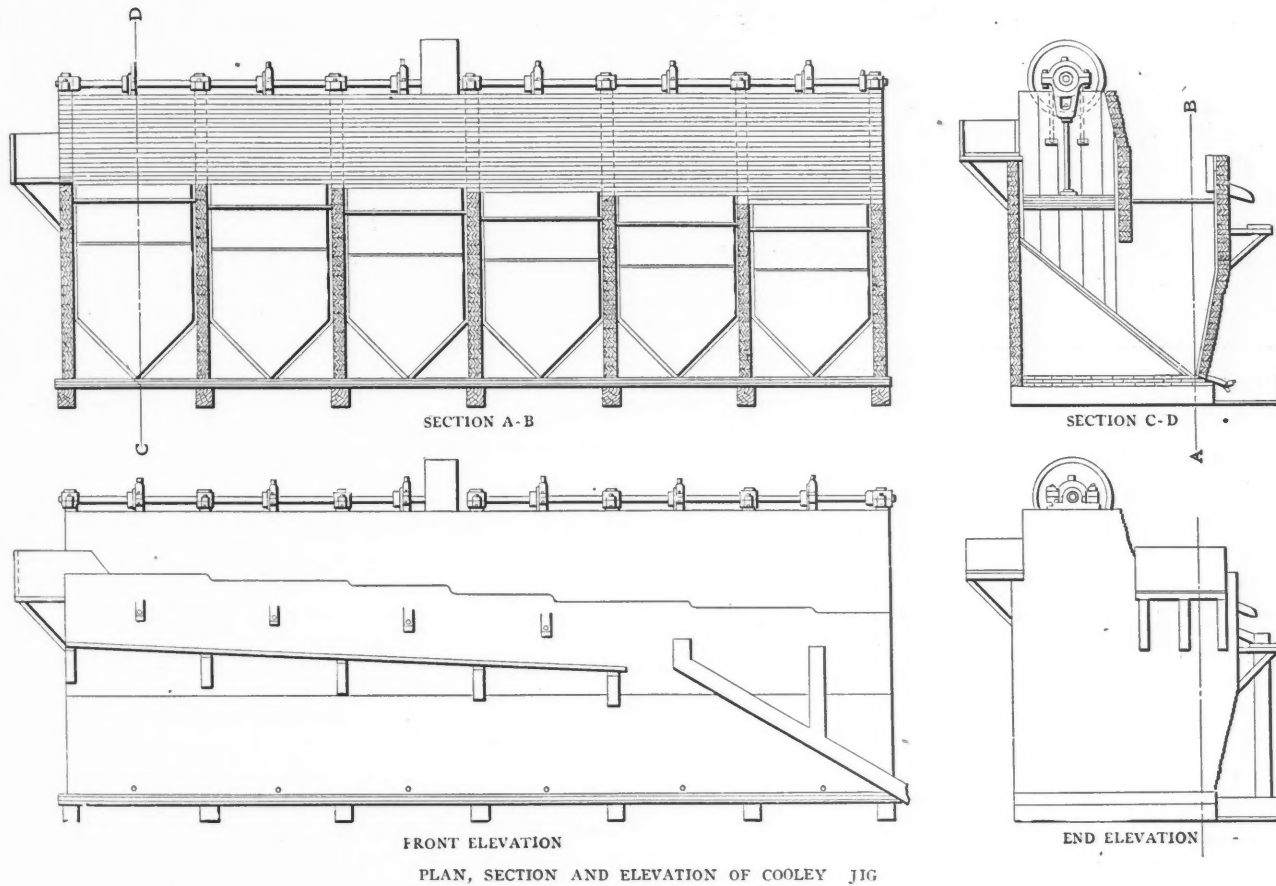
maintaining that, to handle such ore at a profit, a mill of 500 tons capacity per day is necessary, while it ought to be of 1000 tons. Many of the owners of smaller mills (ranging from 150 to 200 tons per day) have attempted to remedy the difficulty—and to a certain extent have succeeded—by running their mills far beyond their contract capacity. Some of these, like the Osceola No. 1 and No. 2, have even doubled the tonnage for which they were built and with a contract capacity of only 150 and 200 tons respectively stand high as producers among other mills ranging from 300 to 500 tons daily capacity. Operators now are fully convinced of the efficiency of the large mill and are following the ex-

It is electrically driven and cost \$160,000. It operates on ore running from 11 to 30 per cent., has never missed a dividend and never paid one less than 37 per cent. Owing to its importance in the zinc industry as a whole and especially to the concentration of sheet ore, the Yellow Dog mill deserves special prominence in the consideration of methods employed in the concentration of this class of ore.

The power plant of this mill consists of 12 three-phase alternating-current motors; two sets of transformers, one reducing the electric current from 2300 volts to 280 and the second from 280 to 125. A seven-panel switchboard completes the installation. All parts of the

which bring the ore from the two 220-ft. inclined shafts to the hopper of 2000 tons capacity. A 10-h.p. motor operates the machine shop. Power is furnished by the Spring River Power Company, the five larger motors taking it at 2300 volts and the others at 280.

The bucket-conveyers, one for each of the two inclined shafts, are the only ones in use in the district. Each consists of 320 buckets, 2 ft. long, 1 ft. wide and 1 ft. deep, linked together by four bars of 1½x½-in. steel. The chain of buckets runs on wheels, and the whole conveyer, with an estimated weight of 40 tons, is driven by means of a sprocket located several feet above the hopper of the mill. In the mine the lower end of



PLAN, SECTION AND ELEVATION OF COOLEY JIG

ample recently set by the American Zinc, Lead and Smelting Company, which has erected its fourth 300-ton mill. These are the finest group of large mills in the entire district and as examples of those mills which have handled the sheet ore most successfully, may be cited along with the Portland, Osceola No. 1, Osceola No. 2, Golden Glow, Red Dog, and Yellow Dog, of the Underwriters Land Company.

THE YELLOW DOG MILL

The Yellow Dog mill, built by F. W. Caulkins, of Webb City, Mo., is the finest and most complete mill in the district. It is 345 ft. long, of the 1000-ton type, consisting of two wings of 500 tons each.

plant are on independent circuit breakers and completely protected from lightning. Of the 12 motors three of 200 h.p. each drive three Ingersoll air compressors of 1500 cu.ft. capacity per minute, the compressors being driven by 30-in. leather belts. From the compressors the air passes through a 5-in. air line into a 10-in. header and is from there conveyed into four reservoirs, one of which is located underground and three on top. Forty drills are run with this equipment. Of the other motors, two of 100 h.p. each drive the mill; four of 40 h.p. each drive the sand jigs and the centrifugal pumps with which the mill is supplied with water for washing the ore; two of 30 h.p. each are used for the huge bucket-conveyers

the conveyer extends into a sump where it is fed automatically from a platform on which the ore has been dumped from cars. With this equipment, 800 tons of ore can be handled at each shaft per eight-hour shift. There is also a large electric hoist for each shaft for the purpose of handling cars for lowering and elevating men and supplies.

As both-wings of the mill are independent and similar, a description of one wing will answer for both. From the hopper where the ore is continuously dumped from the conveyer it passes through an automatic feed gate into a grizzly 8 in. deep, 24 in. wide at the upper end and tapering to 22 in. at the lower. The metal bottom of the grizzly

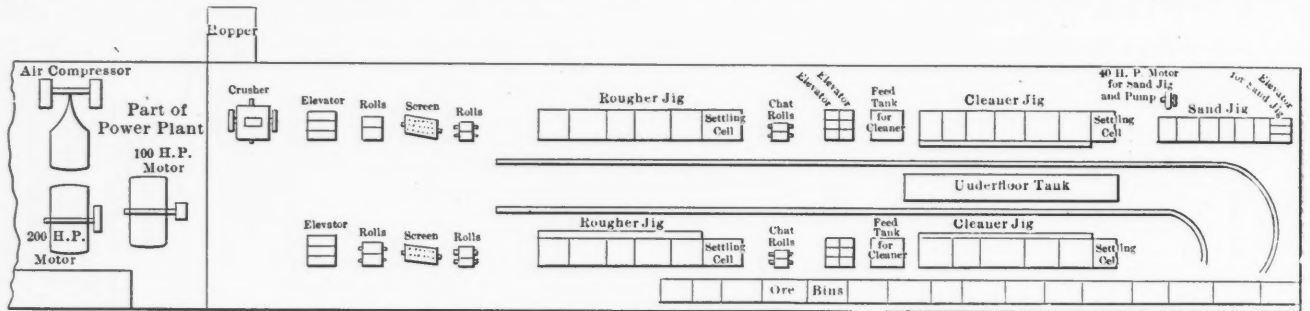
contains 3/4-in. perforations through which a part of the ore sifts without passing through the breaker. The greater part, however, passes directly into a 22-in. breaker which crushes it so that the largest pieces are no greater than 1 1/2 x 4 in. It then joins the undersize from the grizzly and the stream is divided, each half passing to its respective wing of the mill. It is first received by an elevator and carried to a 32x36-in. woven-wire Cohen screen, the stream of the oversize being divided, each half passing through 36-in. rolls and back to the screen. The undersize goes to the rougher jig of five 38x46-in. cells. The overflow from the rougher, consisting of the coarsest barren rock, is carried out of the mill through the tailing elevator. The chat ore from the rougher, drawn

and passed to its proper bin. The hutch from the third, fourth and fifth cells consists of blende free from gangue; it is drawn into a trough and passed to its bin, where it is stored for sale. The hutch from the second cell, which consists of an intimate mixture of blende and galena, and that from the sixth cell, consisting of zinc concentrates with some tailings, are passed over an elevator and again over the cleaner. From the large settling tank under the mill floor the overflow passes to the sludge mill, and the hutch to the sand jig, consisting of six 26x34-in. cells, from which the overflow passes by special flume to the sludge mill. The hutch from the first four cells is saved in a sludge bin and sold, while that from the fifth and sixth cells is returned to the settling tank. At the

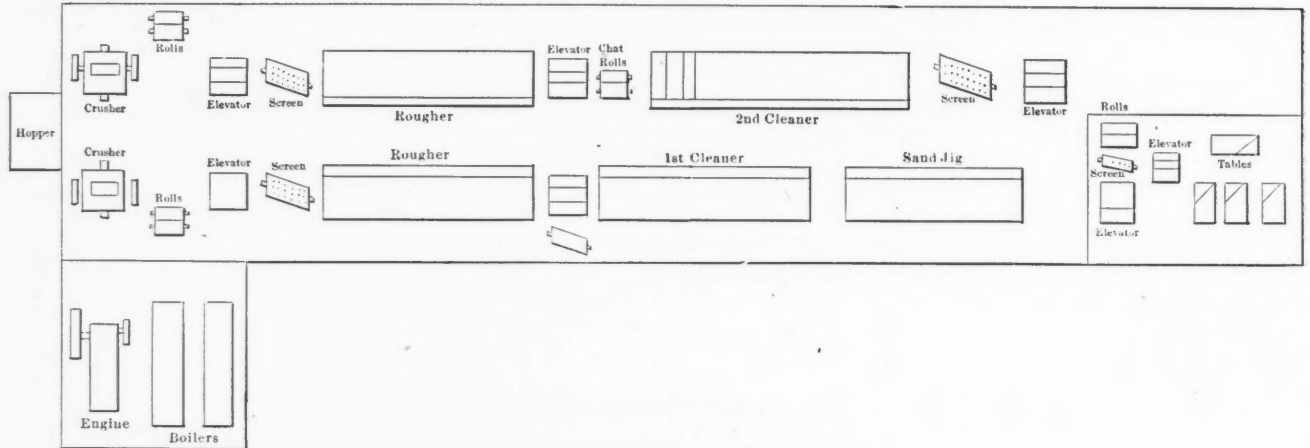
formation the Portland, Osceola No. 1, Osceola No. 2, Golden Glow, Red Dog, differ from the Yellow Dog, only slightly in the details of their equipment as indicated in the accompanying table.

DETAILS OF "SHEET GROUND" MILLS

The power equipment of these mills differs widely, not only in the character of the power employed but also in the amount per ton of capacity. The Portland is equipped with a 60-h.p. gas engine; the Osceola No. 1 and No. 2 each have 65-h.p. steam engines; the Golden Glow has a 75-h.p. electric motor, and the Red Dog a 100-h.p. steam engine. Many of the mills are equipped with gas engines instead of steam or electricity. The ground is drilled with machine drills; the mills are all equipped with air



GROUND PLAN, SOUTH WING, YELLOW DOG MILL



GROUND PLAN, PORTLAND MILL

from the middle ore layers of the first four cells and the spigot of the last, is carried to a set of 19-in. chat rolls and passed again over the rougher. The hutch product drawn off from the spigots of the first four cells passes into an elevator, and from there to a feed tank, 4x6 ft. in width and length and 5 ft. deep. The float ore from this tank passes to a large settling tank 20 ft. long, 6 ft. wide and 6 ft. deep, placed under the floor of the mill. Most of the ore from the feed tank passes into the cleaner jig containing six cells, 28x34 in. The overflow from the cleaner and the hutch from the settling cell at the end of the jig pass to the large settling tank. The hutch from the first cell of the cleaner consists of galena which is drawn into a trough

sludge mill the ore is passed over a trommel screen of 1-mm. perforations. The oversize passes over a sand jig and the undersize over Wilfley tables.

VARIATIONS IN PRACTICE

Of the other mills representative of the milling practice of the sheet-ground

compressors; gas is used where any fuel is required either for power or heating purposes; most all are lighted with electricity, and several, such as the Yellow Dog and the Osceola No. 1, are equipped with Ajax machine drill sharpeners, though most of the mills sharpen their steel with hammer and forge. Other

DETAILS OF "SHEET GROUND" MILLS.

Name.	Capacity.	Crusher.	First Rolls.	Rougher.	Cleaner.	Sand Jig.
Portland	300 tons.	16 in.	36 in.	6 cells, 30 x 44 in.	1st jig 7 cells, 28 x 36 in. 2nd jig 7 cells, 28 x 38 in.	6 cells, 27 x 33 in.
Osceola No. 1 ..	150 tons.	14 in.	30 in.	6 cells, 34 x 48 in.	6 cells, 28 x 36 in.	
Osceola No. 2 ..	200 tons.	16 in.	30 in.	5 cells, 30 x 42 in.	6 cells, 26 x 42 in.	
Golden Glow ..	250 tons.	15 in.	36 in.	5 cells, 31 x 46 in.	5 cells, 24 x 34 in.	6 cells, 24 x 34 in.
Red Dog	300 tons.	15 in.	36 in.	6 cells, 36 x 46 in.	7 cells, 30 x 42 in.	4 cells, 22 x 32 in.
Yellow Dog ...	1000 tons.	22 in.	36 in.	5 cells, 38 x 46 in.	6 cells, 28 x 34 in.	6 cells, 26 x 34 in.

minor differences in the mill equipment are embraced in the presence or absence of tables, the number of rolls, and the number and size of the jig cells. The latter is an important item in the completeness of the ore separation. Where the ore is of low specific gravity, and finely disseminated in the chert, very fine crushing and sizing are required and the jigs handling such ore successfully must have more cells of greater length in proportion to width than those handling heavier and less finely divided ore.

As the equipment differs there is likewise a difference in the disposition of the ore at various stages of the separation. Differing from the Yellow Dog, the Osceola No. 1 operates a second set of rolls which receives the oversize from the $\frac{7}{8}$ -in. screen for the ore from the first set. The chat rolls receive middlings from the cleaner instead of the rougher, but return them over the rougher. The overflow from both the rougher and cleaner passes to a settling tank. The Osceola No. 2 sends the middlings from both the cleaner and rougher over the chat rolls, returning them to the rougher. Both these mills send the ore from the crusher to rolls without screening. The Portland has a unique arrangement of its jig machinery. From its two roughers the first cleaner receives all the hutch while the second receives all the chat. The overflow from both cleaners passes to settling tanks and the tailings from both to sand jigs. The overflow from the sand jigs passes to the settling tank from which the ore passes over tables. The advantage claimed for this arrangement of cleaners is that the material handled by each is more homogeneous than in the case of the ordinary method in which the cleaners receive the hutch only from their respective roughers.

These mills cited as examples represent in the aggregate every practicable method of zinc-ore concentration known to modern mill practice in the Joplin district. Even with the utmost care in the operation of these methods much of the ore is still lost and the stream beds are yellow with ungathered wealth. This is a sufficient indication that methods are yet far from perfect and fortune awaits the inventor of that machine which will save to the operator the thousands of dollars worth of ore washed from the mills of the district every week.

[Note—In referring to the grade of ore milled in the Joplin district, the author means the yield of mineral that is obtainable; that is, speaking of 2 per cent. ore, he means ore that yields 2 per cent. concentrate. Speaking of mill capacities the capacity for an eight-hour shift is meant; that is, a thousand-ton mill is one of capacity of treating 1000 tons ore per eight hours.—EDITOR.]

Recent Improvements in the Cyanide Process on the Witwatersrand

By E. M. WESTON

It has always been acknowledged that the addition of oxidizing agents to ores or to solutions treating ores that contain ferrous salts and other cyanides has a beneficial effect in hastening solution and in preventing the destruction of cyanide. Various chemicals, niter, barium dioxide, hydroxyl, etc., have been proposed, and some have been used in practice. On the Rand, however, it came to be considered that the expense of their use was too great a drawback and that the best oxidizing effect was obtained by aerating the solutions. There did not appear to be any other oxidizing agent available that was sufficiently cheap and abundant to justify its use on a large scale.

Quite a large area of the Transvaal in the vicinity of the Main Reef is covered by dolomite which contains a certain percentage of the carbonates of manganese and iron. Solution has, of course, gone on to a large extent, as shown by the caves and underground streams in this formation. The oxides of manganese and iron have been re-precipitated in many places, in the form of hydrated oxides, forming quite large and workable deposits of wad or umber, with varying proportions of the different oxides. These lie near the surface and within a short distance of the gold deposits, and can be cheaply mined and delivered to the mines along the reef. The attention of A. Adair was directed to this matter, and he took out a patent for the addition of about 0.25 per cent. of this material to slimes under treatment. The results of experiments made by the Geldenhuis Estate Gold Mining Company and the Crown Reef Gold Mining Company are said to be most favorable. Results showed a smaller consumption of cyanide and a more rapid and complete solution of gold in the slimes treated. Solutions going to zinc-boxes were much cleaner, and the formation of white precipitate was retarded. Where slimes are taken from old dumps 10 to 12 hours' contact has a most marked effect in the solution of the gold. Slimes also settle better. This Adair process is worked in conjunction with the Usher process. The patent relates to a method of forcing the solutions through holes in pipes at the bottom of the vats, so that a thorough intermixture of solutions and washes with the pulp is obtained. Owing, probably, to the effect of the wad on the colloids of the slimes, the slimes tend to concentrate toward the middle of the vat, and leave a layer of clean solution on the top which can be decanted off continuously. The results claimed for the combined process are (1) a better extraction from slimes;

(2) one vat can treat a charge without any transference; (3) time of treatment is reduced by one-third, consequently lesser capital expenditure would be required for new plants and the capacity of existing plants proportionally increased; (4) less power required owing to less transference of slimes by pumping; (5) cleaner solutions and better extraction in zinc-boxes.

Treating a charge of slimes assaying 2.5 dwt. resulted in an unwashed residue of 0.12 dwt. It is only right to point out that similar extraction results are being obtained by filter-pressing in the plants designed by Denny Brothers without the use of wad. This process should, however, encourage the all-sliming policy in existing decantation plants, as an increased extraction would be gained, since most sand residues assay 0.3 to 0.5 dwt. per ton.

Lead Mining in Derbyshire, England

Lead has been mined in Derbyshire from time immemorial and at the present time increased attention is being given to the deposits owing to the high price of the metal. In addition, the fluorspar found with the lead has now a market value, and many old heaps are being worked over. It is hardly possible for the deposits to be worked on a large scale according to modern ideas, on account of the nature of the local mining laws, which are really the lineal descendants of the ancient feudal laws. There is no codified mining law in England, but each district has its own law founded on custom.

In Derbyshire the law is that any person may mine on anyone's land without asking permission. After a shaft has been sunk and ore brought to the surface, a jury of a local "barmote" is called in to examine, and their duty is to "free the mine." By this formality the miner obtains right-of-way over the land in order to take his ore to market. This law applies only to lead ore. If there is any other ore or mineral of value, then the landowner has to be consulted and paid a royalty. Though a man may obtain a miner's privilege so easily, yet he is bound by certain restrictions. He must work the mine continuously or he loses his interest, and a new proposer may obtain possession in as short a time as six weeks.

This method of exploiting a mine is out of date, and cannot produce the best results. As it is, the mines are worked down to water level, and then abandoned. There must be enormous deposits below water level, which would pay for exploitation on a large scale by men with plenty of capital. There are numerous people examining the deposits, but until the antiquated law is altered or circumvented, any great increase in activity is hardly possible.

The Syracuse Shaft on the Mesabi

How a Shaft Was Sunk through Quicksand by a Novel Application of the Pneumatic Process, after Failure of Other Methods

SPECIAL CORRESPONDENCE

Recently there has been successfully constructed on the Mesabi range, near Biwabik, Minn., a timber and concrete mine shaft. This shaft is of considerable interest, owing to the extreme difficulties overcome, and the somewhat novel application of the pneumatic process to this particular class of construction. The work in question is the shaft sunk for the Syracuse Mining Company, a subsidiary company of Pickands, Mather & Co.'s holdings, to enable it to open up a rich deposit of iron ore.

The history of the previous efforts to put down this shaft is a two-year record of disappointment and expenditure of money. The orebody is adjacent to and running under a lake of considerable size, which adjoins it on two sides. Immediately on top of the ore deposit is 45 ft. of treacherous quicksand. Owing to the proximity of the lake the ground is saturated with water, and it is particularly difficult to sink a shaft through it by any ordinary process.

THE COFFERDAM METHOD

The mining company realized this before beginning operations, and made an arrangement with the patentee of a method of sinking open shafts through water-bearing material, adopting his method and employing him to superintend the work. Operations were begun in December, 1904. The method as applied consisted of a series of cofferdams driven inside each other, the first one being sufficiently large to provide space for the other dams inside of it. Wooden sheet-piles, 18 ft. long, were driven down around two sets of timbers, and the excavation started inside the staves.

The first cofferdam was built and the excavation and pumping were started inside of it. Very slow progress was made, however, as the flow of water and sand was too great for the pumps to handle. The next set of staves was started but landed on top of a bed of large boulders and could not be forced down. By this time four No. 10 Cameron pumps failed to handle the inflow of sand and water, and it was apparent that the work could not be successfully accomplished by this method. After a four months' trial the mining company decided to stop all operations at this point, and to change the location of the shaft to a point some 200 ft. south from the abandoned one. Here the overburden is some 50 ft. thicker, but the chance of encountering boulders was considered much slighter.

TIMBER SHAFT AND SHEET-PILING METHOD

The permanent mining plant, which had already been installed, was accordingly moved to the proposed site. As this plant had to be taken up a steep hill, moving it entailed considerable expense. At the new site, the mining company with its own force sunk a large timber shaft to the quicksand (about 50 ft.) by the method commonly employed on the Mesabi range. This consists of suspending sets of timber about 3 ft. apart from the surface. As the excavation proceeds 2x10-in. planks 4 ft. long are slipped in back of these timbers, forming a comparatively tight wall to keep out the soil. Each course of waling timbers, or each set, as it is locally called, is suspended from the set of timbers immediately above it by 1¼-in. bolts, the top set of timbers in turn being connected in a like manner to large round timbers, called bearing timbers, on the surface, which span the excavation and carry the weight of the shaft until it rests on the bottom.

From the surface of the quicksand it was the intention to drive steel sheet-piling to the ledge. The shaft was accordingly built large enough to permit a steel sheet-pile cofferdam at the bottom of and inside the timber shaft. Work was started driving the steel sheet-piling in November, 1905, and continued until the following spring.

The piling was driven from an ordinary pile-driver derrick, which rested on the timber shaft: at the surface, and was sent home by means of a special follower designed by the manufacturers of the steel piling. A 3000-lb. hammer was used and at one period of the work a water-jet was also employed to assist the work of the hammer. The piles were driven very hard, and were of heavy section.

After the pile cofferdam was completed, a No. 10 Cameron pump was installed and the excavation started inside the steel piling, waling pieces and struts being introduced about every 3 ft. as the work progressed, to keep the piles in place. The excavating was accomplished without much difficulty to a point about 20 ft. below the top of the piles. Below this point it proceeded very slowly. After taking out a few feet of material the quicksand would suddenly start to boil up from the bottom, accompanied by a corresponding movement of the material on the outside of the shaft. This badly distorted the timber shaft and cracked its timbers.

It became evident to those in charge

that there must be a bad leak or break in the steel sheet-piling, and means were at once adopted to overcome this difficulty. A crib of 10x10-in. timbers 3 ft. high was built at the bottom of the excavation inside the shaft, the intention being to load this crib and force it down, with the hope that it would overlap the leak or break in the piling, and that then the work could be prosecuted successfully. The crib was forced down a few feet and then stuck; so that very little, if anything, was gained by the scheme. In the meantime each period of excavation was followed by an upward boiling of the quicksand at the bottom. The material around the outside of the shaft settled away, leaving the upper part of the shaft exposed. Hay, straw, etc., were placed outside the shaft with the hope that at each settlement of the sand this material would be carried down outside the steel piling and ultimately stop the leak in it.

At this stage it became necessary to support the timber shaft, as it had broken away from the bearing timbers at the surface, and was settling down and telescoping the steel cofferdam. This was accomplished by stretching railroad rails and timbers across the top of the cofferdam and under one of the sets of timber of the wooden shaft, allowing the timber shaft to take a bearing on them. Pumping was then resumed and pieces of sheet iron were forced down alongside the sheet-piles and every effort was made to locate and stop the holes where the quicksand was entering the shaft. As a last resort, grout was pumped down to the ledge through a 2-in. pipe, it being withdrawn and moved frequently. This was allowed time to harden and the excavation was resumed. After advancing a few feet the sand and water broke in from the bottom and boiled up as usual. On Aug. 1 the mining company decided that the shaft could not be sunk by ordinary methods, and it then called upon the Foundation Company, of New York, which devised plans and contracted to put the shaft down to and far enough into the ledge to make a water-tight joint with the rock.

THE FOUNDATION COMPANY'S METHOD

The Foundation Company began operations early in October, 1906. The plan was to line the upper or timber part of the old shaft with reinforced concrete, leaving a shaft 13 ft. 6 in. by 6 ft. 1 in., and having two hoisting compartments 4 ft. 6 in. by 6 ft. 1 in. at each end, and

one compartment of 6 ft. 1 in. by 3 ft. 6 in. in the center for a pipe and ladder way. A concrete roof was then to be built on the upper ends of the steel sheet-piling. The material inside the steel sheet-piling was to be excavated and the shaft below the roof lined with 10x12-in. timbers, all

It was then decided to pump out the shaft as low as it had been excavated, about 18 ft. below the tops of the steel sheet-piles, and to timber from that point up to the point where the concrete roof was to go in. Next, to construct the roof and line the old timber shaft with concrete

practicable. It was very evident that the first thing that must be done was to secure and make safe the old timber shaft. Work was immediately begun on this, the first thing done being to transfer the weight of the shaft from the tops of the sheet-piles to the surface of the ground. This was accomplished by putting in some extra-heavy bearing timbers, 60 ft. long, across the top of the shaft at the surface. The old shaft was connected by twelve 1¼-in. bolts to these timbers. The cross timbers and rails on which the shaft formerly rested were then cut out and the shaft was again suspended from the surface.

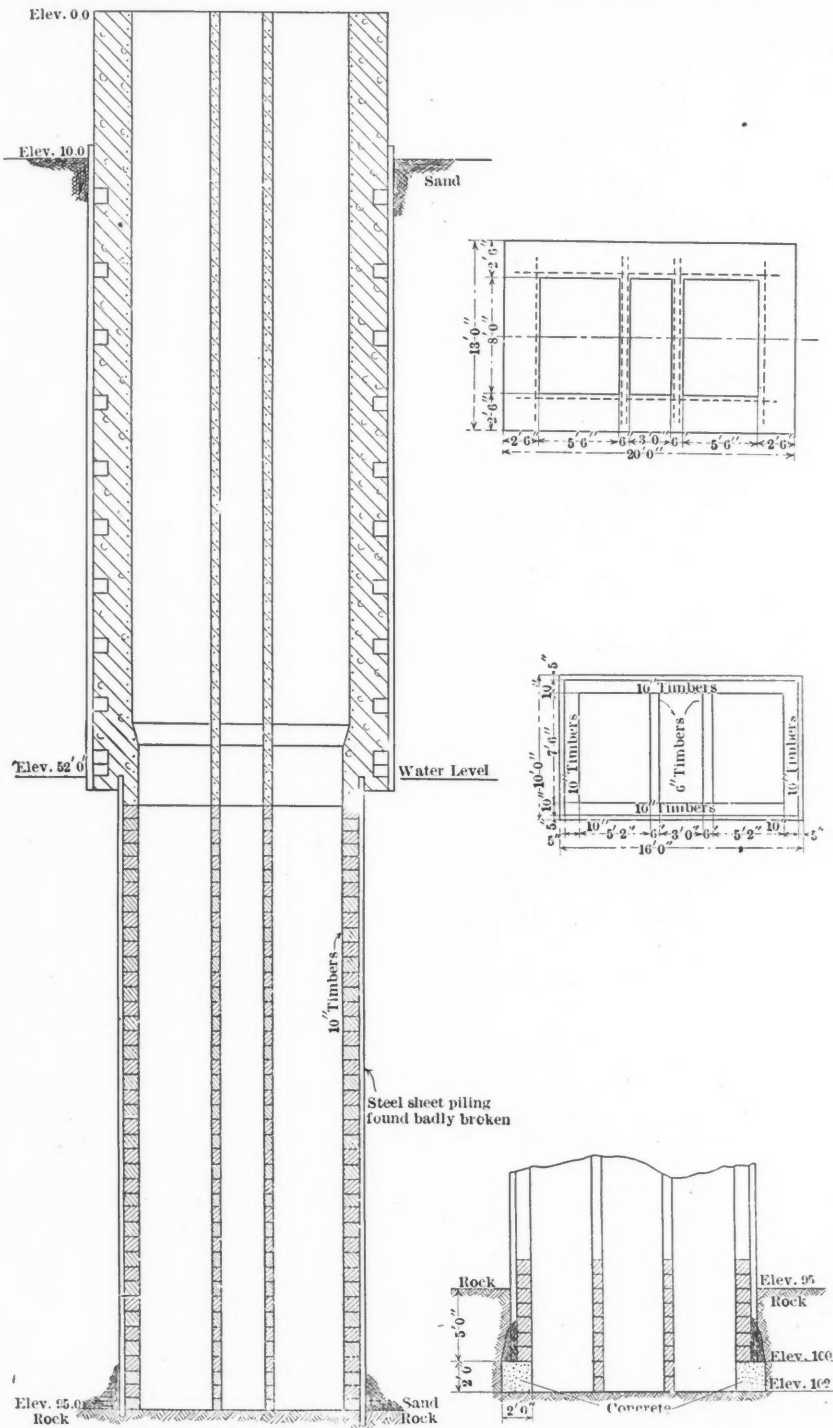
PRELIMINARY WORK

A space 2 ft. in length was now cleared of bracing, broken struts, etc., at the bottom of the timber shaft and a concrete form started to line the shaft. Great care had to be taken in cutting out and shifting the struts and braces to make room for the concrete, which was deposited in sections about 2 ft. high. The timber in the shaft was cracking and moving a good deal of the time while this work was being done, and it was hard to get men to stay in the shaft. A few of the cross braces were concreted in and, after the concrete had set, were cut out and the ends dug out of the concrete, the resulting space being filled with concrete. This work necessarily proceeded very slowly, temporary braces and packs being used and continually shifted. Then, too, the scarcity and poor quality of the only labor to be had contributed to make the work go slowly. On Nov. 9 the concrete lining had reached a point 10 ft. from the top of the shaft and it was then considered to be in a perfectly safe condition.

Horizontal reinforcing rods ½ in. square, spaced 12 in. center to center, vertically, were used in the concrete lining. A recess 6x18 in. was left 1 ft. from the bottom of the side and end walls to permit the concrete roof to be keyed into them.

The shaft was then pumped out to the sand, about 18 ft. below the bottom of the proposed concrete roof, and the work of lining the shaft from this point to the bottom of the roof with 10x12-in. timbers was commenced. This also was a ticklish piece of work, as the bracing then in the shaft at this point had to be removed and solid timbering substituted. The sides and ends of the shaft were lined, starting from the sand, one course or set of timbers resting immediately on the one below it. The joints between the different sets were well calked and hawsed with oakum.

The shaft was braced transversely by two solid walls of 6x12-in. timbers, each placed 1 ft. 9 in. from the center of the shaft. These also served as dividing walls and subdivided the shaft into three chambers, thus: A skip-way at each end 4 ft. 6 in. by 6 ft. 1 in. and a pipe and ladder way 6 ft. 1 in. by 3 ft. 6 in. in the center. In the four corners of the shaft were



CONSTRUCTION OF SYRACUSE SHAFT WHICH WAS SUNK THROUGH QUICKSAND AT BIWABIK, MINN.

to be done under air pressure. The timber was to be thoroughly calked, course by course, until a joint was made between the bottom timber and the ledge. Provision was made to suspend the entire weight of the timber lining from the roof until it rested on the ledge.

from the top of the roof to the surface of the ground. On account of the dangerous condition of the timber shaft and because it had been strengthened from time to time with cross braces, which left very little working room in the shaft, this order of operations was found to be im-

3½x3½x½-in. angles bolted to each set. These secured and braced the ends of the timbers in a satisfactory manner.

The form for the roof was then suspended from 12x12-in. timbers extending across the finished concrete walls of the shaft by twelve 1¼-in. bolts, and work on the concrete roof was started. The roof consisted of a slab of concrete 5 ft. thick, the size of the shaft and extending into the recess left when the lining was built, as before mentioned. The roof was heavily reinforced with 1¼-in. steel bars running horizontally in both directions about 6 ft. center to center. Eight 1¼-in. steel bolts were built into the roof, and after the roof had hardened sufficiently, the weight of the timbering below the roof, which was built on the sand bottom, was transferred to these bolts, so the sand could be excavated below the timber without danger of settlement.

INTRODUCING THE AIR-SHAFT

A section of 48-in. air-shaft had also been built into the roof, and when the concrete had attained sufficient hardness this shaft was continued up to a point 30 ft. above the roof. A Moran air-lock was then connected to the top of the air-shaft, and air was turned into the shaft December 18, 1906.

The work of excavating the shaft and lining the steel sheet-piles was carried on rapidly for 12 ft., although the old crib or timber lining, which was previously mentioned, had to be cut out and sent to the surface. All the timber lining was lowered through the air-lock and shafts from the surface where it had previously been framed. As each stick was put in place it was suspended from the timber above it by 2¼x½-in. iron straps 24 in. long, fastened to each timber by two 7x¾-in. lag-screws. After 10 courses of timber were suspended in this manner, an iron strap of the same dimensions, except that it was enough longer to engage 10 sticks of timber instead of one, was fastened to the wall in the same manner, and the upper end of the roof bolt as a necessary precaution.

The size of the finished shaft inside of the steel sheet-piling was somewhat smaller than was anticipated, and for the first 25 ft. of this work there was a space of from 3 to 6 in. between the timber lining and the steel piling. This space was filled with rich concrete. As this had to be suspended from the roof as well as the timbers, and had to be put in from the bottom instead of the top, it was found to be somewhat difficult. However, the general line of the steel piling slanted toward the center of the shaft, and it was not long before the space inclosed by the piling was none too large to receive the timber lining.

DIFFICULTIES ENCOUNTERED

At this point, 12 ft. down, it was dis-

covered that four of the sheet-piles had landed on a boulder, and had been deflected from their course and, as they were further driven, curled up inside the shaft in almost true circles of from 4 to 6 ft. diameters. These were cut off with pneumatic tools and sinking resumed. On account of the large space left open for the escape of air, caused by cutting out these four piles, and the peculiar nature of the ground, great difficulty was experienced from this point downward to the ledge. It was almost impossible to keep the water and quicksand low enough to get in a set of timbers. In a good many cases this could only be accomplished by the aid of jacks and an air-jet.

More steel sheet-piles were encountered as sinking progressed, piles that had broken away from the general line of the piling, and had been forced into the shaft area. Some of them had to be cut several times as the excavating and timbering proceeded. In all 143 cuts were made in the steel sheet-piles. This, of course, was slow work, as a good many of them had to be cut 14 in. under the surface of the sand and water to allow for placing the timbers.

The work was further retarded by a fire caused by the flame of a miner's candle, and by the breaking down of an air compressor, both happening at different times, and it was not until March 12, 1907, that the ledge was reached.

CONCLUSION OF THE WORK

It was the intention of the contractor to stop the shaft at the ledge and, after making a tight joint with the same, turn it over to the mining company, but on reaching the ledge it was found to be so badly broken up and seamy that it was finally decided to carry the excavation under air into it. After going into the ledge 12 ft. it was thought best to stop further sinking under air pressure and finish the shaft in the open. Accordingly a tight joint was made with the ledge and air was taken off on May 10. The walls of the shaft were found to be tight and in good condition. Very little water came in, and that only in the center of the ledge.

The contractor had a complete modern equipment for the work, consisting of air compressors, pneumatic tools, electric-light plant, etc., besides other plant devices of which the company controls the patents. Very little, if any, headway could have been accomplished without these aids. The Syracuse Mining Company was represented by C. H. Munger, general manager, and the work was done under the direction of F. W. Adgate, superintendent for the Foundation Company.

The Dominion Iron and Steel Company

The report of the Dominion Iron and Steel Company, of Sydney, Nova Scotia, for the year ended May 31 last reviews briefly the difficulty over the coal supply with the Dominion Coal Company. The excess cost of coal used over the contract price of \$1.28 per ton amounts to \$810,713, which sum has been charged to a special account against the coal company, as part of the damages claimed from it. Including this amount the earnings of the year were \$2,247,536, or \$1,563,151, after deducting interest charges. Of this \$810,713 was transferred to contingent account, to offset the charge against the Dominion Coal Company, leaving \$752,437 available for the making up of deficits, etc., a credit balance of \$318,711 remaining. The increased volume of business and reserve stocks of pig-iron and billets account for assets in liquid assets of \$447,863, current liabilities being a little higher. The net indebtedness was \$192,221 less than the previous year. Expenditures on capital account amounted to \$306,355, including the bessemer plant, coke ovens and development of ore deposits at Wabana. Exploration has shown the ore property there to be much more extensive and valuable than was originally estimated, and capable of furnishing a very large supply of ore which can be mined at a reasonable rate.

Opinion on Idaho Corporation Tax Law

Robert Lansdon, Secretary of State of Idaho, in reply to an inquiry concerning the application of the new law of that State requiring a license from incorporated companies, states that after consultation with the attorney-general he had arrived at the following conclusions:

"1. Only corporations doing business are subject to this law.

"2. Only corporations having a capital stock and doing business for profit are subject to this law.

"3. Charitable, religious, scientific and literary corporations, either foreign or domestic, are not subject.

"4. If a corporation is not legally dissolved, or still does business under the corporate name, or receives the benefits of a corporation doing business, it is subject to the law.

"5. Mines that are not productive, or mines that are not producing ore for shipment or milling purposes, do not come under the provisions of the law—in other words, no mining properties or prospects that are in a state of development are subject to the law. I take it that it means just those that are paying properties."

Experience with Gold Dredges at Ruby, Mont.—II

Electric Power Has Been Found Superior to Steam, Having a Surer, Steadier Pull and Working Effectively in Cold Weather

BY J. P. HUTCHINS*

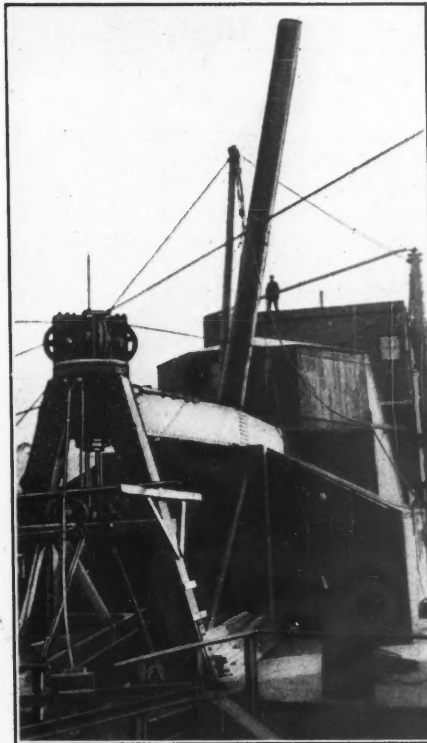
In the gold dredges at Ruby, Mont., which were described in an earlier issue, experience with the buckets, tumblers and ladders has been similar to that of other dredging districts, and from the light buckets first used has been evolved the present 7.5-cu.ft. bucket weighing 1400 lb., with 4 $\frac{5}{8}$ -in. pins, the 10-cu.ft. bucket on No. 2 dredge, weighing 2100 lb., with 4 $\frac{3}{4}$ -in. pins, and the 12.5-cu.ft. bucket on the No. 3, weighing 2800 lb., with 5 $\frac{3}{8}$ -in. pins. Manganese steel pins and bushings were first used and various other steel alloys have been tried; but now locomotive-tire steel pins and manganese steel bushings are used, as they have been found to give the best satisfaction. Multiple eye articulations, with two on the male and three on the female, are used most successfully. Complete spare bucket chains are kept on hand and each chain is considered and treated as a unit in repairing and renewing. This method has for its object maintaining a uniform bucket pitch in all the elements of the chain and thus preventing excessive wear on the bucket bottoms and tumbler faces by slipping, as results when the uniformity of pitch is destroyed. Another method for accomplishing the same end is by shimming up between the tumbler and its wearing plates as the bucket pins and bushings wear. In this way the tumbler faces are kept up, and though the pins and bushings wear and pitch is increased, the relation of buckets to tumbler faces is as if the buckets and tumblers were new, and no slipping occurs. These features are excellent.

LUBRICATION OF BUCKET BEARINGS

A successful means has been evolved for keeping the lower tumbler boxes lubricated. Protecting rings on the tumbler boxes, so arranged as to take the side thrust of the tumbler while side feeding, have annular spaces which are packed with flax packing; the outer ends of the boxes are capped. Engine oil is used and excellent results are had. The bearings of the rollers on the bucket ladder are also protected and lubricated successfully in a similar way.

Such success has been attained in lubricating these bearings that it can be predicted, with a fair amount of certainty, that lubricated dirt-proof bearings for bucket pins are a promising development of the future. The same device can be

applied to bucket pins; considerations of economy and expediency are all that prevent. With lubricated lower tumbler bearings, lubricated bucket pins and shimmed tumbler faces, the only great wear of the future dredge bucket having these features would be that of the lips. This may seem optimistic, but after the success at Ruby it seems not only possible but likely that the same ingenuity and resourcefulness that have developed the dredge to its present efficiency under tremendous disadvantages will result in an efficiently lubricated bucket articulation not like the "patent dirt-proof articulation"



MOORING APPARATUS AND STEEL SUPER-STRUCTURE

tion" and "protecting bearings" advertised so extensively, but actually dirt proof for an inconsiderable time at best. Such a device would reduce operating cost materially. Bucket pins and bushings have been designed and used at Ruby so that their life bears a certain relation to each other, thus permitting systematic method in renewals.

BITING EDGES—LADDERS

Teeth of numerous types, with different shapes and angles of the biting edges, have been tried, but all have been discarded after a great deal of experiment-

ing, as it was found that they gave no noticeable aid in excavating. Bucket rollers of various materials have been tried, manganese steel being one of the alloys; white iron is now used. Bucket lips of cast manganese steel are used; those for the 12.5 cu.ft. buckets weigh 500 lb. each.

Some difficulty has been experienced with the dredge ladders, and checking and cracking have been a feature of one of them. This ladder is a trussed I-beam of bessemer steel. It is thought that this kind of steel is inferior for such purpose and that open-hearth steel is superior. The ladder for the No. 3 dredge is a lattice girder in which a large number of angles enter as elements; it weighs 40 tons.

A device for preventing the loss of material spilled from the buckets is in successful operation on all the dredges. The two sides of the ladder are connected on the bottom faces by a sheet and a stream of water from the upper end keeps this clean. Material washed down is discharged on both sides of the buckets about to round lower tumbler, by a device similar in shape to the roof of a house, and at such a point as to insure its being picked up in feeding laterally. Considerable experimenting has been done with bucket castings; in one instance annealed and unannealed castings were used in the same bucket chain; no difference in wearing quality and strength was distinguished.

SCREENING AND SLUICING APPARATUS—TAILING DISPOSAL

Trommels with rectangular orifices are used. They are set level, with a spiral to advance material through them. They have cast manganese-steel wearing plates and friction rollers (ordinary car wheels) for driving them. There are no pipes in the screens, but water is fed into them from both ends in large volume from centrifugal pumps, but not under pressure. It is probable that a screen pipe with several powerful jets would be more advantageous in washing the sticky material encountered. Oversize goes overboard on both sides of the dredge.

Fine material drops into a sluice paved with strap longitudinal and transverse angle-iron riffles. Quicksilver is used. The sluice has a 7 per cent. grade. The No. 3 dredge has a sluice 66 in. wide and 135 ft. long, and uses 12,000 gal. of water per minute. Clean-ups are made every 10 days.

Tailing is discharged so as to leave

*Mining engineer, No. 52 Broadway, New York. The first article of this series was published in the JOURNAL of June 29, pp. 1223-1226.

open water between it and virgin ground at the sides of the cut, thus preventing loss; an expansion of less than 5 per cent. occurs. As with all dredges using the wet method of tailing disposal, the pond must be kept nearly full, and some difficulty has been experienced when it was not possible to do this. Thus a considerable difference is noted when the

often lets go, showing the great power required in excavating.

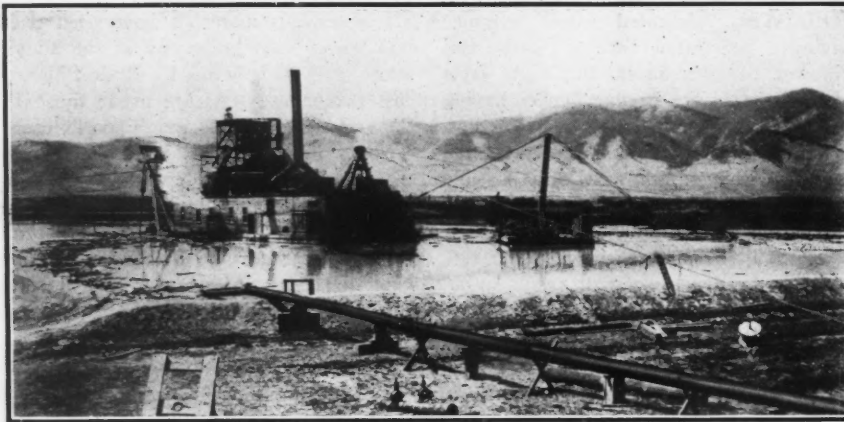
This dredge is 130x48x7 ft. 7.62 in, with a 4-in. crown to the deck. About 400,000 ft. of lumber, board measure, were used in its construction; a total weight of about 1000 tons of structural material (lumber, steel, bolts and machinery) were needed.

is not sufficient to sluice all the material that can be excavated. Changing to the table system, so as to require less water and consequently less power, is being considered. The wear of ruffles is now a considerable cost item; changing to tables would reduce this.

STEAM VS. ELECTRICITY

Wood was originally used; now coal is had at the dredges for \$4.90 per ton and electricity at about 1c. per kw-hour will soon be available. About 15 tons of coal are burned per day per dredge. The No. 3 dredge has motors, one of which—the 150-h.p. bucket-drive motor—is located on an iron superstructure at the same elevation and behind the upper tumbler shaft, and is geared to it through two intermediate shafts and a slipping friction. This is a distinct innovation and if it works satisfactorily it will probably mean its adoption elsewhere. Belts have not proved altogether satisfactory, but they have been generally used on digging motors in preference to gears, as they have an element of safety in their tendency to slip when the buckets encounter obstructions. It is interesting to note that this motor is about 35 ft. above water level. The floor of the pilot house is about 40 ft. above water level.

Numerous visitors to Ruby, particularly those from Oroville, have criticized the use of steam power. It was formerly thought at Ruby that steam was essentially the best power for excavating the tenacious gravel encountered. Electricity has some of the



ARRANGEMENT OF MOORING LINES

dredges work down stream, and as a result have about 2 ft. less depth of water than when working up stream or across stream.

UNUSUAL FEATURES OF DESIGN

It has been attempted in many designs of dredges to localize as much as possible the great strains, stresses and shocks which result in the excavation of gravel and in holding the dredge against the digging bank. With the dredge having a single pivotal digging spud, conditions are at the worst, for the shocks are transmitted to the extreme stern (the spud being located at that point) through the digging machinery and ladder, main gantry, hull and spud frames. A number of stresses difficult to foresee in designing and hard to provide for in construction and maintenance result and a heavy machine must be provided from the lower end of the digging ladder throughout the course traveled by the stresses. Where insufficient provision is made, remarkable hull distortions and consequent difficulties result.

It was with the idea of improvement in this regard that a very unusual feature was introduced in the design and construction of No. 3, the dredge with 12.5 cu-ft. buckets. The upper tumbler framing is connected directly to the A frame, from which the mooring lines lead, by a substantial steel superstructure. The 150-h.p. bucket-drive motor is located on this superstructure immediately behind the upper tumbler. In this way shocks are localized to a remarkable degree. This motor is geared to the upper tumbler shaft through two intermediate shafts, a slipping friction, and a circuit-breaker set at about 300 h.p. The circuit-breaker

This dredge began operating early in September, and has been running about 80 to 85 per cent. of the time. The geared connection of the 150-h.p. motor to the upper tumbler has worked very well. All of the gearing, except the 13-ft. gear wheel on the upper tumbler shaft (which is slightly out of line) meshes nicely. The slipping friction works but not as



BUCKET LINE, SHOWING TEETH

easily as with a belted motor drive, and its consequent elasticity.

About six to nine buckets per minute are discharged when excavating bottom and top gravel, respectively. On the No. 3 dredge there are three centrifugal pumps, respectively 10 in., 12 in. and 14 in. in size. The water supplied by them

same disadvantages while driving the buckets of a dredge as it has when used in hoisting from mines. Under the unique conditions at Ruby and with one dredge electrically driven and two steam-driven, a basis of comparison is available.

It has been found that electric power is superior to steam by comparing the work-

ing of the new dredge with that of the old ones. It has a steadier, surer pull, with much less stalling action, and but slight variation in the chain speed in hard digging is noted. The buckets seem to fill more satisfactorily and there is much less racking, jerking and jarring. The ammeter of the digging motor fluctuates between 130 and 150 kw. It may be said that, from the mechanical and economical viewpoints, electricity is superior to steam in the dredging operations at Ruby.

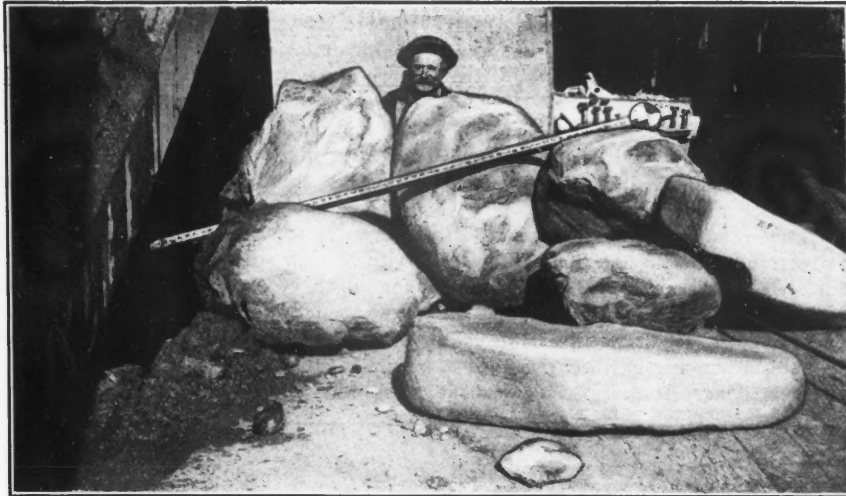
There seems to be an excessive amount of power used on the No. 3 dredge when compared with the No. 2 dredge, which has 10-cu.ft. buckets and uses about 75 h.p. in digging alone. It may be explained by noting the heavier bucket-drive machinery, the heavier bucket chain used and the steadier and more uniform speed, although this is hardly satisfactory as an explanation.

WINTER WORK

The Ruby dredges are the first to run throughout the winter in such a cold climate. In attempting this procedure, the same commendable initiative manifest in other ways was shown. The successful result signifies that with similar practice, particularly when electric dredges having belt slackers are used, dredging can be made a twelve-month operation in nearly every part of the United States. The Ruby operators have demonstrated that dredging can be conducted in almost as cold a climate as that in which a quartz mill can be operated. Formerly it was

meter is 25 to 35 deg. below zero, Fahrenheit. The steam dredges have warmed their ponds with the water of condensation and have also used live steam in combating frost and ice. Ice is also chopped from the sides, ladder and chutes. The dredges are manipulated during the cold weather so as to keep the parts most likely

many years. The temperature was continuously near zero during January and at times as much as 30 deg. below zero, F. The temperature of the dredge pond was 34 deg. F. and the pond was kept from freezing over at times only by moving the dredge about. It was extremely difficult to dig into the corners of the cut by rea-



BIG BOULDERS. THE ROD IS 6.15 FEET LONG

to freeze well exposed to the sun. The ground to be dredged is kept flooded and thus does not freeze. The dredge pond does not freeze if operation is continuous. Amalgamation does not proceed to as good advantage when the water is cold, but the inferiority does not seem to affect the percentage of extraction materially. The

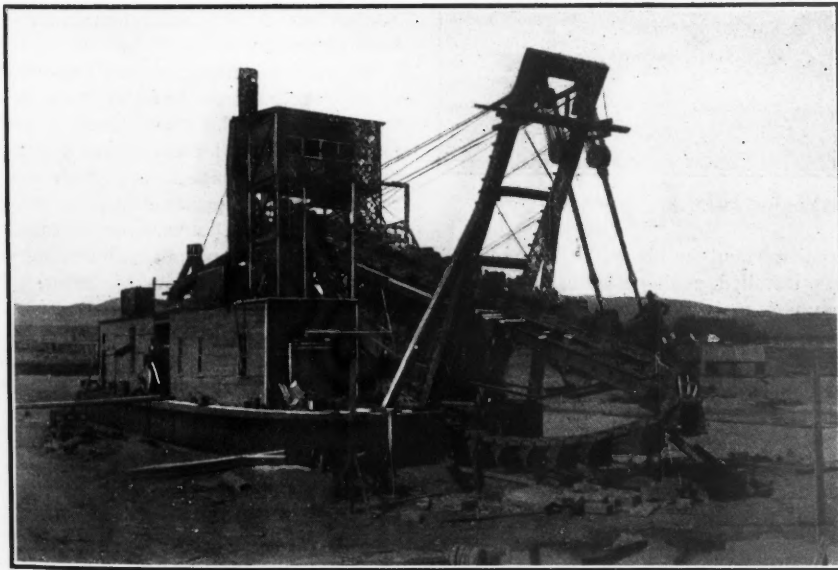
son of the large accumulations of floating ice. The accompanying illustrations show winter conditions very well and also illustrate how the ice accumulations on the hull make the No. 3 dredge draw more water and consequently reduce its freeboard. This amounted at times to about 25 per cent. of the normal draft of the dredge.

Some of the greatest difficulties due to the very cold weather have been mentioned. Ice accumulated to such a depth on the ladder that the ladder rollers were out of sight and the buckets slid over ice. Sheaves froze solidly, frozen material accumulated in the hopper, the outboard pump suction froze if the dredge was shut down for long, and inside small pipes and valves froze and burst. In January about 5 per cent. of the total lost time was due to the excessive cold; the dredge operated 72 per cent. of the time during the month of January.

CAPACITIES

Generally about 1.4 kw.-hours of electricity are used per cubic yard dredged. In January 1.7 kw.-hours of electricity per cubic yard were used. In April only 1.25 kw.-hours were consumed, but the material excavated was less indurated. The total amount dredged in January was 81,000 cu.yd. in 539 hours; the total for April was 108,000 cu.yd. 599 hours. It is thought from the experience of last winter that it will be advantageous to heat the dredge pond during very cold weather, although it will not be absolutely necessary to do so.

No. 1 dredge, which has 7.5-cu.ft. buckets digs about 1800 cu.yd. per day. No. 2 with 10-cu.ft. buckets, 2300 cu.yd. per



DREDGE NO. 2 READY FOR FLOATING

thought that a dredge must be shut down about the time other placer-mining operations ceased, and it was because of this belief, rather than any other reason, that dredges in many instances were idle during four or five months each year. This has all been changed.

It is not an easy matter to operate during the coldest weather, when the ther-

amalgam is softer and it takes more mercury to do the same amount of work during cold weather.

The No. 3 dredge which is electrically operated has a boiler and steam piping to provide warmth for the dredge-men, hot water for clean-ups, and heat for the false-bottomed sluice.

Last winter was one of the coldest in

day. No. 3 with 12.5-cu.ft. buckets handles 3300 cu.yd. per day at a cost of 8c. per cu.yd. including depreciation, salaries, general expense, etc. While these yardage figures seem small as judged by Californian standards it must be remembered that there is a difference in the character of the respective gravels. A lack of coördination between the digging, screening and sluicing phases has a bearing in this regard in reducing the excavating capacity.

MINOR DEVICES

Among the most convenient is a telephone system to the dredges. An ingenious device allows considerable moving ahead before attention need be given to it to rearrange the connection with the shore. It has been found that a blow on the bucket lips as they are rounding the upper tumbler facilitates discharge. A small steam hammer has been installed to do the striking. It gives a blow about

the dredge. No. 2 dredge formerly had 6 in. crown to the deck; it now has 6 in. cup, making a total distortion of 12 in.; as a result the well of this dredge is 12 in. wider at the bow than it was originally.

MANIPULATION

There are no radical modifications in this respect. Side feeding is used, but the depth of lowering the buckets each time varies greatly, from several feet in the loose top material to only a few inches in the tenacious bottom gravel. Side feeding is done with the engine running at constant speed and the friction clutch slipping much of the time. The dredge crews formerly worked 12-hour shifts with 30-min. stops at noon and midnight for oiling, etc.; of the 23 hours' running time about 10 to 15 per cent. is lost. Now three eight-hour shifts are used and no regular stops are made.

As the Conrey company does its own

contact with other dredging operations, little provincialism is encountered. The dredging industry owes much to Montana; formerly, operators at Bannack solved many problems and now those at Ruby, in a most admirable spirit, are continuing the good work.

Black Mountain Mining Company

The second report of the Black Mountain Mining Company, which owns the capital stock of the Banco del Oro Mining Company, operating the Cerro Prieto gold mine, 36 miles southeast of Magdalena, Sonora, Mexico, shows assets of \$2,752,498 and states that the cyanide plant at the mine is treating between 400 and 500 tons per day, partly ore and partly old tailings. Since its completion the cost of operation has gradually been reduced from \$3 to \$2.43 per ton of ore.

Contracts have been let for equipment to increase the capacity of the plant to approximately 900 tons per day. Tube mills will be employed to relieve the 120 stamps of fine crushing, practically doubling the tonnage per stamp.

The main tunnel of this mine, 7x11 ft., has been driven 2000 ft. on the vein and continues in ore unbroken. Steel ore cars of 4 tons capacity are handled by an electric locomotive. The average assay value of all ore milled, including old tailings, shows a yield of \$5.30 per ton, \$4.70 gold and 60c. silver. The vein ranges in width from 7 to 40 ft. Up to March 1, 1907, 104,546 tons of ore and old tailings had been treated.

A pumping station has been constructed at the San Domingo river, 2½ miles from the mine and mill. An electrically driven Gould triplex pump delivers water through an 8-in. pipe to the reservoir. A concrete dam at the mine, with a capacity of 27,000,000 gal., is used for storage.

Power for all purposes, including the light for the village at the mine; now numbering about 2500 inhabitants, is furnished by an electric-power plant at Magdalena. This plant is equipped with 1000-h.p. Babcock & Wilcox boilers and two Westinghouse-Parsons turbo-generators of 670 h.p. each.



DREDGE IN WINTER, SHOWING METHOD OF SHIPPING BUCKETS

equal to that of a man with a 10-lb. hammer and it works well. I observed the action in loosening adhesive material and it was effective. It seemed to have had no bad effect upon the buckets, although it has caused a loosening of the rivets holding the lips on the hoods.

HULL CONSTRUCTION

A new feature to prevent spreading of the bow pontoons has been introduced in the hull of No. 3; it consists in hog rods crossing diagonally just aft of the well and fastened to the outside of the hull, thus tying the two sides together. Some difficulty has been experienced in the well spreading, because of the great weight of the ladder and buckets and by pulling the dredge laterally from the hull and not from the ladder in feeding the buckets. A considerable hull distortion has occurred in "cupping," caused by the great weight of the ladder and buckets being sustained near the median line of

repairing and builds its own dredges, it has installed a shop having besides the common tools a 250-ton hydraulic press. In building the No. 3 dredge, compressed air for riveting and a steam derrick were used to good advantage.

ALTERATIONS

It is likely that dredges No. 1 and No. 2 will be changed to the stacker and table type with spuds. They are also to be converted to electric power. All these changes are, of course, to lower dredging cost. No. 1 dredge is eight years old and its hull is in a dubious condition. No. 2 hull is badly distorted and it is possible that neither of these hulls will be used and new dredges may be installed.

All interested in dredging should visit Ruby. Besides seeing a number of features different from other dredging fields, a vast amount of useful information is given in a most generous way. Though they are isolated at Ruby, and thus not in

Mineral Exports of Brazil

According to official statistics the mineral exports from Brazil in 1905 and 1906 were as follows:

	1905.	1906.
Gold (bar & scrap)	3,881(a)	4,568(a)
Diamonds	\$449,172	\$1,055,444
Carbons	356,784	992,164
Precious stones	278,925	438,750
Crystal	57,363	32,978
Monazite	4,437(b)	4,352(b)
Graphite	3,395(a)	2,563(a)
Manganese	224,377(b)	121,331(b)
Mica	1,358(a)	6,123(a)
Copper ore	658(b)	1,484(b)
Platinum	72(a)	....

(a) Kilograms. (b) Metric tons.

The Turned-back Shaft at the Salisbury Mine

By REGINALD MEEKS

The Cleveland-Cliffs Iron Company, at Ishpeming, Mich., was confronted at the Salisbury mine, with a problem for which there were but two solutions. The ground had caved under the engine-house and the

So far as is known, this kind of shaft is unique in mining practice.

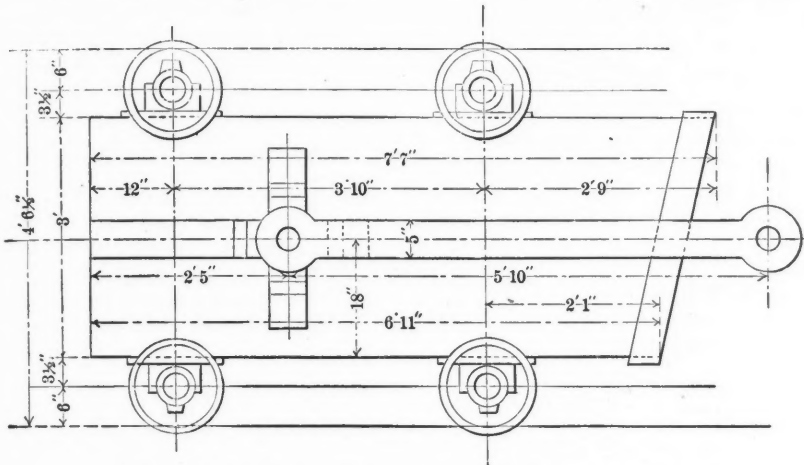
INCLINATION OF THE SHAFT

From the lower workings the shaft comes up along the foot at an angle of 52 deg., then turns into the vertical for 50 ft.; it then turns back and enters the shaft-house at about 52 deg. On account of these turns an eight-wheeled-skip is required, the details and dimensions of

over sheaves sunk so that the skip will clear them. The shaft has two sets of tracks, those on the hanging side acting merely as guides until the vertical section is reached when they come into active service, and at the last incline they carry the whole load. Above ground only one set of tracks is necessary. The skip, therefore, comes up on one set of wheels to the vertical section and, at the last turn, it turns over and finishes on the other set of wheels. By constructing the shaft in this manner, the ore is dumped directly into the pockets and from these into the cars below.

It is an undecided question whether this double turned shaft has or has not proved more costly than the transfer of the ore on a trestle would have been. The double knuckle in the shaft has caused considerable trouble, and the speed of hoisting is necessarily reduced. Constant attention is necessary to keep the shaft in alinement, and it is probable that these considerations more than offset the extra handling of the ore.

The widespread and abundant occurrence of zinc in the ores of the Rocky Mountains is indicated by the slags made in silver-lead smelting in the United States, which average about 6 per cent.

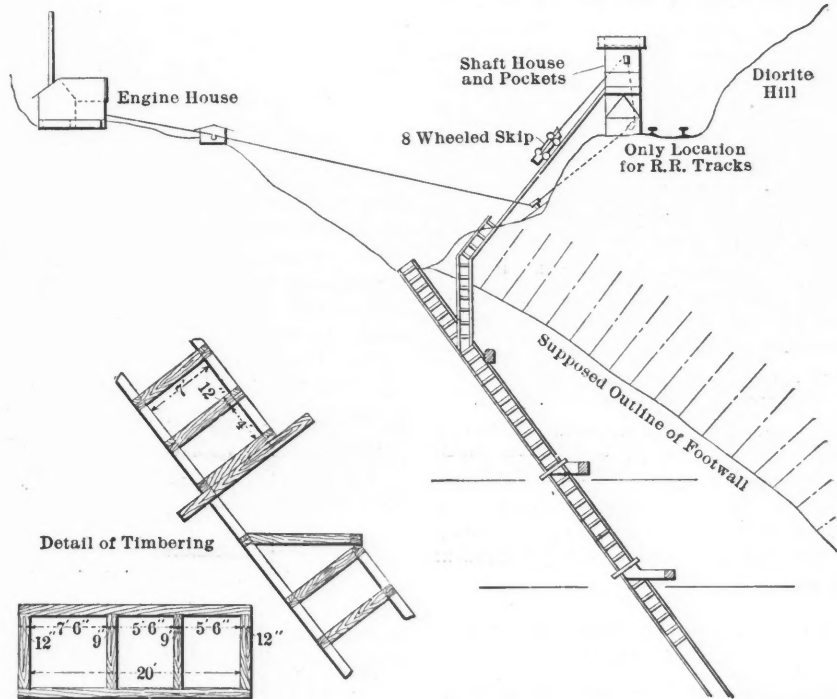


DETAILS OF EIGHT-WHEELED SKIPS, SALISBURY MINE, ISHPERING

buildings and shaft were ruined. As the former location was impossible, a new site was necessary. The mine lay between two diorite bluffs, with a moderately deep pit between. Alongside of one of these hills was the only possible location for the railroad tracks and ore-pockets. If the shaft was brought up along the footwall and continued above ground, the shaft-house would have to be placed on the hill opposite to the pockets, a trestle built and the ore transferred a distance of about 400 ft. It was believed that this would be costly and slow so, in 1897, Capt. Arthur Buzzo decided to bring the shaft up along the footwall to within 50 ft. of the surface, then turn it to a vertical position, and at the surface turn it back upon itself and continue up to the pockets.

METHOD OF CONSTRUCTION

Instead of sinking from the surface, cross-cuts were run from the old workings, and from these openings the shaft was driven up in several sections, each being cut simultaneously. The location of the shaft was in the solid diorite footwall, 200 ft. from the ore formation, which gave rigidity and permanence, and at the same time the orebody was easily reached by crosscuts. Timber was placed in the several sections, and tracks laid as the work progressed, and where the sections were connected it was found that the timbers checked within a small fraction of an inch, and the rails showed no appreciable deflection. The lines were all furnished by the company's engineers, and this shaft and its equipment furnish an example of originality and skill in mine engineering.



SECTION THROUGH NO. 5 SHAFT, SALISBURY MINE, ISHPERING

which as well as the details of timbering and a section through the shaft, are shown in the illustrations.

The haulage rope runs from the engine and hoist-house, down the slope of the hill to an inclined sheave, then up to a second sheave, located near the bottom of the shaft-house; it then goes over a third sheave, and is connected to the skip. At the two turns in the shaft the rope passes

zinc oxide, or approximately 5 per cent. metallic zinc. Estimating the smelting of 2,000,000 tons of ore per annum, which is considerably under the quantity now actually treated, and a product of 0.9 ton of slag per ton of ore, there is annually discarded in this form about 90,000 tons of zinc, which is the result after that ore has been so far as possible culled out by the miner, or left behind in his stopes.

Practical Experiments in Coal-mine Ventilation

A Series of Mine Tests Made for the Purpose of Investigating Disputed Points Concerning the Action of Fans

B Y W . D . O W E N S *

There has long been a desire to increase the mechanical efficiency of the ventilating fan. In order to throw light upon this important subject, I made recently a series of tests, which are summarized and discussed in this article.

GREATER VOLUME OF AIR WITH CONSTANT SPEED CAUSES GREATER AIR DEPRESSION

I was not able, during the tests carried on, to get a diagram of the average steam pressure on the piston, nor was I interested much in this matter, since from long experience I have observed that whenever a greater volume of air is admitted into the fan, when running the same number of revolutions per minute, the air depression is reduced, and the engine itself requires more steam admitted into the cylinder, to enable it to keep up the same velocity. And this was the case here; for when running the fan at 25 r.p.m. in the fourth test, it required more steam admitted into the cylinder than when running 25 r. p. m. in the first test in vacuum. In the first test there was nothing but pressure developed, but in the fourth test there was 69,740 cu.ft. of air passing through the fan, and yet, there was no visible depression in the water-gage. Again, when the fan in the fifth test was running 51½ r.p.m., it produced 136,800 cu.ft. of air, and yet there was but 0.06 in. water-gage, and which, according to the rule, produced

$$\frac{136,800 \times 0.06 \times 5.2}{33.0} = 1.29 \text{ h.p.}$$

While in the seventh test made, much less steam was admitted into the cylinder to make 50 r.p.m., than was admitted during the fifth test, and yet according to our formula, 8.22 h.p. was produced in the air.

UPON OPENING ALL DOORS, THE FAN SLOWS DOWN

In another test made, which is not mentioned in the series of tests here given, a 20-ft. fan was running 78 r.p.m. and producing 1.2 in. water-gage, and by very careful measurement of the air current, in the airway about 100 ft. from the foot of the shaft, 97,200 cu.ft. of air was circulating per minute. Upon opening all doors inserted in the casing connecting the fan with the shaft on the outside, the water-gage indicated 0.4 in., and the fan dropped

its number of revolutions from 78 to 67, with the same pressure precisely indicated upon the steam gage. Now it is evident, and is proved, in the foregoing tests, that the quantity passing through the fan under the latter condition, was as follows: $\sqrt{0.4}$: 97,200 cu.ft. :: $\sqrt{1.2}$: 161,352 cu.ft., or a pressure of 2.08 lb. per sq.ft., therefore, developing in the air;

$$\frac{2.08 \times 161,352}{33,000} = 17.17 \text{ h.p.,}$$

while with normal conditions the pressure was 1.2 in. or 6.24 lb. per sq.ft., and therefore, developing

$$\frac{6.24 \times 97,200}{33,000} = 18.38 \text{ h.p.,}$$

and consuming precisely the same quantity of steam per minute. In another test with the same fan running 49 r.p.m. and producing 0.45 in. water-gage; all doors were again opened, with the result that the fan slowed down to 42 r.p.m., with the same steam pressure indicated upon the steam gage.

NO STANDARD RELATIVE HORSE-POWER

This is sufficient I think, to prove that there is no such thing as a "standard relative horse-power" between that developed in the steam engine of a fan, and the horse-power produced by the depression and volume of air in circulation, except under the same conditions.

The following tests were made on the new mine ventilation fan installed at the Exeter Colliery of the Lehigh Valley Coal Company. A test was made and taken of the said fan May 9, 1905; the dimensions being as follows:

DIMENSIONS

Radius of fan 10 ft. 1 in.; length of blade on radial line, 5 ft. 9 in.; length of blade on arc line, 6 ft. 1 in.; width of blade, 6 ft. 8 in.; width of pit circle, 6 ft. 11 in.; area of blade on radial line, 38.29 sq.ft.; area of blade on arc line, 40.55 sq.ft.; diameter of ports of entry (2), 10 ft.; dimensions of port of discharge at point of cut-off = 6 ft. 11 in. x 5 ft. 2¼ in. = 36.16 sq.ft. or only 23 per cent. of the area of the ports of entry.

Dimensions of top of chimney or outlet, after the same had been lined with flooring on the back part, because it had too much taper, causing the current of air to whirl, and return downward or backward; = 6 ft. 11 in. x 6 ft. 4 in. = 43.75 sq.ft. The fan casing has

one large explosion door, and directly over the shaft has two small bucket doors, dimensions of one of the latter = 7 ft. 6 in. x 2 ft. 8 in. = 20 sq.ft.; temperature = 69 deg.; barometer reading 29½ in. Arc of blade being forward in motion and tangent to "cut off."

FIRST TEST MADE IN VACUUM

Fan running 25 r.p.m. in vacuum, observed water-gage = 0.25 in., read off from three water-gages. Theoretical water-gage for the velocity, according to Murgue, = 0.30 in., therefore the fan produced 83 per cent. efficiency of depression.

SECOND TEST MADE IN VACUUM

Fan running 50 r.p.m. observed water-gage = 1 in. (one of the water-gages read about 0.96 in.). Theoretical water-gage for the above velocity = 1.2 in., therefore, fan produced 83 per cent. efficiency as in the first test. The velocity was here double that of the first test, so as to prove the perfect ratios of pressures between such velocities.

THIRD TEST MADE IN VACUUM

Fan running 106 r.p.m. in vacuum, observed water-gage = 4.3 in. Theoretical water-gage for the above velocity = 5.4 in., therefore, fan produced 80 per cent. efficiency. To run the fan this number of revolutions per minute, the engineer had to hold the steam governor weight in his hand, and therefore the difficulty of keeping the engine at a permanent speed may account for the drop in the percentage of efficiency.

FOURTH TEST IN OPEN ATMOSPHERE

Fan running 25 r.p.m. in open atmosphere, all doors wide open, and all windows taken out, so as to relieve the air current from any resistance in entering the fan. Observed water-gage = 0 in. Quantity of air delivered = 69,740 cu. ft. per minute. If the periphery speed is multiplied into the area of blade on arc line, the quantity should read as follows: 1583.25 x 40.55 = 64,200 cu.ft. per min. The fan, therefore, produced 8.5 per cent. above this theoretical standard. The theoretical water-gage should read 0.305 in., which was entirely consumed in passing the above stated volume of air through the fan itself.

FIFTH TEST AT HIGHER SPEED

Fan running 51½ r.p.m., same conditions as in test No. 4. Observed water-

*Division superintendent, Lehigh Valley Coal Company, Pittston, Penn.

gage = 0.06 in. Theoretical water-gage for this speed should read 1.29 in., therefore the observed water-gage indicated about 4.6 per cent. of the supposed theoretical, and produced 136,800 cu.ft. of air per minute. The quantity the fan should produce by multiplying periphery speed into area of blade = 132,250 cu.ft. Hence, the fan developed 3.4 per cent. above this calculated standard. In the fourth test we find that the product of air = 8.5 per cent. above the same standard: But in this test we find that 4.6 per cent. of its theoretical depression was absorbed in forcing the air into the fan; and to nearly the same ratio the loss in the quantity of air is equal.

SIXTH TEST, LOWER SPEED

Fan running 30 r.p.m., with but one bucket door open, area = 20 sq.ft. Observed water-gage = 0.35 in. Theoretical depression for 30 revolutions should read = 0.44 in. Therefore the fan developed a mine water-gage = 80 per cent. of its initial depression, and produced 31,150 cu.ft. of air per min. or 40.4 per cent. of the quantity the periphery speed into area of blade should have developed. And since the fan produced 69,740 cu.ft. at 25 r.p.m., when the initial water-gage was completely absorbed in passing the said volume through the fan itself, and which read 0.305. The depression required to pass 31,150 cu.ft. should read as follows: $69,740^2 : 0.305 \text{ in.} :: 31,150^2 : 0.66 \text{ in.}$ The mine water-gage developed $0.35 \text{ in.} + 0.06 \text{ in.} = 0.41 \text{ in.}$ or a loss of 7 per cent. Considerable of this percentage might have occurred in not being able to read the mine water-gage closer.

SEVENTH TEST, HIGHER SPEED

Fan running 50 r.p.m. with but one bucket door open. Observed water-gage about 0.97 in., theoretical depression for this velocity should read 1.22 in., therefore, fan absorbed 0.25 in. water-gage, and propelled 53,800 cu.ft. of air per min., or 42 per cent. of the periphery speed into area of blade, or nearly 39 per cent. of the quantity the fan propelled when perfectly free from mine resistance. And since the depression required in fourth test, to pass 69,740 cu.ft. through fan itself read 0.305 in. The pressure required for this quantity, 53,800, should read thus: $69,740^2 : 0.305 \text{ in.} :: 53,800^2 : 0.182 \text{ in.}$ and $0.97 \text{ in.} + 0.182 \text{ in.} = 1.152 \text{ in.}$ Again a loss of about 6 per cent. The fan developed a mine depression of 79 per cent. of its initial pressure.

EIGHTH TEST WITH ONE BUCKET DOOR OPEN

Fan running 78 r.p.m., with only one bucket door open, area = 20 sq.ft. Theoretical water-gage should read 2.968 in., observed water-gage = 2.20 in., therefore, fan absorbed = 0.768 in. of its initial depression, and produced 89,810 cu.ft. of air per minute. The quantity of air the

fan should produce on periphery speed into area of blade should read 200,000 cu. ft. Therefore fan developed nearly 45 per cent. of this standard. The depression required to pass 89,810 through the fan, reads as follows: $69,740^2 : 0.305 \text{ in.} :: 89,810^2 : 0.506 \text{ in.}$ and $2.2 \text{ in.} + 0.506 \text{ in.} = 2.706 \text{ in.}$ or 91 per cent. of the initial water-gage, a loss therefore of about 9 per cent. The mine water-gage equals about 74 per cent. of its theoretical pressure.

NINTH TEST, BUCKET DOORS OPEN

Fan running 41 r.p.m., having two bucket doors open, area = 40 sq.ft. Theoretical depression for this speed = 0.82 in., observed water-gage 0.45 in., and produced 78,190 cu.ft. of air per minute.

The depression necessary to pass this volume through the fan should read $69,740^2 : 0.305 \text{ in.} :: 78,190^2 : 0.383 \text{ in.}$, and $0.45 \text{ in.} + 0.38 \text{ in.} = 0.83 \text{ in.}$, which is practically the same as the theoretical water-gage required. The quantity of air the fan should have developed on periphery velocity into area of blade = 105,200 cu. ft., therefore, fan produced about 74 per cent. of this standard, and developed a mine water-gage of 55 per cent. of the theoretical depression. Any fan developing 83 per cent. efficiency of depression in vacuum upon the principles of Murgue's theory is certainly a great success.

All air measurements were taken three times for each, and measured in eight different places on top of the discharge chimney. The following persons were present when tests were made: D. P. Thomas, mine foreman; William Matthews, mine foreman; R. A. Mulhall, outside foreman; A. H. Browning, clerk; and W. D. Owens.

Marshall's Discovery of Gold

By R. W. RAYMOND

Through a surprising slip of the tongue, in my extemporaneous remarks at the first session of the late New York meeting of the American Institute of Mining Engineers (*Bi-monthly Bulletin*, No. 15, May, 1907, p. 547), I named Sutter's creek, California, as the stream in which Marshall made (in 1848) his momentous discovery of gold. At the very moment of this blunder I held in my hand written memoranda, with which I was perfectly familiar, giving the true locality. More surprising still is the circumstance that, in correcting for publication the report of my remarks, I overlooked this palpable error, for at that time I was engaged in a somewhat extensive research and correspondence for the purpose of preparing as a contribution to the *Transactions* a careful and complete statement of the events attending Marshall's discovery, and I was literally surrounded with books, letters and other records, out of which the correction of my mistake was multitudinally

staring me in the face. Certainly an author is not competent to correct his own proofs. I found that out long ago, but I did not expect, at my present age, to furnish such a striking proof of it!

Perhaps I should add a third surprising event, that out of all the members of the Institute (hundreds of whom knew, as well as I did, the facts in the case) only one man noticed my mistake and called my attention to it. Ten to one, his wife or some old pioneer friend called his attention to it. I shall not make him uncomfortably proud by naming him here. Some day, when I catch him in a mistake, I will generously give him the chance to right himself and thus return his friendly service to me.

The foregoing elaborate explanation has been written in order that due notice may be attached to the following statements:

1. Marshall made his discovery of gold, not in Sutter's creek, but in the tail-race of a sawmill at Coloma, about 35 miles from Sutter's Fort, on the south fork of the American river.

2. This correction will be made in the July number of the *Bi-monthly Bulletin* and embodied in the report of my remarks, to be published in Vol. XXXVIII of the *Transactions*.

3. I am engaged in preparing the historical sketch above mentioned, which I hope to make so comprehensive and accurate that it will need no further correction. And I would rather make it thus perfect than finish it too soon and leave it defective. Wherefore I earnestly solicit from members of the Institute and all other persons having direct or indirect knowledge of this subject, or of important publications concerning it, such aid as they can give through personal reminiscences or references to other sources of information.

Coal Mining in Japan

The general method of mining coal in Japan is the pillar-and-room system, the size of the pillars being about 66 ft. square. The cutting of coal is almost entirely done by manual labor. The amount of coal mined per miner per 10 hours is 2.5 tons under normal conditions, and when robbing pillars the output per miner per 10 hours is increased to three tons. Timbering is seldom necessary in the mines as the roof is generally of hard sandstone. Steel and bricks are principally used in building overcasts. As most mines are very wet, pumping water is the most important factor in mine operations. In the Miike mines, where the daily output is about 4000 tons, there are 80 pumps in use. About 90 per cent. of this number are used in collecting the water at the main sump at the foot of the shaft. The daily output of water is about 4000 gal. per ton of coal hoisted, against 900 ft. head.

Coal Washing

BY STAUNTON B. PECK*

Coal, as found in the mine, consists of coal proper, slate, sulphur (pyrites) and sometimes fire-clay. The object of washing is to remove these impurities and make the coal suitable for fuel or coking purposes, and the removal is made possible by the differences in specific gravity between the coal and the impurities.

If a number of different finely broken substances of varying specific gravities be shaken together for a short time in a box, one section taken through the mass will show it to have become more or less stratified, the particles of the heaviest material having found their way to the bottom, the next lighter above these and so on. This result would not occur at all in a vacuum, and is accomplished more readily in water than in air. The term "washing," however, does not correctly describe the process, which is not a washing at all in the usual meaning of the word, but a process of separating coal from impurities through the agency of water in conjunction with suitable apparatus.

The specific gravity of coal is about 1.28. The specific gravities of the impuri-

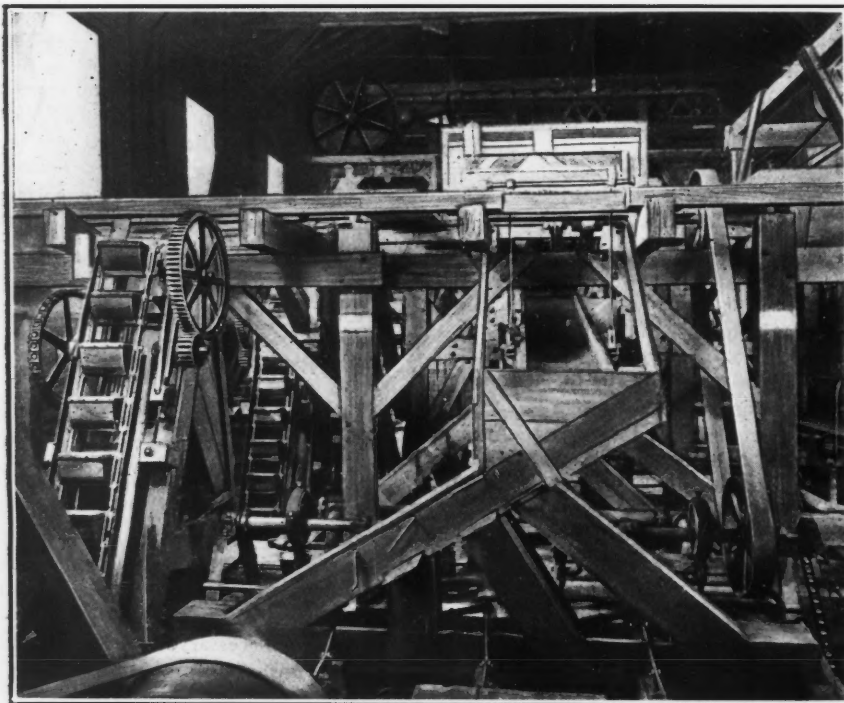
A complete coal washery comprises three separate processes: First, the preparation of the coal; second, the actual washing or mechanical separation of the coal from its impurities; third, the recovery, or separation of the washed coal and the refuse from the water, and the disposition of these products in suitable bins for subsequent removal.

To prepare the coal, it is crushed to nut

the actual washing, from the crude form of the miner's sluice-way to hoppers which contain revolving agitated arms. The scientific washing of coal has reduced itself to the use of the jig, of which there are two general types: one, in which the water is caused to pulsate through the material to be washed by the action of a plunger; and the other, in which the material is carried in a box,



LUHRIG WASHERY OF THE NEW OHIO WASHED COAL COMPANY AT CARTERVILLE, ILLINOIS. CAPACITY 60 TONS PER HOUR



LUHRIG WASHERY, BIG MUDDY COAL AND IRON COMPANY, HERRIN, ILLINOIS

ties are much higher. It is the usually accepted practice in washing to save as coal, material of a specific gravity of 1.35 and less, and to reject all material having a specific gravity over 1.45, as this does not contain enough coal to be worth saving.

*Second vice-president, Link-Belt Machinery Company, Philadelphia.

size and under, and screened to separate the crushed coal into four or five sizes to facilitate the washing and selling of the clean product; or, in a plant exclusively for coking, a reduction of all the coal to a size of $\frac{1}{2}$ in., or less.

MACHINERY EMPLOYED

Various devices have been employed for

with perforated bottom, which is moved up and down in a tank of water.

The Stewart washery, which employs this latter type of jig, is simple and has a low initial cost. The coal, from nut down, is delivered to the washery and sluiced to the jig, which has a capacity of about 25 tons per hour. This jig gives good results with the coarser sizes of coal, but the size of screen and the violence of agitation necessary to separate properly the coarser refuse from the coal is not suited to a separation of the finer materials.

For a thorough reduction of ash and sulphur, the Luhrig system is better adapted. An essential feature of this system is the accurate separation of the coal into five or six sizes before washing, and no attempt is made to wash more than about 5 to 7 tons of the coarse coal per hour, or 3 to 5 tons of the finer coal. There is also a combination of both the Stewart and Luhrig systems, in which the nut coal is separated from the smaller sizes and washed in Stewart jigs while the smaller sizes are treated by the Luhrig process.

The stroke of the New Century jig is small and the action so gentle that it is especially adapted for very fine separating of refuse from coals intended for coking purposes.

In detail, the Luhrig jig consists of a rectangular box, with hopper bottom, divided about half-way down from the top by a partition. In one of the compartments thus made a relatively close-fitting rectangular piston, actuated by an

eccentric, works up and down. The other compartment is closed at the bottom of the partition by a slightly inclined screen plate. The entire jig is filled with water and the movement of the piston gives a pulsating motion to this water, forcing it up and down through the screen plate. The coal for washing is received on this screen plate near the partition and the action of the water agitates the mass, separating the lighter material, the coal, which flows off the top of the jig, from the refuse which settles on the screen. The excess refuse, beyond what is needed for suitable depth of bed, is allowed to flow off through a valve, thus preventing accumulation of such a heavy bed of refuse as to interfere with the proper movement of the water through it. Passing through the valve, the refuse falls into a compartment, in the bottom of which is a slowly moving screw conveyer by which it is carried away. This screw

valve adjusted to maintain a bed of desired thickness at all times.

The characteristic feature of the Stewart jig is the basket, or box, with perforated bottom, into which the material to be washed is fed, and over which the water carries it. The box is suspended in a tank of water from eccentric suspension rods. These rods impart an upward and downward movement to the box, which forces the water back and forth through the perforated bottom, lifting the coal which is then carried away by the stream of water flowing from the top, while, of course, the heavy material sinks on to the screen plate, eventually working forward and off into the water tank. This tank has a hoppers bottom which directs the refuse into a conveyer, by which it is removed.

As previously mentioned, washing coal being a mechanical process for separating it from impurities, it naturally follows

Evaporation of Water from Reservoirs

In building reservoirs for operating coal mines the daily evaporation of the water should be carefully considered. It varies according to the locality and the season of the year. For the northeastern parts of the United States the evaporation of water amounts to 150 gal. per 24 hours per acre of water surface; for the Southern States, it is 700 gal. per 24 hours per acre of water surface. During the dry summer months the water evaporates about five times more rapidly than in the winter.

Silica Ware

The ability to fuse silica into a pure transparent mass has previously been announced in the scientific journals. The scientific work of which the process of manufacturing apparatus of fused silica is the outcome was carried out by two English scientists about 10 years ago; its commercial importance was first recognized in Germany. Johnson, Matthey & Co., Ltd., of 48-81 Hatton Garden, London, has now taken up the original process, and by suitable modifications to meet industrial requirements is enabled to place this material upon the market at a price which can no longer be considered prohibitive. The apparatus is manufactured from the purest silica obtainable. At a high temperature this substance melts, and yields a viscid liquid which can by suitable means be fashioned into apparatus having all the appearance of ordinary glass. The apparatus possesses many properties which are likely to render it of great service both to science and to industry; thus, it can be made white hot and plunged into water, or otherwise rapidly cooled, without any danger of cracking; it is quite unattacked by water or acids, while ordinary glass under similar conditions is appreciably dissolved. The apparatus being transparent, and consisting of pure silica in a thoroughly fused and homogeneous condition, fulfills purposes for which the ordinary opaque material is unsuitable. Fused silica does not crack on subjection to the most violent and sudden changes of temperature. It is unattacked by the volatile acids, with the exception of hydrofluoric acid. It has a melting-point approximately equal to that of platinum. It is harder than ordinary glass. Above 1000 deg. C. it is permeable to hydrogen and certain other gases. Its coefficient of expansion is 0.0000059 per °C. (about one-seventeenth of that of platinum). Its expansion, up to 1000 deg. C., is regular; above 1200 deg. C. it contracts. As far as is at present known, it shows no tendency to devitrification. Its density is 2.2 (approximately.)

ANALYSIS OF COAL BEFORE AND AFTER JIGGING.

LOCATION OF MINE.	BEFORE WASHING.		AFTER WASHING.	
	Per Cent. Ash.	Per Cent. Sulphur.	Per Cent. Ash.	Per Cent. Sulphur.
Cartersville District, Ill.....	9.48	0.78	4.85	0.69
Third Vein District, Ill.....	29.0	....	8.3	....
Morgan County, Ky.....	12.88	3.53	7.65	2.87
Park County, Mont.....	25.60	....	8.50	....
Hocking Valley, O.....	15.80	1.90	8.00	0.87
Greensburg District, Penn.....	12.80	1.30	5.14	0.69
Rhea County, Tenn.....	21.75	0.77	9.14	0.48
Skagit, Wash.....	37.04	....	11.00	....
Cambria, Wyo.....	18.21	5.07	11.72	4.54

Note—The Luhrig and New Century jigs described in above article, were shown in Figs. 1, 2, 3 and 4 on page 18 of the JOURNAL for July 6.

conveyer may be made to serve an entire row of jigs side by side.

The refuse bed on the screen prevents the finer coal being drawn through it by the suction of the piston. The apparatus for handling the fine coal, or Luhrig feldspar jig, is similar to the one just described, except that as the fine bed of refuse on the screen would offer too much resistance to the action of the water, an artificial layer of the feldspar is carried on the screen. The heavy material works through this feldspar, but the coal works across the top and flows over the end of the jig.

The jiggling stroke of the New Century differential-motion jig is produced by a cam acting against a roller on the plunger, which lifts the latter, at the same time compressing a spring against the fixed beam. When the high point of the cam passes the roller, the spring immediately forces the plunger downward with a quick stroke, the force of which is regulated by the adjusting nut of the spring.

The jiggling plunger has a large water-way around it, which is sealed during the quick down-stroke by a rubber flap valve that yields during the up-stroke. The water passes freely beneath the plunger when it is ascending, but is forced to pass through the screen and coal bed on the descending stroke. As in the Luhrig jig, the refuse makes its own bed on the jig screen and is removed automatically by a

that before the type of washery is decided upon the coal must be subjected to thorough chemical analysis; for how effectively a coal may be washed depends greatly on its particular character, the form in which the sulphur occurs, and the amount of fixed ash. Each washing problem is individual and must be so treated. On this account, analyses of coals taken before and after washing are of interest as showing what washing will accomplish. However, such figures do not form a basis for comparison with coal from other mines. For this reason the partial list given in the accompanying table is offered as an illustration.

Purchase of Coal According to Heating Value

S. S. Voorhees, of the United States Treasury Department, at the recent meeting of the Society for Testing Materials, described a series of experiments looking toward the purchase of coal according to the number of heat units it yields under test. He stated that the Government contracts this year call for coal producing a certain number of heat units, and that he expected that the saving effected in this way would amount to fully 10 per cent. In his opinion all consumers could economize in expenditures for fuel in the same way.

Colliery Notes, Observations and Comments

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

DEVELOPMENT AND MANAGEMENT

In substituting wood for coal under a boiler, the dimensions of the furnace must be increased, mainly in height, so that by carrying a greater depth of fuel, nearly as much by weight may be present in the furnace as was necessary with coal.

When installing a furnace for mine ventilation it should be remembered that the unit of ventilating pressure, pounds per square foot, is directly proportional to the difference in the elevations between the furnace and the mouth of the shaft. For this reason a deep shaft gives a greater ventilating pressure than a shallow shaft.

The coal measures found in West Virginia are divided into four groups: The Pottsville, the Allegheny, the Conemaugh and the Monongahela. All of these coals are of the soft, columnar variety, low in volatile matter, ash and sulphur and high in fixed carbon. All have the same chemical composition as the Welsh Cardiff coal.

The supply house at mines should be conveniently located and as near the shaft or mine opening and carpenter and blacksmith shops as possible; but should not be less than 200 ft. from the mine opening. The size of such a building depends upon the quantity of supplies kept on hand; it runs from 20x20 ft. to 25x50 ft. in the anthracite field.

In sinking a deep shaft experience has shown that the hoisting bucket is apt to swing and at times to tip over. To prevent this, a wrought-iron frame or cross-head is fitted to the guides so as to run up and down, and is attached to the end of the rope just above the hook. At the lower ends of the guides, stops are provided so that the bucket may be lowered to the bottom of the shaft while the cross-head is caught by the stops.

It has been found that the slate occurring in anthracite measures is considerably lighter than ordinary roof slate. The lightness of the slate is due to the fact that it is highly carbonized. The average specific gravity of such slate is about 2.25, while the specific gravity of ordinary roof slate is 2.70. The average specific gravity of anthracite bone is about 1.85 against 1.50 for the coal. In designing jigs for anthracite coal these facts must be thoroughly considered and studied.

Gas produced from bituminous coal differs from that made from anthracite in that it contains a much larger percentage of hydrocarbons, and consequently has greater heat energy and also greater illuminating power, which quality gives it a special value in high temperature work.

In order to utilize these hydrocarbons the gases must be kept at a temperature that will prevent their condensation. It must be remembered, however, that a very high temperature will break them down and cause the deposition of soot.

In calculating the haulage capacity of any locomotive or motor used in mines, the draw-bar pull should be divided by the sum total of the resistance, the resistance due to gravity and the resistance due to friction. For a level road, the resistance due to gravity is zero, and the resistance due to friction is on an average 15 lb. per short ton, so that the hauling capacity of a motor would be $D \div 15$ tons, in which D is equal to the draw-bar pull. For a road having a grade of 1 per cent., the hauling capacity of the motor is: $D \div (15 + 20)$ tons; for 3 per cent. road it will become $D \div (15 + 60)$ tons, etc.

In making steam connections in an engine room, it must be remembered that by using a valve having an angle end, one joint in the pipe line is saved, besides less space is occupied by such a pipe than by an elbow and a straight valve. All valves should be tested to at least three times the working steam pressure, and they should be so made that the stuffing box can be repacked under pressure. The case rings should have double joints and should be heavy to permit their being unscrewed from the body and replaced after they have been ground to the gate rings. The body and cover flanges should be grooved to hold the packing. Rubber packing is usually used for gaskets.

In gasifying bituminous coal experience has shown that the best results are obtained from a good, clean coal, low in ash and moisture and high in volatile matter. A poorer quality of coal does not make as good a gas nor can the producer be driven as hard. The size of coal is not very important when the coal cakes, as it then fuses together into large masses, which when broken with a bar, make the fuel bed porous and open. The nut size is a very convenient one for use in the producer, and run-of-mine is also used with success. When anthracite is used, the most economical coal is buckwheat, which is cheap, besides containing very little moisture and only a low percentage of fusible ash.

In driving a slope in the bituminous coal fields, where a considerable amount of gas is generated, the dimensions of the slope should be about 16 ft. wide and 6

ft. high in the clear above the rail. Airways, 10 to 16 ft. wide, should be driven on each side of the slope, and pillars 30 to 35 ft. wide should be left between the slope and the airways. The crosscuts should be driven every 60 to 75 ft., and all left hand crosscuts should be between the two on the right-hand side. All airway coal should be hoisted up through the main slope by connecting the airways with the sections from the slope. At least every third crosscut should be made a section or slant head crosscut so that the tracks may be laid with an easy curve.

Past records show that France has the lowest death rate resulting from the fall of roof in coal mines. This is due to the thorough method used in timbering gangways and working faces. The system briefly described is as follows: Bars 10 to 15 ft in length are supported upon posts set 1 meter (39.38 in.) apart. The bars are placed parallel to the working faces and are set 1m. apart. They are made of iron, either an I-beam or square in the cross section and are driven above the last cross-bar at the face, leaving about 1½ ft. of the face unprotected between the ends of the bars. As the face advances, short poles are set up to support the last bar before the next bar is put up. The miners are not allowed to work under unprotected roofs. The coal is mined and broken down by wedges, no blasting powder being used, which enables timbering close to the face.

Experience has shown that slow combustion and a consequent low temperature in a boiler is not economical; for the greater the difference of temperature between the fire box and the chimney, consistent with complete combustion, the greater is the utilization of heat. To illustrate this point more clearly, if the temperature of combustion could be increased from 2000 deg. F. to 4000 deg. F. without increasing the temperature of the chimney gases above 500 deg., only about one-eighth of the heat in the coal would be lost, instead of one-quarter in the lower temperature; and if the temperature of the fire box were 1000 deg. and the temperature of the chimney gases 500 deg. F., the loss would be one-half of the total heat in the coal. The best utilization of heat energy under boilers is secured by, first, perfect combustion; second, the use of the least amount of air; third, the maintenance of the greatest possible difference in temperature between the fire box and the chimney.

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*Illustrated.

Limiting the Size of Drill's Used in Coal Mining

At a recent session of the Indiana legislature an amendment to the mining law was passed, prohibiting miners from using a drill in excess of 2½ in. in diameter in drilling a hole in coal for blasting purposes. The reason for the enactment of this law was primarily to prevent blown-out shots, although the operators who favored it also claimed that the use of 3- to 3½-in. drills, which were formerly employed, had resulted in decreasing the output about 12 per cent. The miners have taken a different view, however, and the president of the United Mine Workers for District No. 8 has issued a call for a meeting of block-coal miners, to be held July 16, to take action on the new legislation.

The miners claim that the limitation of the drill has reduced their earning power, because it reduces the amount of powder used in a shot. It is claimed by those in sympathy with the mine workers that the law limiting the use of powder to six pounds is sufficient to do away with the danger of blown-out shots, which have recently been the cause of many serious disasters.

When State legislatures begin to investigate the quality of powder used, instead of so carefully regulating the quantity, the number of fatalities resulting from blown-out shots will be reduced, and such delicate questions as have now arisen between operator and miner will be simplified. The work of investigating mine explosives, also, and the preparation of a table of permitted explosives by the proper authorities will certainly result in great good to the coal-mining industry as a whole, as has already been proved in Great Britain.

The Copper Situation

In commenting on the situation in copper last week, reference was made to the deadlock existing between some large selling companies on the one hand, and the large consumers of copper on the other. It was apparent that the situation could not continue much longer, as few of the manufacturers who are the chief users of the metal were supplied beyond the cur-

rent month. It has been evident that they would soon be obliged to come into the market, unless the ultimate sales of copper—that is, its marketing in finished form with consumers—had fallen off to a more serious extent than seemed at all probable. On the other hand, there was no doubt that stocks of metal in sellers' hands had increased to a considerable extent. Our market reports showed also that the small current sales have been made at lower figures than those at which the large selling companies have been holding the metal.

This week the deadlock has apparently been broken, sellers having accepted the position, and copper is being sold for immediate delivery and for the next three months at figures considerably below those for which certain sellers have been holding out. They have decided that it is better policy to acquiesce, in some degree, in buyers' views. In other words, the waiting policy of the past two months seems to have resulted in favor of the buyers.

It is too soon to say how far the reduction in price has stimulated purchases of copper, though there are indications that the result may be considerable sales. The accumulation of stocks above referred to is, in one way, more apparent than real; the stocks are, for the time being, held by sellers, instead of being in the manufacturers' storehouses.

The fall in prices still leaves copper at a higher figure than it had reached for many years prior to the present; and it does not seem probable that there will be a great recession. Much, of course, depends on the general condition of business, concerning which there are various opinions: though a more hopeful feeling now seems to predominate.

A California Miners' Strike

The strike of the miners at Angels, in Calaveras county, California, still continues, and the mines are completely closed down. The strike was based on a demand for an eight-hour day, which the mine-owners refused to grant, on the ground that any concession would wipe out the narrow margin of profit on which they had been working. The complete lock-out has had its effect on the strikers, and it is now understood that the miners'

union would be glad to compromise in any way, as long as the union will be recognized. It is reported that the men would accept any kind of an offer for a compromise underground, and let the topmen remain as they were, but as the mines were not getting more than 8½ hours in a shift that is called 10 hours, the mine-owners cannot see their way clear to offer any compromise, preferring to fight it out even if the properties are tied up for a year. The town of Angels is fast being depopulated and many of the business houses are closing out, while some miners have left and more are leaving. In this case two Americans and one Austrian succeeded, by fomenting a strike, in preventing the payment of \$45,000 per month in wages.

Most of the owners think the strike will be broken before long, and if it is called off there seems no doubt that men can be obtained. Miners who have worked many years at Angels will flock back as it is an ideal camp for them. They can board where they please, and have other advantages. Moreover when men have been accustomed to working in wide veins, as at Angels, they do not like narrow veins. The owners and managers do not think they can afford to recognize the union in any way, as it will mean more trouble in the near future. If they gave in now it would produce a strike among the miners in Amador and Tuolumne counties within 24 hours, as the men there were ready to go out when the strike was called at Angels. The conditions there, however, have prevented any spread of the movement.

Underground Illumination

In the JOURNAL of May 4, 1907, the following item appeared in the page of "Colliery Notes." "An experienced mine manager in a Western State is credited with the assertion that electric mine lighting does not bring compensating results, in that it fosters idleness rather than industry on the part of the men in the ground. For this reason it has been decided to remove all electricity from under ground at the mines controlled by this engineer, supplanting this modern light with the old-fashioned miners' oil lamp, worn on the hat."

We have received various inquiries in respect to the above statement, not ques-

tioning the latter but seeking more information. This was quite natural, inasmuch as the views expressed were rather unique and contrary to what would probably be formed from an off-hand conclusion. In taking up the matter further with the engineer to whom these views were due, we received the following interesting communication.

"In regard to the fact that a well lighted mine is likely to make the miners feel sociable, this first came to my notice in Globe, Arizona, where we had worked out a huge cavern and had about 100 men working in one room. Later, in Leadville, Colo., I noticed the same tendency to a social session when the workings were brilliantly lighted. I have watched the same thing with a great deal of interest here in Joplin, as our sheet ground workings are specially adapted to lighting by electricity. Here, of course, it is not a matter of so much importance, as all shoveling and tramping are done by contract and the expense of the visiting is limited to that done by machine men and their helpers. We have generally found that if a man has just sufficient light to enable him to do his work, there is little or no tendency for him to loaf, while if the room in which he is working is brilliantly lighted, the tendency to visit other machine men and workers is irresistible and frequently one good raconteur will entertain 15 or 20 workers who gather around a pile of broken ore where he is sitting. I have discussed the matter with a number of other superintendents and find that they also have noticed it."

The engineer who expresses the above opinion is of high standing and long experience, who is well capable of deducing a sound conclusion. It would be extremely interesting if other engineers and mine operators would communicate the result of their own experience upon this interesting and important subject. In the particular case cited above, the remedy would appear to be the employment of more gang bosses and it may be that in mines where there are many gang bosses under the shift foremen there would be no such experience to report. However, if that be the correct deduction, the result would be the same, viz: Too much illumination underground may lead to offsetting results, either through more inefficiency of the men or the increased cost of supervision to keep them up to the standard of efficiency.

Investigating the Action of a Mine Fan

In our issue of May 11 (page 919) attention was called by a mining engineer from West Virginia to a statement made by a prominent engineer at a mining institute. The question in doubt was whether or not a fan would run away if some accident should cause the doors in the mine to be blown out and the air to be short-circuited. The engineer quoted made the assertion that the fan will slow down and that the machine at such a time will perform its greatest work in foot-pounds while running free and open to the atmosphere.

The publication of these statements brought us many letters from mining engineers in various parts of the country, asking for more conclusive tests along this line. In this issue, on page 74, Mr. Owens has furnished a description of many practical experiments which deal exhaustively with this subject. Attention is called to the results here obtained, which practically corroborate the statement of the engineer previously quoted.

Enforcing the Law in California

The California State Mining Bureau, under the energetic leadership of Lewis M. Aubury, has succeeded in securing the conviction of another promoter of worthless mining schemes. In this case, one E. W. Emmons, who by false representation induced people to invest in the Drummer Boy mine near Yreka, in Siskiyou county, has been found guilty after an extended trial and has been sentenced to the State prison for five years. The State laws are now such that it is possible to get such people behind the bars more easily than before, and this will have a deterrent effect in the future.

No PHASE IN the subject of coal mining requires such constant attention as ventilation, and for this reason it is frequently necessary to compute the volume of air passing through the various airways. In order to abbreviate this necessary work, a table prepared by C. H. Ruderer is published on page 82 of this issue and will be found of great benefit to mine engineers and superintendents. The table is prepared for all probable readings of the water-gage, and by using the constants given for the various lengths it is applicable to all cases.

Views, Suggestions and Experiences of Readers

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

CORRESPONDENCE AND DISCUSSION

Calories Required to Heat Iron

The communication of Major Stassano in your issue of recent date contains information of value to those interested in the electro-metallurgy of iron and steel, a subject of rapidly increasing importance. For this reason, therefore, if for no other, attention ought to be called to the fact that the curve of heat content in steel, on page 1137 is totally misleading from the melting point of iron up to 2000 deg.

The heat in iron at 1900 deg. is undoubtedly about 450 calories, and at 1600 deg., the melting point, 300 calories, when unmelted, but about 370 calories, at 1600 deg., when melted. The curve errs therefore, in totally ignoring the latent heat of fusion, which has never been experimentally determined, but which the writer has calculated by two different thermochemical principles to be 69 or 70 calories; it also errs in taking the specific heat of

Utilization of Black Sand

My attention has been called to J. A. Edman's article on the auriferous black sands of California, which appeared in the JOURNAL of June 1, 1907. With all due respect to the ability with which Mr. Edman has presented this interesting information, I cannot refrain from criticizing what he terms the first step in reduction. In this he suggests the magnetic removal of the magnetic material from the non-magnetic minerals. This is entirely wrong, and will result in serious losses of the two most important values it is endeavored to recover, viz.: the gold and platinum. It is true that the former is non-magnetic, while the latter is decidedly magnetic, due not so much to any magnetic attractability it possesses in itself, but probably to minute particles of iron mechanically attached to it, although invisible. The gold losses occur by entanglement with the large vol-

of black sand have the wrong impression of the application of the magnet, I trust the above will tend to correct it.

HENRY E. WOOD.

Denver, Colo., June 20, 1907.

Gas in Metal Mines

I have noticed with much interest the discussion, in the JOURNAL, of the liberation of gases in coal mines, due to the change in the barometric pressure, but in this I do not remember to have seen anything applying to metal mines; consequently the following may be of interest, although it is not claimed that gas was liberated. However, judging from what was observed it is possible that this may be the explanation. One case has fallen under my direct observation, and I am informed by reliable persons that they noticed the same conditions in their mines on the same days. On June 13 the contractors in a small mine complained that they could not continue work, as the tallow candles they were using would not burn; thinking that they could use stearine candles, they were given some of these, but they soon returned with the same complaint that the candles would not burn, nor would the large torch which they had taken with them. The only light that would burn for any time was a small carbide lamp. The same difficulty was noticed in another small mine, on the same day, when the contractors used a lantern instead of candles. On June 14 my attention was called to the same trouble in another small mine and also in one of our large mines, where the ventilation is not very good.

These difficulties all occurred at about the same time, and directly after a very decided change in the atmospheric conditions. Unfortunately there is no barometer with which to note the changes; but they were very marked, as on the evening of June 11 it began to rain after a dry season of some six months or more; on the evenings of June 12 and 13 it again rained. The trouble was first noticed the afternoon of June 12; during the day of June 13 it became so bad that all work was suspended for the day in the small mines. The country rock is shale and limestone. The elevation of the mines is about 7200 ft. above sea level.

Is it probable that some CO₂ was liberated due to the change in atmospheric pressure?

A. B. MYERS.

Superintendent M. Guggenheim's Sons Mines.

Tepezala, Mexico, June 18, 1907.

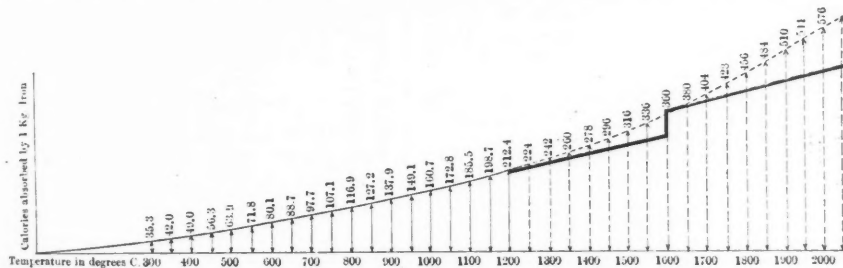


DIAGRAM SHOWING THE NUMBER OF CALORIES REQUIRED TO HEAT IRON TO DIFFERENT TEMPERATURES

liquid iron as about 0.44 when in all probability it is 0.22. The comparison of the curve as it is, and as it should be, are about as shown in the accompanying diagram.

The question of the specific heat in the melted state not being the very high quantity—0.44—used by Stassano is of immense importance in those thermo-electric processes which receive melted steel and simply raise its temperature and keep it fluid while under treatment. The fact that some 70 calories is absorbed as latent heat in melting pure iron, at 1600 deg., is also of great significance as a thermo-electric consideration, because this amount of heat, if not disappearing as latent heat, would raise the temperature of the iron some 300 deg. Centigrade.

JOSEPH W. RICHARDS.

Lehigh University, June 15, 1907.

One cubic inch of water evaporated under atmospheric pressure is converted into approximately 1 cu.ft. of steam.

ume of highly magnetic iron which is being carried off. If one applies a current, such as is applied in the operation of the Wetherill separator to a black sand concentrate, all of the platinum it contains will pass into the magnetic products. This fact I demonstrated years ago.

After I separate the gold and platinum from the black sand by simple wet concentration, in which operation it is generally an easy thing to recover 90 per cent. of the gold and 100 per cent. of the platinum, I use the Wetherill separator to remove the platinum from the gold. Over four years ago I made use of this magnetic property of platinum to separate it completely from the scales of osmiridium which are almost always associated with it. I prepare my platinum shipments for market in this way, obtaining products of great purity. Hence it is evident that specific-gravity separations should precede any magnetic separations in order to recover successfully the chief values.

As so many people in the examination

New Publications

WATER-WORKS MANAGEMENT AND MAINTENANCE. By Winfred D. Hubbard and Wynkoop Kiersted. Pp. 429; illustrated. 6x9 in.; cloth, \$4. New York, 1907: John Wiley & Sons.

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1906. Part I—Metals and Non-metals, except Fuels. U. S. Geological Survey, Bull. No. 315, 1907. Pp. 595; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

The individual reports contained in this volume have been noted in the "Mining Index" of the JOURNAL.

FORGED STEEL PIPE FLANGES. Pp. 96; illustrated. 8x10¼ in.; paper. Chicago: The American Spiral Pipe Works.

This publication deserves more notice than the ordinary trade catalog, owing to the inclusion in its pages of several tables useful to engineers. One of these gives weight and other particulars as to spiral riveted pipe, of all dimensions from 3-in. to 40-in. inside diameter, with the approximate bursting pressures, as determined by test.

LABORATORIUMSBUCH FUER DEN EISENHUETTENCHEMIKER. By Max Orthey. Pp. 50; 7x9½ in.; paper, 1 mark, 80 pf. Halle, a. S., Germany, 1907: Wilhelm Knapp.

This is the first of a series of laboratory handbooks for the chemical and allied industries, edited by L. Max Wohlgenuth, which are subsequently to be republished in bound volumes. The first bound volume will comprise 14 parts, among the authors of which are some distinguished names in analytical chemistry.

PETROLEUM. By Sir Boverton Redwood. Second Edition, Revised, Enlarged and Re-set. Contains valuable Bibliography, New Maps, Illustrations, etc. Two volumes; pp. 1064, 6½x9 in.; cloth, \$13.50. London, 1907: Charles Griffin & Co.

Of this voluminous and invaluable compendium the first edition was published in 1896. At that time the distinguished author had been for nearly a quarter of a century connected as consulting expert with the petroleum industry of the world; had visited the principal oil regions and refineries in America, Russia and elsewhere; had studied in Europe, Asia and America the methods of the production, refinement, transportation, distribution and utilization of petroleum; and had kept himself, as a necessary concomitant of his daily practice, acquainted with the successive steps of progress in every department of this immense industry. These circumstances, as he frankly declared in the preface to that edition, both qualified and disqualified him to prepare such a work as the publishers desired and the

public, in view of the importance of the subject and the paucity of its authoritative literature, earnestly demanded. No man who was not afloat on the current, at once so deep and so swift, of this new and revolutionary development in modern life, could dare to estimate its volume, velocity and results, or to describe its incidental eddies and their effects. Yet, on the other hand, no man thus afloat and continuously occupied with the duties of navigation, could stop to make maps or measurements, or even to report progress.

Sir Boverton Redwood solved this difficulty years ago through the coöperation of many friends, competent to appreciate, arrange, complement and edit the mass of information at his disposal. In preparing this second thoroughly revised and greatly enlarged edition, he has pursued the same wise plan—to an extent even greater, if we may judge from the acknowledgment conspicuously printed on the back of the title page, in which the following eminent gentlemen are named as his chief collaborators, and the special sphere of each is stated:

(1) W. H. Dalton, F. G. S., F. C. S., late of the British Geological Survey, who gave special attention to the section dealing with the geological and geographical distribution of petroleum and natural gas, besides compiling the invaluable bibliography and the excellent alphabetical index which constitute already (and, as years go on, will constitute in ever-increasing proportion) a chief element of the value of the work. I may frankly confess, right here, that (being still hot with residual indignation from the study of a recent foreign work, crammed with valuable facts, and provided with a logically arranged and minutely subdivided table of contents, but no alphabetical index), I would certainly have handled this work, if it had lacked that feature, in a manner to make the publishers "sit up!"

(2) Arthur W. Eastlake, M. Inst. M. E., A. M. I. Mech. E., who coöperated on the sections treating of the production of petroleum, natural gas and ozokerite, the refining of petroleum, and the important statistical appendix A.

(3) Robert Redwood, F. C. S., whose labors were devoted to the section on the transport, storage and distribution of petroleum, and to appendix B, which gives more particularly the statistics of its marine transportation.

(4) Capt. J. H. Thomson, His Majesty's chief inspector of explosives, at the Home Office, who prepared the uniquely comprehensive and useful section which concisely states the statutory, municipal and other regulations of all civilized countries concerning the testing, storing, storage, transport and use of petroleum and its products. I notice, by the way, that in this compendium the several States of this nation are separately catalogued, and the peculiar regulations of each reported.

(5) Prof. Vivian B. Lewis, F. I. C., who has contributed valuable additions to the section on the uses of petroleum and its products.

(6) John Wishart, of the Oakbank Oil Company, of Glasgow, who assisted Mr. Redwood on the section describing petroleum transportation, storage, etc.

If I add to the foregoing list of competent authorities the statement that these two octavo volumes, comprising 1064 closely printed pages (of which the statistical appendices, the bibliography and the index occupy 269), and including 138 tables, 14 large plates and 337 engravings, treats successively and with abundant detail of the history of the petroleum industry; the geological and geographical distribution of petroleum and natural gas; their physical and chemical properties; their origin; their production (together with that of ozokerite); the refining of petroleum; the industry of shale-oil and allied industries; the transport, storage and distribution of petroleum; the testing of crude petroleum and its products, and of other similar materials; their manifold uses; the statutory or other regulations concerning them; and the statistics of trade, tariffs, etc., which belong to the subject—if I add all this, I say (and the intelligent reader will perceive that I have, in fact, done that very thing), I complete thereby a much more fair as well as useful review of Sir Boverton Redwood's book than if I had merely picked out of it, here and there, particulars for adverse criticism. I confess that I would feel little inclination to mar with such comment my hearty praise of a work like this, undertaken originally to supply a real and great need, executed with patience and care, and with competent assistance, and now reissued, with many additions and improvements made in the same spirit. But I am bound to confess that I have not found in it defects worthy of such criticism, even if I had been disposed to offer it. Examining, for instance, the section treating of the origin of petroleum and natural gas—a subject with the literature of which I was more or less acquainted—I found in it no dogmatic statement, but something far better, namely, a very complete synopsis of the various theories heretofore advanced, with adequate references to the publications containing them. This summary, taken together with the really remarkable bibliography at the end of the second volume, is worth much more to the student than any one expression of individual views, however authoritative.

In short, this work seems to me to have been well planned and well executed. It is clearly and logically arranged, handsomely illustrated, and adequately indexed, and Sir Boverton Redwood may well regard it as a worthy monument of his long, active and creditable career.

R. W. RAYMOND.

Personal

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

J. B. Tyrrell has returned to Toronto, Ont., from Larder Lake.

T. B. Bassett is examining copper properties in Mexico for Denver capitalists.

J. Argall, manager of the Iron Mask mine, Kamloops, B. C., has returned from England.

P. G. Lidner, of New York, has gone to California on professional business. He will be absent about one month.

Allan C. Bernard has opened an office at Tucson, Arizona, for general consulting work as a mining engineer.

Dwight E. Woodbridge, mining engineer of Duluth, Minn., has returned to that city after an extended visit in Mexico.

Albano Brand, lecturer on metallurgy at the Charlottenburg Technical School, Berlin, Germany, committed suicide on May 8.

R. A. Varden, of the firm of Bainbridge Seymour & Co., leaves London on June 22 to examine mining properties in Mexico.

H. C. Hoover, of the firm of Bewick Moreing & Co., is expected to arrive in England in July after nearly a six months trip to Australia.

F. Lynwood Garrison, mining engineer of Philadelphia, Penn., who has been in California and elsewhere, on professional business, has now gone to Mexico.

E. C. Opperman, formerly ore purchaser at Guanacevi, Durango, Mexico, for the National Metal Company, has been examining mines at Gold Hill, N. C.

Herman von Schrenk, E. B. Fulks and A. L. Kammerer have opened an office at Tower Grove and Flad avenues, St. Louis, Mo., as consulting timber engineers.

* Horace V. Winchell, of St. Paul, Minn., chief geologist for the Great Northern Railway Company, recently visited the Boundary district of British Columbia.

Roy W. Moore is on the Sonora river, Sonora, Mexico, about 80 miles below Cananea, examining the Artimisa mine, which is under bond to Denver capitalists.

Frank A. Ross, general manager of the Daly Reduction Company, has returned to Hedley, Similkameen district of British Columbia, from a business visit to New York.

Henry G. Bradlee has been admitted to the firm of Stone & Webster, Boston, Mass., the other members being Charles A. Stone, Edwin S. Webster and Russell Robb.

Alexander Henderson, of Vancouver,

B. C., has been appointed commissioner of Yukon Territory, Canada, to succeed W. W. B. McInnes, who resigned last winter.

James Philips, Jr., the well known copper operator, of Boston, Mass., accompanied by W. S. Newman, has been on a visit to the Gold Hill Copper Mines in North Carolina.

O. B. Perry is visiting the Guggenheim hydraulic gold properties in the Cariboo district, B. C. He is accompanied by John F. Newsom, of Leland Stanford University, California.

Henry S. Washington, New York, and Volney Lewis, of Rutgers College, have formed the firm, Washington & Lewis, consulting mining geologists, with offices at No. 95 Liberty street, New York.

J. A. Whittier, manager of the Good-enough Mines, Ltd., has returned to British Columbia after having wintered in California. He will begin the season's work on the Grey Copper mine, Slocan.

Edward T. Perkins, of the Granby Mining and Smelting Company, Granby, Mo., who has been in southeastern Missouri, for a month or more, on business in behalf of this company, has returned to Granby.

A. D. Hatfield has resigned as secretary and treasurer of the Wellman-Seaver-Morgan Company, Cleveland, Ohio. He is succeeded by W. H. Cowell, heretofore connected with the Algoma Steel Company, Sault Ste. Marie, Ont.

William Edenborn, a director of the United States Steel Corporation, has been elected president of the Sheffield Steel and Iron Company, to succeed Leonard Peckitt. The operating headquarters of this company have been removed to Sheffield, Ala.

Walter J. Browing, general manager of the Mazapil Copper Company, at Concepcion del Oro, Zacatecas, Mexico, informs us that there is no truth in the reports that have been circulated of his appointment as manager of the Rio Tinto mines, in Spain.

R. W. Brock, of the geological survey of Canada, has been employed by the Ontario bureau of mines to make an examination of the Larder lake region. Later in the summer he will join W. H. Boyd in the Lardeau district of British Columbia.

Societies and Technical Schools

Case School of Applied Science—Members of the junior class of the mining department are making their annual trip to the copper and iron district of northern Michigan. The party is accompanied by Professor Smith. Members of the sophomore class, under the direction of Professor Cadwell, are studying mine surveying at Boyers, Penn.

Machinery Club of New York—A prospectus of this new club has been issued. Temporary offices have been opened at No. 26 Cortlandt street, and the following house committee has been appointed: Thornton N. Motley, Percy A. Ware, E. H. Benners, Charles A. Schieren, Jr., and George A. Howells. The membership committee is as follows: J. R. Vandyck, George L. Gillon and Charles B. Crook. Other committees will be appointed as the necessity arises.

Industrial

The Westinghouse Electric and Manufacturing Company has issued a pamphlet entitled, "Westinghouse Mining Equipment," containing a detailed description of the electric equipment of El Oro mine in Mexico.

The Laclede-Christy Clay Products Company, St. Louis, Mo., succeeds the Laclede Fire Brick Manufacturing Company and the Christy Fire Clay Company, both of that city. The two plants will be known as the "Laclede," and the "Christy," respectively, and will be operated as heretofore.

Trade Catalogs

R. D. Wood & Co., Philadelphia, Penn. Centrifugal Pumps for Water Works and High-pressure Fire Service. Pp. 38, illustrated, paper, 6x9 in.; 1907.

Liberty Manufacturing Company, Pittsburgh, Penn. Bulletin No. 40. Liberty Oil Purification system type "O" for System Use. Bulletin No. 41. Liberty Oil Purification System Type "L" for Hand and System Use. Pp. 4, illustrated, paper, 6x9 in.

Construction News

Mojave, Kern County, California—The Big Three Company will erect a 10-stamp mill.

Havillah District, Kern County, California—The King Solomon company is preparing for a new mill.

Nevada County, California—The Kenosha Mining Company is about to install electrically-driven pumps and a hoist.

Mono County, California—A concentrating plant is to be built at the Indian Queen mine. George H. Hewitt is general manager.

Dahlonga District, Kern County, California—L. B. Thomas and Daniel Spaulding, of Los Angeles, have purchased the Pine Tree and Buckeye claims and will erect a mill.

Hauto, Pennsylvania—The Lehigh Coal and Navigation Company will shortly begin the construction of a mammoth coal storage yard, which will have a capacity of more than a half million tons.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 6—The mine-owners at Grass Valley, Nevada county, have agreed to contribute enough rock from their mines to construct a quartz advertising monument at Colfax on the line of the Overland railroad. The monument will be lighted at night. Meantime another monument, not of an advertising nature, is to be erected by the miners of Bishop, Inyo county. This will be a life-sized bronze figure of an ordinary, every-day burro, the animal which has played so important a part in the mining development of Bishop as well as of other regions. Doubtless if suitable steps were taken thousands of miners in other places would contribute their mites to District Recorder J. W. Clark to help out the plan.

Now that San Bernardino county is beginning to have so many active mines and that the mining industry is progressing so rapidly the old and once famous silver camp of Calico gives signs of renewed activity. In the early "eighties" there were twenty producing mines at Calico and very high-grade ore was taken out, but when the price of silver fell and the water level was reached Calico began to run down hill and has been virtually abandoned ever since. Now a number of the companies are preparing to reopen their mines. Some of the old mines will be drained and their lower levels properly prospected and developed.

The old mining town of Brown Valley in Yuba county is also taking on new life. The Dannenbrogue and Pennsylvania mines, now under bond to Chas. D. Lane, are being thoroughly developed and tested. Good ore has been found and a new mill is being put up. J. C. Campbell, of Nevada City, has also bonded the Old Flag, Bessie, Hilbert and Burris, lying north of the Lane properties. Some machinery has been moved on to the Bessie from the Old Flag and sinking is being prosecuted. The dispute over land titles has been settled by purchasing the rights of the agricultural claimants, making it safe to do more extensive prospecting of the various ledges known to exist.

Numbers of mining companies are reducing their capital stock in view of the State law in regard to graduated taxation of corporations. The tax is payable between July 1 and Sept. 1. Among the Nevada county companies which have held meetings and reduced capital stock are the following: Yuba River Mining Company reduced from 100,000 shares at \$10 to the same number of shares at 10

cents; Twin Cities Oil Company, from \$250,000 to \$10,000; Grass Valley Investment Company, from 10,000 shares of \$10 10,000 shares at \$2 each; Coal-inga Banner Oil Company, from 400,000 shares at 60 cents to same number at 2 cents; California Mining Company, from \$1,000,000 capital stock to \$100,000; New Blue Point Mining Company, from \$10,000,000 to \$1,500,000; Powning Mining Company, from \$750,000 to 75,000 shares; Hartery Consolidated Mining Company, from \$1,000,000 to \$100,000; St. John Mining Company, from \$1,000,000 to \$10,000; Planet Consolidated Mining Company, from \$5,000,000 capital stock to \$10,000.

It is expected that active work will be commenced again on the old Temescal tin mines in Southern California. Pittsburg and Arizona men are expected to take hold of them. The property now belongs to the United States Consolidated Tin Mining Company and has been idle for a long time. The Southwestern Mining Company is also about to begin operations on its tin mine in San Gabriel cañon and a tunnel is to be run to strike the lode 1000 feet below the surface.

The Yuba Consolidated Gold Fields Company is preparing to construct three new dredges along the Yuba river this year, each to cost about \$140,000. Outside of the castings the iron work will be done at the shops at Marysville. The Marysville Gold Dredging Company will also build two new dredges in the Yuba field.

Up in Siskiyou county the work of opening the Salmon river stage line is completed and daily trips are made to Sawyers Bar. In the same county a new locality for stone, etc., will be opened up by the building of the California Northern road which leaves the main Southern Pacific line at Weed and runs through the Grass Lake and Butte Creek country. There are gold, copper and other mines in this section as well as beds of stone, but none have been developed though considerable prospecting is now being done. A wagon road is also to be constructed from Coffee Creek mines south of Callahan. The Blue Gravel mine lease on the mine south of Yreka has expired and it is thought that a new company will take hold of the property. It was at one time a large producer but litigation has held matters back for some years.

It is expected that the Mammoth company of Shasta county will be shipping ore from mine to smelter by the new com-

bination electric tramway and gravity tram by October. The smelter will be by that time running five furnaces instead of two as at present.

The little Tightner mine at Alleghany, Sierra county, the \$250,000 option of which was given up by Senator Jones and others about a year ago, seems to be keeping up a remarkable record of gold production. The most recent result was \$75,000 from 1900 lb. of ore and this has been repeated several times within the year. The county of Sierra is showing up a number of productive mines particularly about Alleghany and Forest City.

Salt Lake City

July 3—The consolidation of the Bingham Central and Bingham Standard Copper mines has been completed by the formal transfer of both properties to the Bingham Central-Standard Consolidated Mines Company, which has been organized with Samuel Newhouse as president; D. C. Jackling, vice-president; William M. Bradley, secretary, and H. P. Clark, treasurer. The management of the property will be vested in an executive committee, consisting of Charles W. Whitley, D. C. Jackling and W. E. Hubbard.

The directors of the Daly Judge Mining Company have decided to pass the regular quarterly dividend, which was due in July. There has been a recent change in management and steps are about to be taken to provide facilities for the treatment of the zinc ores, of which the property is abundantly prolific.

Important developments are being made in the mines of Alta. The principal mines are the Columbus Consolidated, South Columbus Consolidated, Albion and City Rocks, with several others on the verge of becoming regular producers. The old Emma mine, one of the earliest producing mines in the State, is about to be rejuvenated by a syndicate, which is to be known as the Old Emma Mining Company.

The Utah Supreme Court has recently rendered an important decision regarding assessable and non-assessable mining stocks. Some months ago the St. Joe Mining Company, a non-assessable organization, was changed to an assessable company by a vote of two-thirds of the issued stock. An assessment of 20c. a share was thereupon levied; but Ellen Gary and others refused to pay it and brought an injunction suit in the District Court to restrain the secretary of the company from disposing of their stock, amounting to

about 200,000 shares, at delinquent sale. The restraining order was denied, whereupon the case was appealed to the Supreme Court, where the decision of the lower court was reversed. The legislature of Utah in 1905 enacted a law making it possible to change non-assessable to assessable stock companies by a two-thirds vote of shareholders. The Supreme Court holds that the law is not applicable to corporations organized prior to 1905 and that with them a unanimous vote is necessary to make such a change.

The eastern section of the Tintic mining district is attracting widespread attention at the present time, which is due to the sensational developments made recently in the Colorado and other mines in the immediate vicinity. As a result there has been a decided upward turn in Tintic stocks.

The Columbus Consolidated Mining Company, operating at Alta, has declared its regular quarterly dividend of 20c. a share for payment in July. This company has paid 55c. a share this year.

The property of the Amalgamated Nevada Mines Company, located in the Black Horse and Osceola, Nev., districts, has passed into the control of Willard F. Snyder, of Salt Lake, and associates.

The third section of the initial unit of the Utah Copper Company's mill at Garfield, Utah, has been placed in commission. The plant is now treating 1500 tons of ore daily from the Utah copper mine of Bingham.

The Silver King Coalition Mines Company, the organization which recently came into existence to take over the Silver King and other mines in Park City, will pay its initial dividend in July. Payments are to be made quarterly on the basis of 12 per cent. per annum on the capitalization, or \$750,000. The original Silver King company disbursed \$10,900,000 in dividends.

More than \$3,000,000 has been paid by Utah mining companies during the first half of the year. Seventeen of them have disbursed the sum of \$2,857,485, as follows: Beck Tunnel Consolidated, \$245,000; Bullion Beck, \$30,000; Century, \$6000; Colorado, \$80,000; Columbus Consolidated, \$105,000; Daly Judge, \$225,000; Daly West, \$216,000; Grand Central, \$82,000; Horn Silver, \$40,000; Lower Mammoth, \$19,000; Silver King, \$50,000; Swansea, \$5000; United States, \$785,485; Utah, \$18,000; Utah Consolidated, \$900,000; Victoria, \$30,000; Yankee Consolidated, \$15,000.

Denver

July 2—Snow is now off the high places, where, in Colorado, Providence seems to have placed most of the best mines, and work for 1907 is well under way.

In the San Juan region, between Silverton and Ouray, the railway is running into the Red Mountain district, which, since

the great drop in silver in '93, has looked like a graveyard of ruined hopes. Now all is activity again, and the old mines which made it famous—Yankee Girl, Guston, Genessee-Vanderbilt, Congress and others—are being opened, and adjoining properties are preparing to follow suit. Reduced expenses by modern mining and milling methods, and higher prices for silver, lead and copper, have caused the change, for the great bodies of ore were never exhausted.

In the Sneffels district the Camp Bird is credited with a production of \$200,000 per month, and the Revenue Tunnel and silver mines of the Caroline Mining Company, which in the past are said to have produced over thirty millions, are being worked again under the leasing system.

Across the mountains from these mines on the Savage fork of the San Miguel river the Tomboy Company pays \$562,500 dividends for the year closed June 30, reserving \$397,555 for improvements, a total net earning of \$960,055 for the year. Most of this comes from the Argentine-Cincinnati claims, on a vein parallel to the original Tomboy vein. The Japan-Flora, on another parallel vein in the same basin, has been transferred to the Mines Selection Company, of London, England. Another series of claims on the Columbia, an extremely rich vein, also paralleling the Argentine vein, have been taken over by the Mines Finance Company, of New York.

Speaking of high places, it may be interesting to note that all these successfully worked mines have their outcrops at from 10,000 to 12,500 ft. above tide-water.

At Cripple Creek, where the production is still around \$1,250,000 a month, the leasing system is being almost wholly adopted, and the future of the camp seems to depend, to some extent, on the success of the district cyanide mills, and more largely on the lowering of rates by the other mills and the railroads, so as to permit of the profitable treatment of ores varying from \$4 to \$10. As this will mean the movement of a very heavy tonnage, which will otherwise remain on the dumps as waste, and as there is a liberal margin of profit on the existing railway rates and mill charges to permit of the reduction, it is probable that this will come. The new drainage tunnel, from Gatch Park, is being built by the tunnel company, as the contractors "laid down."

London

June 29—A company has been formed in London, called the Anglo-Mexican Oilfields, Ltd., for the purpose of acquiring oil lands on the San Carlos and Guadalupe estates, near the town of Pichucalco, Chiapas, Mexico. The properties have been reported on by Dr. Olszewski, who has considerable experience in oil formations in Galicia and elsewhere, and by Ernest Nicklos. Mr. Bergheim, the pro-

motor of the company, has interests in Galician oilfields. At the present time very little work has been done on the properties to prove their actual value, so the capitalization of the company, £250,000, seems a large amount. However, all London capitalizations are open to this criticism. The geology of the district is of interest.

The Castner-Kellner Alkali Company is already enlarging and extending its new works near Newcastle-on-Tyne, which commenced operations about 18 months ago. The new works were built at Newcastle instead of at Weston Point in Cheshire, where the main plant is situated, chiefly because electricity is much cheaper in the Newcastle district. The new works principally produce sodium, which is used in the manufacture of the cyanide put on the market by the Cassel Company.

An interesting new departure in platinum mining is that of the Platinum Corporation, which has recently been formed in London for the purpose of working certain lands in Russia. The promoters of this scheme are the directors of Claudius Ash, Sons & Co., a firm which has an extensive business in dental supplies. In order to free themselves from the platinum market, they desire to have a supply of their own. The directors and shareholders in the Claudius Ash company are putting up a large amount of capital for working these concessions. The Platinum Corporation will be worked by a different organization from the Claudius Ash company, though of course the control and interests will be identical.

I have from time to time recorded the troubles of the Avino Mines of Mexico, Ltd. Ralph Nichols some time ago recommended additional expenditure for exploring purposes, but the capital was exhausted and shareholders were chary of putting up any more money. It was therefore decided to have another examination to confirm Mr. Nichols' opinion before going any further. Accordingly Gordon Hardy, of New York, who knows Mexico and has been connected with the Dolores mine, was requisitioned. His report has just come to hand. His conclusions are in complete opposition to those of Mr. Nichols, both as to the extent and value of the ore reserves and the prospect of successfully treating the ore. The directors have decided to have still another examination and have engaged R. A. Varden, of the firm of Bainbridge, Seymour & Co., of London, to proceed to the mine and give his opinion. In the meantime instructions have been given to Mr. Nichols to reduce expenditures at the mine in every possible direction and to extract sufficient ore to meet the necessary expenditure during the next three months. Further comment on the situation I will reserve until Mr. Varden's report is received; but in the meantime I may say that I shall be content to take his opinion as final.

Mining News from All Parts of the World

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

THE CURRENT HISTORY OF MINING

California

AMADOR COUNTY

Bunker Hill Mining Company—The average of 31 days' milling at this mine, Amador City, in May, was \$5.40 per ton. The usual monthly dividend of three cents per share was declared.

South Eureka—A crosscut is being run on the 2300 level to encounter the ledge.

CALAVERAS COUNTY

Gwin Mine Development Company—The output of this famous old producer has not been up to the mark of late, and an assessment of 20 cents a share has been levied to meet liabilities. This will raise \$20,000.

EL DORADO COUNTY

Gravel Hill—Frechette & Delwisch are moving the mill, machinery and buildings of the Delwisch mine to this property.

Green Valley Mining Company—This company has been organized to build and operate a dredge in the Dormody ranch. W. F. Gormley, B. F. McLaughlin, A. L. Shinn and others are directors, with offices in Sacramento.

Trimble Placer—This property, as well as the Tanksley placer, has been bought by George Buchler and J. B. Fountain, who intend working in the creek channel for seam diggings.

Two Channel—At this property, near Georgetown, owned by H. E. Pickett, leasing companies are doing all the work.

INYO COUNTY

Bonnie Claire—On this property, in Gold Mountain district, owned by W. G. Emerson, A. Thompson, and others, of Los Angeles, the new mill is in operation.

Cocopah—In this tunnel at Skidoo 4 ft. of high-grade ore has been found.

Granite Contact Mines Company—This company has obtained possession of the Gold Bird claim, in Skidoo district.

Inyo Mines Syndicate—This company is about to commence operations on the Red Rose group, where high-grade ore has been found.

New Coso Mining Company—The Lucky Jim mine, of this company, at Keeler, is shipping ore to the smelters.

Southern Belle Mines Company—Superintendent Vandercook is opening the 250-ft. level of the New Year. The foot-wall of the vein was struck on that level 20 ft. from the incline.

KERN COUNTY

Around Mojave—The Queen Esther is milling 150 tons of ore daily. The Karma-Ajax is being retimbered and developed. At the Fairview four stamps are being added to the mill, and three 50-ton tanks to the cyanide plant.

Havilah District—The King Solomon is installing a hoist and making ready for a mill. At the Mammoth a five-stamp mill is being built. The McKidney is to be incorporated and started up.

Pine Tree and Buckeye—These claims on Dahlonaga district have been purchased from Rolfers and Hansen by L. B. Thomas and Daniel Spaulding, of Los Angeles.

MARIPOSA COUNTY

Red Cloud and Marble Mining Company—This company has been organized with A. L. Wagner as president and E. P. Pitman as secretary, to work the two mines named, which include five full claims.

MONO COUNTY

Indian Queen—This mine, which was years ago a steady producer, has been purchased by a company of which L. S. Brown, of Springfield, Mass., is president; George H. Hewitt, general manager, and S. J. Alderman, superintendent.

NEVADA COUNTY

California—At the bottom of the 260-ft. shaft in this mine at Deadman's Flat, a rich orebody has been encountered.

Champion Mines Company—The good ore from the shoot over which there has been so much litigation in this mine at Nevada City is keeping the 20-stamp mill busy, and 120 men are employed. The shaft of the Home claim is now 800 ft. deep.

Conlan Mining Company—The mill is running at full capacity, and the ore developed is expected to pay all the expenses of past prospecting, and the construction of the present plant. The company has bought the Lafayette and Comet claims.

NEVADA COUNTY

Kenosha Mining Company—This company is about to install electrically driven pumps to sink 1000 ft.; a hoist will also be put in.

Last Chance—A 60-ft. upraise at the end of the 400-ft. tunnel has shown up a good pay streak of gravel running about

\$2 per car. The mine is owned by J. M. O'Hearn.

Olla Mining Company—This company is developing the McPherrin mine, at Graniteville, and has the tunnel in 500 feet.

PLUMAS COUNTY

Solomon Group—W. W. Savercool and associates have found rich quartz in this mine on the north fork of the Feather river, nine miles from Seneca.

SACRAMENTO COUNTY

Blue Ravine Mining Company—In the new shaft, about a mile from the old one, above Folsom, this company is drifting in good gravel.

SAN DIEGO COUNTY

Picacho Basin Mining Company—This Los Angeles company has bought from the master in chancery a number of mines and a quantity of costly mining machinery, shops, apparatus, etc., located at Picacho.

SHASTA COUNTY

Dredging—The Horsetown dredge, in Clear creek, owned by the Shasta Dredge Company, is having its test run. The first dredge built was burned, the second was unsatisfactory; this is the third.

White Oak—This old mine, near Shasta, has been purchased by H. O. Cummings.

Yankee John Gold Mines Company—Ore rich enough to be sacked for shipment to the smelter has been found on this property at Centerville, eight miles from Redding.

SIERRA COUNTY

Del Norte-Scotia—This property at Forest, owned by Smith and Crafts, has been leased to F. E. Jameson, of Alameda.

SISKIYOU COUNTY

French Company—On this gravel property, near Collahans, closed by litigation three years ago, work has been resumed by Fred Beaudry. Five miles of ditches are being cleared and repaired, preparatory to hydraulicking.

Snook & Burns—This mining ground, consisting of 160 acres, has been purchased by J. M. Morrison, of Yreka.

TUOLUMNE COUNTY

Grizzly—Preparations are being carried on for the erection of a 100-stamp mill, the machinery for which is on the ground.

Colorado

DOLOROS COUNTY—RICO

Atlantic Cable—Recent development work in this group, owned by the United Rico Mines Company, has resulted in several important discoveries. The zinc blende ore is a huge irregular deposit. The first and second levels are practically all ore, with a dip to the south and west. In the south upraise from the third level, rosin zinc and calamine, the silicate of zinc, were encountered. This gives the Cable a great variety of minerals—gold, silver, copper, lead, zinc (black jack), zinc (rosin), silicate of zinc and bismuth, together with specular iron.

Group Tunnel Dump—Sluicing and hand jiggling on this dump is yielding a concentrate of 92 oz. silver and 56 oz. gold, with some lead, on a basis of twenty into one. The dump contains about 750,000 tons.

Rio Dolores—At a recent meeting of the Rio Dolores Mining Company at headquarters in Milwaukee it was decided to await the construction of the Stalman-Germer concentrating plant and smelter at Rico before deciding upon a concentrating method for its ores. The company has about 500,000 tons of low-grade ore available.

Ute—An upraise of 175 ft. from tunnel level to contact shows constantly increasing values in this 15-in. vein of the United Rico Mines Company on Dolores mountain.

Wellington Group—This group, owned by David Swickhimer and Louis Habermann, is shipping three cars per week of 5 per cent. copper ore carrying some silver.

LAKE COUNTY—LEADVILLE

A. Y. & Minnie—Changes and improvements have given a new lease of life to this property. The mine has a hoisting capacity of 200 tons daily, but for the present 100 tons will be shipped daily. A body of high-grade zinc ore was recently opened and there are bodies of lead carbonates which can be worked to advantage.

Big English—The Gold Bug Company is preparing to erect a mill in order to treat the low-grade gold ores uncovered in the property, and in the meantime is taking out occasional lots of crude shipping ore.

California Gulch—A 3-ft. vein has been encountered in the Grover Cleveland tunnel, which shows gold, silver and copper.

Iowa Gulch—There is a plan on foot to drive a tunnel from the bottom of this gulch, with an outlet in Empire gulch, which will fully develop this territory. Considerable high-grade ore was encountered while driving the Chicago, or, as it is generally known, the Ready Cash Tunnel, and several shipments have been made.

Iron-Silver Ground—Several new leases are being opened in this district in Cali-

fornia gulch, and a large amount of iron and carbonates is being shipped.

Morocco—From 300 to 500 tons of manganese ore is being shipped daily to the Pueblo steel works from this company's ground and the Stars and Catalpa-Crescent are adding to this supply.

Placer Mining—Placer operations on an extensive scale have been begun in Colorado gulch, the work being carried on by the Ximo Mining Company under the personal direction of Col. Timothy Kyle. Only a small portion of the ground, which in its entirety covers 134 acres of patented ground, will be worked this season, as a large portion cannot be worked without modern appliances. All of this large acreage is virgin ground.

Sunday Shaft—A body of oxidized ore was recently encountered in this shaft on Ball mountain, which will materially increase shipments. The shaft has been sunk to a depth of 100 ft. and prospect work is kept well ahead.

Indian Territory

CHOCTAW NATION

Milby & Dow Coal Company—This company is sinking a new shaft on its property at Dow, and the Missouri, Kansas & Texas railroad is building a line to the mine. J. Tonkin has been made superintendent of the company.

CREEK NATION

Gas at Gibson—Large volumes of gas have been struck and exploitation work is going forward rapidly.

Texas Oil Company—The pipe line which this company is building from Tulsa to Port Arthur, Tex., is nearing completion.

Victor Oil and Gas Company—This company suffered a loss of more than a half million dollars at Tulsa during the tornado and electric storm which recently swept through the territory.

Michigan

KEWEENAW COUNTY—COPPER

Ojibway—A gang of men is clearing a road into this property and sinking on the two shafts will soon be under way. The overburden consists of about 30 ft. of soft material easily removed. The operation of the mine will be in charge of Henry Roberts, superintendent; Andrew Formiss, engineer; and Capt. Trevarthen mining captain. The organization of the Ojibway Mining Company consists of the following officers, elected recently at Duluth: Dr. L. L. Hubbard, president; Charles A. Duncan, first vice-president and treasurer; Gustav Huggart, second vice-president. The directors are: Thomas F. Cole, L. L. Hubbard, Chester A. Congdon, James Hoatson, Thomas Hoatson, Charles D'Autremont, John D. Ryan, Chas. A. Duncan and O. J.

Larson. The company will have its main offices in the Lyceum building, Duluth.

Missouri

ST. FRANCOIS COUNTY

St. Joe Lead Company—Fire destroyed the new No. 2 mill and the tin roasting furnaces at the Hoffman shaft on June 24. The plant is a total loss, and will reduce the lead output of the St. Joe Company 40 per cent. until the mill can be reconstructed. The mill had a capacity of 1000 tons, and was one of the latest and best designed concentrators in the lead belt. The plant will at once be rebuilt and steel will be employed as far as possible.

Montana

CHOTEAU COUNTY

Havre Coal Mining Company—This company, at Havre, is preparing to put in a complete and modern electric coal-mining and handling plant that will embrace in the line of machinery the following: Coal-mining machines, electrical locomotives for workings, electric locomotives for tram service, electric hoists for incline work, 250-h.p. steam plant electric generators, 100 two-ton coal cars, automatic tipples, screens, etc. It is calculated to give the plant 500 tons capacity for eight-hour shifts. The coal seam varies from 5 to 6 ft. in thickness.

Nevada

ESMERALDA COUNTY—GOLDFIELD

The Florence Leasing and Mining Company has sunk its shaft 385 ft. on its lease, and is driving to intersect the rich ore lenses that were encountered at the 285-ft. level.

White Rock—The lessees report having cut a rich vein in a crosscut from the 315-ft. level.

Little Florence—Between 50 and 60 tons of shipping ore are being daily raised and shipped in bulk. The average value is \$350 per ton. Between June 8 and 20 the output of ore amounted to 746 tons valued at \$228,880; or an average of \$340 per ton. The lessees are making arrangements to increase the production to 300 tons per day.

Mohawk Ledge—The shaft has reached the 310-ft. level, and a crosscut west of that level has cut a vein between 18 and 20 ft. in width. The company has decided to sink the shaft to the 400-ft. level before shipping the ore.

HUMBOLDT COUNTY

Special agents of the Federal Government have been sent out from Denver to investigate the title to a large amount of coal land in Humboldt county, Nevada, patents for which are said to have been secured by the Central Pacific Railroad Company through fraudulent means. Under the general railroad grant of 1862, by the terms of which alternate sections were

granted, certain provisions were made as to the reservation of mineral lands, containing precious metals.

NYE COUNTY—MANHATTAN

Breyfogle—At this property, situated on Mustang hill, the main shaft has reached a depth of 120 ft., and has lately been equipped by a power hoist.

Gold Wedge—The shaft has been sunk to the 100-ft. level and arrangements are in progress for the erection of a power hoist. In several parts of the workings ore of milling grade has been cut.

Manhattan Consolidated—The rich vein recently cut in this property has a fair width of ore of shipping grade and across its face it carries ore of milling grade. At present only ore of shipping grade is mined.

Mustang—The orebody in the cross-cuts at the 260-ft. level is gold-bearing throughout. A large proportion is of shipping grade.

Otero—Sulphide ore is coming in at the lower levels, and the country is becoming more settled. A large amount of milling ore is accumulating on the dump awaiting the completion of the Manhattan Ore Reduction Works. A new hoist is being installed.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments over the Tonopah Railroad for the week ending June 27 were: Tonopah Company, 910 tons; Tonopah Extension, 210; Belmont, 200; Montana-Tonopah, 135; Midway, 41; total, 1496 tons. From Goldfield, 1330 tons were shipped, making a total of 2826 tons. In addition the Tonopah Company sent 3250 tons and the Belmont 740 tons to the mills.

Belmont—Shipments of picked ore continue to go forward at the rate of 200 tons weekly.

Jim Butler—Large ore reserves have been developed and shipments averaging 60 tons per week of high-grade ore are regularly being made.

Rescue—The shaft has reached the 650-ft. level. A number of stringers of ore bearing quartz have been cut and the assay values are sufficiently high to warrant picking and sacking.

West End—The new main shaft has reached the 150-ft. level. The weekly ore shipments average about 40 tons.

New Mexico

GRANT COUNTY

Central District—In the Old Hanover, C. R. Cramer is doing re-stopping, and is preparing to explore some in the Emma, Hanover No. 2 and Nora claims. A Milwaukee syndicate has recently acquired the Philadelphia and Copper George groups.

Central District—Upper Basin—A wagon road has been run to the Anson

S. group. The Gladstone, Marblehead, Bryan and McKinley groups are along the upper contact, and are opened by several shafts. The greatest development, however, on this contact is done in the Humboldt mine of the Hermosa company, of which H. C. Anchor is manager. Here the shaft has reached a depth of 500 ft.; it is planned to sink to 1000 feet.

Copper Flat and Rough Rider—T. W. Beam, of Denver, Colo., has acquired this group. The mines will be developed under the charge of T. C. Garee. Machinery has been ordered for deepening the shafts.

Gold Hill Camp—A strike of gold ore has been made in the Roosevelt mine at 80 ft. depth. A new road has been constructed from the Alumogen district, to connect the mines of the Meerschbaum Company of America with Silver City, via Scott's sawmill and Pinos Altos, with a saving of 25 miles.

Pinos Altos—A new hoist has been erected at the Hearst shaft with the expectation of sinking to the 1200-ft. level.

Santa Rita—On Lee hill, the company expects to sink the shaft on the Oxide claim to 1000 ft., if necessary, to penetrate the underlying limestone and explore for orebodies on this side of Santa Rita basin.

Tyrone Camp—The Tyrone Development Company, directed by Link and Jack Merrill, is engaged in extensive development. Four shafts have been sunk, from 200 to 600 ft. deep.

SOCORRO COUNTY

Little Fannie—This mine of the Mogollon Mountain Investment Company has reached 550 ft., where a crosscut shows the vein to be 20 ft. wide with good ore. The main shaft of the Cooney mine is being sunk to the 800-ft. level, while the large concentrator is treating low-grade ore. The 100-ton cyanide plant of the Last Chance mine is running mainly on ore extracted during development work.

Zinc Development—In the lower levels of both the Graphic and Kelly mines, zinc is increasing at the expense of the lead. The latter metal shows only 2 to 8 per cent. in the lowest Kelly lense, while the zinc is 25 to 35 per cent.; higher up in the sulphide zone much of the ore ran 8 to 14 per cent. lead, with the zinc only 20 to 25 per cent. Preliminary work is advancing slowly for the erection of a custom zinc smelter at Albuquerque by the Tribullion company, but the actual construction may be postponed till the concentrator at Kelly is running successfully.

Magdalena District—The Spring lode has been bought by the Tribullion company from Colonel Eaton for \$5000. A Joplin company has been inspecting all the claims in South Kelly and has bought all those for sale at moderate prices. The

large boilers, steam hoist and 15-drill air-compressor are in place at the Traylor shaft of the Kelly mine.

Mogollon District—An association has been formed by the leading mining men to boom the camp, with T. J. Curran, president; E. C. Cleveland, vice-president, and Ernest Craig, secretary and treasurer. Its first work will be the establishment of automobile and telephone lines to Silver City.

SIERRA COUNTY

Hillsboro District—At the Columbia mine, ruby-silver ore has lately been struck. The dynamiting of the hoist of the Milwaukee Mining Company, and of the power-room of Hitscher Bros., by malicious persons, has considerably crippled the operation of those plants.

North Carolina

ALEXANDER COUNTY

Hiddenite—This mine is again being opened by Cary Wright, gem expert for the American Gem Syndicate. It is reported that hiddenite and other precious stones are being found. This is the only locality in the world where hiddenite is found. It is a beautiful emerald green gem.

CATAWBA COUNTY

Catawba Gold—This mine is working 400 tons of material per day by the Erdman method. Capt. A. J. Overton, N. C., is manager.

GUILFORD COUNTY

Deep River—This mine is being opened up by F. J. Conroy, of Colorado. The mine has a record for good copper-gold ore.

RANDOLPH COUNTY

Asheboro Copper—This mine is being reopened and expects to resume shipments within 30 days.

ROWAN COUNTY

Gold Hill Copper—This mine was taken out of the hands of a receiver some months ago and is under new management. The main shaft is down 800 ft. and the ore shows well in gold and copper.

Southern Mining Company—This is a new company organized in Joliet, Ill., by E. L. Hollingshead and others to work a property in the town of Gold Hill. The workings are down about 50 ft. A 10-stamp mill is in process of erection.

Oregon

BAKER COUNTY

Belcher—It is the intention to erect a 20-stamp mill this season, and place the electric drills in commission. Most of the machinery is on the ground.

Constellation Group—L. B. Swiggert states that he has sold this group in the Cable Cove camp. The group lies near

the California and consists of nine full claims, and has been uncovered 600 ft., showing an orebody 4 ft. in depth.

East Eagle Placers—Three No. 4 giants are at work on this property, 28 miles east of Baker City. There is plenty of water, and the company has installed an electric light plant, and is working day and night in three shifts.

Gem Mine—A strike has been made in this mine in the Susanville camp of high-grade copper, gold and silver ore on the 250-ft. level.

Mining Association—At a meeting held June 7, the Eastern Oregon Mining Association organized by electing J. K. Romig, president; J. W. Messner, first vice-president; F. H. Dean, second vice-president; W. J. Patterson, third vice-president, and James H. Howard, treasurer, with a full advisory board from the different precincts. There are sixty members in the association.

Standard Mines—The 100-ton mill is running, and concentrates are being shipped to the Sumpter smelter.

MALHEUR COUNTY

Oregon Oil and Gas Company—This company will explore the Ontario field for oil. The following are the officers: W. L. Hixon, president; A. E. Clark, vice-president; Frank H. Richardson, treasurer; C. W. Taylor, secretary and manager. A rig will be placed on the Pogue tract, another on the Idaho side of the river, and a third at some point in the foothills west of Ontario.

Pennsylvania

ANTHRACITE COAL

In disposing of the suit instituted by the city of Philadelphia to restrain coal companies operating in the Schuylkill valley from discharging coal dirt and refuse into the river, the supreme court on June 25 approved the report of the referee. The referee found that the complaint against the companies for pollution of the water was well taken, but that since the suit was begun the matter had been remedied. The court ordered the costs apportioned among the following coal companies: Philadelphia & Reading Coal and Iron Company, Lehigh Coal and Navigation Company, and Silver Brook Coal Company.

Philadelphia & Reading Coal and Iron Company—This company's statement for May and the 11 months of its fiscal year from July 1 to May 31 is as follows:

	May.	Eleven Mos.
Earnings.....	\$1,407,558	\$35,418,019
Expenses.....	3,168,303	33,488,184
Net earnings.....	\$ 239,255	\$ 1,929,835

For the 11 months there was an increase of \$4,648,714 in earnings; an increase of \$4,268,434 in expenses; and a resulting increase of \$380,280 in net earnings.

BITUMINOUS COAL

Pittsburg Coal Company—This company makes the following statement for May and the five months ended May 31:

	May.	Five Mos.
Net earnings.....	\$451,638	\$1,974,471
Depreciation of coal lands....	\$ 60,967	\$ 284,686
Depreciation of plant.....	79,562	415,929
Interest.....	88,933	461,361
Total charges.....	\$229,462	\$1,161,876
Surplus.....	\$222,235	\$ 832,595

As compared with 1906, there was, for the five months, an increase of \$131,758 in net earnings, and of \$229,099 in surplus.

South Dakota

CUSTER COUNTY

Gold Ochre—An important strike has just been made by James Demereau on this claim. The vein is 8 ft. in width and is a white and bluish granulated quartz with streaks of telluride and running high in gold.

White Spar Mica—Machinery is being installed at the electric plant at the White Spar and New York Mica mines. The force of men at the mines is steadily increasing, and good quantities of mica are being taken out.

LAWRENCE COUNTY

Branch Mint—Work will be resumed on this property on a larger scale than ever before. An entire car of powder, a car of cyanide and 50 cars of coal have been ordered. The mill will be worked up to its full capacity from the start; 18,000 tons of ore are now in the bins, enough to run the mill for a month.

Homestake Extension—Within 30 days active work will be begun on this property and New England Homestake. C. E. McHugh, of Deadwood, is president and general manager of both companies, and the fiscal agents of the company have just turned over to him \$52,000 to be used in liquidating the company's debts and for development work.

Imperial Dakota—The annual meeting of the Dakota Mining Company will be held in Deadwood this month at which will undoubtedly be effected and consolidation of this company with the Imperial. This latter company now owns a controlling interest in the Dakota and at the meeting the directors elected will be Imperial men. A large part of the stock is controlled by Robt. S. and W. W. Jamison, of Deadwood. Work will be resumed at once on the two properties and a mill built for the treatment of the ores.

Lundberg, Dorr and Wilson—J. V. N. Dorr states that this company will resume operations as soon as he can obtain sufficient men. The mill at Terry will start within a few days.

North Homestake Mining Company—This company has been incorporated with a capital stock of \$6,000,000. The company will operate on the Penobscot,

hitherto owned by Alexander Maitland. The ore shoots are in the Cambrian formation. A 100-ton cyanide mill has been operating on the property, but the capacity will now be increased. The officers are: Alexander Maitland, president; James Root, Chicago, secretary and treasurer; A. J. Plowman, E. R. Baldwin, and E. W. Miller, all of Deadwood, directors.

Lucky Strike—At the annual meeting held in Deadwood, June 20, it was decided to recommence work on the mill, for which the grading and the foundations have already been completed. The mine has been pumped out and work will be resumed there also. The mill will be a wet cyanide with capacity of 200 tons daily. The following officers were elected for the ensuing year: N. G. Blakeslee, of Baraboo, Wis., president; C. A. Allen, of Deadwood, vice-president and general manager; H. F. Seiter, of Tracy, Minnesota, treasurer; Lee Swift, of Tracy, secretary, and Frank Allen, of Deadwood, superintendent. These officers constitute the board of directors, together with E. M. Cassidy, Charles Pearson, and M. Hickey, all of Whiting, Iowa.

PENNINGTON COUNTY

Grand View—Operations have been suspended for a short time owing to the recent washouts. The five-stamp mill of the company has been in constant operation for more than a year, and is reported to have made a net profit of \$30 a day.

Gordelia—Work on this property on Silver creek is being pushed rapidly with good results. A body of ore 20 ft. wide has been opened up, and the company is now figuring on a mill. The ore is practically free milling. L. M. Kearney is in charge of the work.

Lady of the Hills—A New York company has bonded this ground and is engaged in active development work. The ground consists of about 35 acres and is located on the antimony belt at Silver City, north of Rapid creek. A 50-ft. shaft which was sunk on a cross sheet of high value is being sunk deeper. The ground has been partly opened up by a number of shafts, tunnels, and cross cuts.

Holy Terror—The work of unwatering this mine has been begun and by September it is expected that the mine will be dry. A large flume has been built and a boiler set up.

Utah

JUAB COUNTY

Tintic Ore Shipments—Shipments for the week ending June 29 amounted to 144 carloads, the contributing mines and respective amounts being: Ajax, 3; Beck Tunnel, 12; Bullion Beck, 7; Carisa, 6; Centennial Eureka, 38; Colorado, 6; Eagle & Blue Bell, 6; Grand Central, 6; Gemiri, 5; Lower Mammoth, 6; May Day, 5; Mammoth, 16; Scranton, 6; Tintic Iron, 9; Uncle Sam Consolidated, 5; Victoria, 2; Yankee Consolidated, 6.

Washington**STEVENS COUNTY**

Napoleon—The British Columbia Copper Company denies a report which appeared in a recent issue of the JOURNAL announcing the completion of plans for a 500-ton cyanide plant. The company has a large body of ore which may ultimately be cyanided, but no plans have been made. A tram 4100 ft. long to a spur for the transportation of sulphide ores is in operation. There are two compressors of seven- and three-drill capacity and not one six-drill compressor as reported.

West Virginia**RALEIGH COUNTY**

Bonanza Coal Company—This company, Charleston, has been incorporated with a capital stock of \$50,000 to develop a tract of about 1000 acres of coal land on Upper Piney creek.

Canada**ALBERTA**

Alberta Coal and Coke Company—This company is opening a mine near Lundbreck. Plans for a plant for an output of 6000 tons a day are being prepared by Chicago engineers. H. N. Galer is manager of this property, conjointly with the International.

Alberta Railway and Irrigation Company—An agreement, to cover two years, has been reached between this company, which owns the Lethbridge colliery, and the United Mine Workers of America, representing the men working in the company's coal mine. The company has conceded recognition of the miners' union, which it had long refused. The agreement settles wages disputes and the question of eight hours' work at the face in the mine. P. L. Naismith is the company's manager.

International Coal and Coke Company—H. N. Galer, manager of this company, says that its coal mines and coke plant at Coleman, which were closed during the recent labor troubles, are again working to full capacity, 1600 tons of coal a day. About 1300 tons of coal are sold daily for steam purposes, and the balance made into coke, which is sold to a Boundary, B. C., smelter.

BRITISH COLUMBIA—BOUNDARY DISTRICT*Crow's Nest Pass Coal Company, Ltd.*

—The directors have authorized the expenditure of \$1,250,000 for the further development and equipment of the company's coal mines at Coal Creek, Michel and Morrissey, in Crow's Nest Pass. G. G. S. Lindsey, managing director, and James McEvoy, chief engineer, have gone to Toronto, Ont., to submit plans to the directors. Efforts are being made to obtain 400 to 500 more men.

Hall Mining and Smelting Company—

Preparations are being made for the further enlargement of the ore-roasting equipment of the lead-silver smelting works at Nelson. A Huntington-Heberlein roaster and converters will be added. J. J. Campbell is general manager, and Selwyn G. Blaylock smelter superintendent.

BRITISH COLUMBIA—ROSSLAND DISTRICT

Consolidated Mining and Smelting Company of Canada, Ltd.—Ore receipts at this company's smelting works at Trail during May totaled 27,363,959 lb. The chief shippers were the Center Star group, Rossland, 17,312,780 lb.; Le Roi No. 2, Rossland, 4,261,380 lb.; Victoria, Nelson, 1,948,520 lb., and St. Eugene, East Kootenay, 1,154,145 lb. Ten other mines shipped the remaining 2,687,134 lb. Ores containing copper, gold and silver totaled 24,696,640 lb.; silver and lead, 2,375,973 lb.; and gold and silver, 291,346 pounds.

ONTARIO—COBALT DISTRICT

Cobalt, Ore Shipments—Shipments of ore for the week ending June 29 were as follows: Buffalo, 60,000 lb.; Coniagas 434,000; Colonial, 40,000; Nipissing, 63,120; Right of Way, 56,500; Trethewey, 102,000; total 755,620 pounds.

Chambers-Ferland—Development is being pushed under the management of W. H. Linney, formerly of the Nipissing Mining Company. A gang of 125 men is employed in trenching and cross-trenching. Six silver-bearing calcite veins have so far been discovered, on the two most promising of which shafts are being sunk and other veins are being developed by open-cuts.

Colonial Silver—Two tunnels have been driven into the diabase mountain, one being in 265 ft. and the other 330 ft. A winze has been sunk in one at about 200 ft. from the entrance and some ore was extracted with good silver contents and native silver. The plant consists of three 100-h.p. boilers and a 12-drill compressor. Superintendent Fred Coombe is in charge of a force of 75 men.

King Edward—A tunnel has been driven 500 ft. into the diabase mountain and good ore is being taken out. Thirty-five men are at work under Superintendent McCaskill. The plant consists of a 12-drill compressor and two 80-h.p. boilers.

Nipissing—A strike was declared by 300 miners, engaged in surface work on this property, on July 2d for an increase in wages. They were getting \$1.75 per day and board and demand \$2. The strikers left without notice or the submission of any formal demand. The Miner's Union has appointed a committee who will meet Manager Drummond and it is expected that the difficulty will shortly be adjusted. A tunnel is being constructed about 200 ft. below the surface to extend from Peterson lake to Cobalt lake to drain the ground for exploration and development.

Mexico**STATE OF MEXICO**

El Oro Mining and Railway Company, Ltd.—According to the company's official report, an important change in the mineralization of the San Rafael vein was revealed by development at the 1000-ft. level. Above this level the values were in oxidized ore and ranged from \$5 to \$20 per ton. At about 1000 ft. the character of the ore changes into sulphide and the workings have entered what appears to be the zone of the original permanent water level. Oxidation has not followed any horizontal plane, and the present accepted theory is that the 1000-ft. level north of the San Rafael vein is following or running along the irregular surface of this unaltered sulphide ore, and in consequence the drift is sometimes in unaltered ore, and at others within the oxidized zone hitherto worked above.

The North drift first entered the San Rafael vein about 200 ft. north from the Somera shaft, at which point the vein was in oxidized ore of little value. Proceeding north the next 50 ft. of the drift showed some evidence of sulphide ore, and gradually improved in grade as the amount of this sulphide increased, until at a point 258 ft. from the shaft a body of sulphide ore was encountered which has been proved to be 8 ft. in width. As this drift advanced, daily samples were taken, showing in some cases, values in excess of \$100 gold per ton, and it may be safely assumed that the average value per ton of this orebody is \$50. At a point 280 ft. north of the shaft the drift again entered oxidized ore, in which it has continued for 70 ft., the values obtained therefrom being of only low grade.

At a point in the north drift 220 ft. from the shaft a crosscut has been driven west a distance of 100 ft., where it has encountered a vein that may prove to be the southerly extension of what is known as the West vein in the Esperanza property adjoining. This vein also shows sulphide ore, and at the point of intersection gave an average value of \$50 in gold per ton. The drift has now been advanced a distance of 99 ft., all of which has been in ore, and has exposed an orebody about 7 ft. in width, some portions of which have shown high values, the whole averaging at least \$25 per ton in gold.

The South drift on the 1000-ft. level has followed two small veins of good milling grade, showing considerable quantities of sulphide ore. Further on these two veins united. The average width of this orebody is 2½ ft., and it gives an average value of not less than \$40 per ton in gold.

Developments on the 1150-ft. level have just been commenced, and the drifts both north and south will be advanced with all possible speed to undercut the orebodies encountered in the 1000-ft. level, as described above.

Metal, Mineral, Coal and Stock Markets

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

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 9—Coal in the Eastern market is plentiful, but in poor demand. In fact coast ports have more than they can take care of. In the West also, coal is plentiful but shippers have been careful to restrict the supply so as to reduce the possibility of demurrage charges at central points. But in spite of these precautions there has been considerable coal in Chicago on which demurrage has been charged.

The unusual activity in the far East still continues, and this territory is calling for coal. The difficulty has been to find vessels for the market. So strong has been the demand that cargoes have been moved at the old winter rates, and consumers have been willing to pay the high freight charges. The shortage of vessels in the coastwise coal trade is probably due to the fact that these vessels find it more profitable to carry ice to supply the heavy demand.

In the Alabama district the new wage scale of 47½@57½c., depending upon the price of pig iron, was signed by the operators. Coal is in demand, and is quickly absorbed. It is predicted that Alabama's output will pass 15,000,000 tons this year. Cars are in good supply, and are running through on schedule.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railway Company's lines east of Pittsburg for the year to June 29 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	2,085,135	2,837,134	I. 751,999
Bituminous.....	15,520,211	18,735,831	I. 3,215,620
Coke.....	6,294,691	6,986,112	I. 691,421
Total.....	23,900,037	28,559,077	I. 4,659,040

The total increase this year was 19.5 per cent.

The total tonnage reported by the Southwestern Interstate Coal Operators' Association for the five months ended May 31 is as follows, in short tons:

	1906.	1907.	Changes.
Missouri.....	1,026,221	1,152,919	I. 125,798
Kansas.....	1,898,078	2,624,262	I. 726,184
Arkansas.....	619,438	927,259	I. 307,821
Indian Territory.....	1,001,553	1,125,918	I. 124,365
Total.....	4,545,290	5,829,458	I. 1,284,168

In April and May, 1906, the mines in the association were closed down on account of the miners' strike.

The coal and coke tonnage of the Chesapeake & Ohio Railway for the 11 months of its fiscal year from July 1 to May 31 was as follows, in short tons:

	Coal.	Coke.	Total.
New River.....	5,081,715	203,018	5,284,733
Kanawha.....	3,358,653	93,826	3,452,479
Kentucky.....	169,107	.....	169,107
Connecting lines...	371,794	118,245	490,039
Total.....	8,981,269	415,089	9,396,358
Total, 1906.....	8,544,747	441,063	8,985,810

The total increase was 410,548 tons, or 4.6 per cent. Deliveries this year of tonnage originating on the line were: Points west of mines, 3,912,098 tons coal and 218,093 tons coke; points east, 1,624,316 tons coal and 78,751 tons coke; tidewater, 3,073,061 tons coal.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to June 29 were 500,201 tons.

Anthracite coal shipments in June are reported at 5,944,260 tons, being 55,012 tons less than in May, but 268,242 tons more than in June, 1906. For the six months ended June 30 the shipments by companies were, in long tons:

	1906.		1907.	
	Tons.	Per Ct.	Tons.	Per Ct.
Reading.....	5,154,323	20.3	6,751,398	20.5
Lehigh Valley....	4,317,788	17.0	5,582,314	16.9
N. J. Central.....	3,156,226	12.4	4,311,696	13.1
Lackawanna.....	4,311,584	17.0	5,153,251	15.7
Del. & Hudson....	2,576,072	10.1	3,208,177	9.8
Pennsylvania....	2,172,258	8.6	2,991,380	9.1
Erie.....	2,612,368	10.3	3,535,577	10.8
N. Y., Ont. & W....	1,086,182	4.3	1,350,802	4.1
Total.....	25,385,801	100.0	32,884,595	100.0

The comparatively small tonnage in 1906 was due to the suspension of mining in April and a part of May, while discussions between operators and miners were going on.

New York

ANTHRACITE

July 10—The anthracite coal market continues quiet and featureless. There is an abundance of coal in local yards and sufficient supplies are available for all demands. The scarcity of small sizes, which formerly prevailed, no longer exists, and hard coal in all grades and sizes is readily obtainable. Prices remain as follows: Broken, \$4.55; egg, stove and chestnut, \$4.80; pea, \$3; buckwheat, \$2.50; rice and buckwheat No. 2, \$1.90@2; barley, \$1.50@1.60; all f.o.b. New York harbor.

BITUMINOUS

There is no apparent change in the situation along the Atlantic seaboard. In New York harbor there is an abundance of coal, which is being offered at low prices, ranging from \$2.25 for ordinary grades up to \$2.40 for good Clearfield coal.

The demand in the far East remains unabated and consumers have difficulty in

obtaining sufficient supplies to meet the demand an account of the continued shortage of vessels sailing to this territory. Trade along the Sound seems to be in a position midway between the two extremes. Transportation from mines to tide is up to all demands, and there seems to be no complaint from shippers with regard to car supply. Coastwise vessels still maintain the same rates of freight prevailing for several weeks; these are quoted as follows: From Philadelphia to Boston, Salem and Portland, \$1.10; to Lynn, Newburyport, Bath, Gardiner and Bangor, \$1.25; to Portsmouth, \$1.15; to the Sound, 90c.; with towages where usual.

Birmingham

July 8—There has been a general resumption of work in the coalfields of Alabama among the commercial operators. Those mines, which were idle during the past week pending the signing of the wage contract, made considerable repairs about the mines, such as moving boilers, putting in new boilers, or other work that was necessary. A. J. Reilly, secretary of the Commercial Coal Operators' Association, met the officials of the United Mine Workers of America of this district, and renewed the wage scale that has been in effect for the past three years. The wage paid ranges from 47½@57½c. per ton, and is based on the average selling price of pig iron. The operators had asked for some concessions in that there should be one pay-day monthly, and that the miners should be allowed a laborer. The miners would not grant the concession. There is a strong demand for coal and the general resumption of work in the district means much, notwithstanding that the union miners control only one-fifth or one-sixth of the industry of the district.

Chicago

July 8—Except for the threshing business, the coal market is very quiet. Both Western and Eastern coals hold up well in price, under a bearish tendency in the market. The explanation of this is the fact that shipments are fairly well restricted this summer, so as to prevent the usual ruinous accumulations of coal on track that must be sold at a sacrifice to escape demurrage. Yet there has been demurrage coal; more of it, indeed, than salesmen could wish. The amount, however, is not large as compared with accumulations in former years, and there are

evidences of a general tendency to hold down consignments closely to actual needs.

Western coals are most active in fine sizes, screenings being in brisk demand at \$1.35@1.75. Run-of-mine from Illinois and Indiana mines is quoted at \$1.65@2.50, and lump and egg sell for \$1.80@2.75 when salable at all, the demand being small.

Supplies of domestic coals being laid in are as yet small, and all grades of Eastern coals, from anthracite to gas coals, are dull. Hocking Valley coal sells for about \$3.15; not much Pittsburg No. 8 and Youghiogheny coal is coming forward, but perhaps enough to supply the demand, at \$2.90 for Pittsburg No. 8, and \$3.30 for Youghiogheny, 1¼-in. size. Smokeless is selling at \$3.15@3.35 for run-of-mine, with the demand steady, but not large. Anthracite sales are small in both country and city.

Cleveland

July 9—The coal market shows a slightly improved tone, owing to freer movements up lake. Many boats are being diverted here to load. Contract figures still hold on large cargoes, but a large business is being done in small shipments with 50c. the prevailing rate. Prices on track remain unchanged from last week.

The Chamber of Commerce reports the following figures for June: Received: Anthracite, tons, 16,149; bituminous, 514,311; by lake, 600. Coke, 59,700. Iron ore, by rail, 3539 gross tons; by lake, 1,035,429. Pig, bloom and railroad iron, 64,407; by lake, 1450. Other iron and castings, 45,192. Manufactures, 60,527 tons; by lake, 615 tons. Forwarded: Anthracite, 1191 tons; bituminous, 5398, by rail; by lake, 417,150. Coke, 2608; iron ore, gross tons, 761,385; pig, bloom and railroad iron, 27,311; by lake, 2300. Other iron and castings, 66,571. Manufactures, 34,084; by lake, 11,962. Shipments of iron ore from upper lake ports will equal over 6,500,000 tons for the month.

It is expected in railroad circles that the Gould interests will make Lorain their regular shipping port instead of Cleveland. The new line from Lorain through Wellington, will make this possible.

Indianapolis

The demand for domestic coal took a decided slump during the past week of hot weather, with a slightly better demand for steam coal. Notwithstanding the decreased demand, prices have advanced from 5 to 10 per cent. Terre Haute is the clearing house or freight junction from which more coal is freighted than any other point in the State. The early completion of the Southern Indiana Railroad, a direct route from Terre Haute to Chicago, known as the Walsh road, is regarded with much favor, since it will at once become a competitor to other roads to Chicago.

Pittsburg

July 9—The holiday last week was responsible for curtailing production, as but little work was done in the last three days. All mines are in full operation this week, and there is an ample supply of railroad cars. It is impossible to accumulate a large supply of coal at the river tipples, and once more all the loaded coal was cleared out of the pools and harbor, the rivers being navigable for three days last week. Prices remain unchanged, and are on a basis of \$1.15@1.20 for mine-run coal at the mine. Slack has advanced slightly, and is quoted this week at 75@85c. for spot and on contract.

Connellsville Coke—Prices continue strong and are a trifle higher than last week. Standard Connellsville furnace coke is quoted at \$2.50@2.65 for spot and second-half delivery, and the product of the lower Connellsville region is quoted at \$2.35@2.50. Foundry coke remains firm at \$3@3.25 for any delivery. The Courier, in its summary for the week, gives the production for both fields at 412,016 tons. The shipments aggregated 14,526 cars, distributed as follows: To Pittsburg, 5110 cars; to points west of Connellsville, 8595 cars; to points east of Connellsville, 821 cars.

Foreign Coal Trade

Shipments of coal from Nova Scotia mines for the five months ended May 31 are reported as follows, by companies:

	1906.	1907.	Changes.
Dominion.....	1,068,585	999,735	D. 68,850
N. S. Steel.....	191,355	163,624	D. 27,731
Cumberland.....	190,217	142,217	D. 48,000
Acadia.....	98,457	112,255	I. 13,798
Intercolonial.....	111,555	109,523	D. 2,032
Inverness.....	54,468	74,975	I. 20,517
Total.....	1,714,627	1,602,329	D. 112,298

Only two companies showed increases. The total loss this year was 6.5 per cent.

Iron Trade Review

New York, July 9—The tone of the market remains practically unchanged. The buyers and sellers of pig iron are playing a waiting game, but prices maintain themselves at practically the same level, with an occasional sale at perhaps 50c. per ton less than a few weeks ago. The furnaces are producing to their full capacity and few stacks are out of commission at present.

The situation for finished steel products is unchanged, there being a good demand at regular prices, though we do not hear so much about premiums being paid. Steel rails, however, are at a standstill, pending an agreement between producers and consumers on the question of new specifications and increased price.

In the South the pig-iron business is quiet, with a little business doing for fourth-quarter delivery. Sales of steel have slackened and this market is quiet.

In an interview with Judge Gary, published this week, the chairman of the Steel Corporation avows himself hopeful of the future. Some recession in business is probable, he thinks, chiefly because our capital resources have been strained and it is difficult for the time being to raise money for new enterprises. This will not be more than a temporary check, however, and new business will come in later. At present the Steel Corporation has all its works fully employed, and there is no apparent decrease in the volume of business for the immediate future.

Baltimore

July 9—Imports of ferromanganese for the week were 1698 tons; of spiegeleisen, 211 tons. One cargo of manganese ore, 7350 tons, arrived from Bombay, India. Receipts of iron ore for the week were 10,600 tons, all from Cuba.

Birmingham

July 8—The pig-iron market continues quiet. Some little business is being transacted, in small-sized lots, for delivery mostly during the fourth quarter of the year. During the past week a few orders for iron to be delivered during the first half of the coming year were received by the larger companies in this district. Spot prices are not as strong as they have been, caused by the unwillingness of manufacturers to make effort to secure this trade. Fourth-quarter iron is quoted at \$21 per ton, No. 2 foundry, with \$22.50 prevailing for the third-quarter product. Iron for delivery during the first half of 1908 still commands \$18.50, No. 2 foundry. The Southern Steel Company is to blow in a furnace this week. The Sloss-Sheffield Steel and Iron Company has been delayed again by structural steel workers on one of their furnaces in the Sheffield district, and it will be toward the last of this month before the furnace is blown in. The Tennessee Coal, Iron and Railroad Company is filling orders right along though reports in some sections are to the contrary. Raw material supplies are easier now than they have been for some time, and manufacturers are confident that the efforts to increase the supplies of ore will come up to all expectations.

One of the larger steel mills in this district has been running a little slack lately. Cast-iron pipe concerns continue to do well, production being large and shipments nearly equal to the output.

Chicago

July 8—Summer quiet has apparently fallen on the iron trade. Sales of pig iron are small, for both quick and future delivery. The market, however, does not show signs of weakness in the sense that furnace agents are trying to sell their iron against the resistance of the melter. On both sides—that of seller and that of buyer—it seems to be a waiting market. The

melter is content, with considerable tonnage undoubtedly to be placed for third- and fourth-quarter deliveries, to await a lower market. The seller is, or professes to be, equally content. He certainly is not materially lowering his prices, and he stands firm on the ground that there is much iron to be sold, for supplying needs of business in sight, whether the sales come soon or late. In this judgment he seems to be supported by the logic of present and prospective conditions.

For delivery in the next three months Southern No. 2 foundry iron brings \$21 Birmingham, or \$25.35 Chicago, while Northern iron brings \$25@25.50; the market seems slightly firmer for Northern than for Southern. For deliveries in the last quarter of the year about \$20 Birmingham for Southern, and \$23 for Northern are the standard quotations. There are large inquiries for iron to be used in the early months of 1908, but few sales.

Coke is stationary, with the supply good and little demurrage coke on hand to force down prices. Connellsville 72-hour sells for \$5.85, and West Virginia 72-hour for \$5.40 per ton.

Cleveland

July 9—Pig iron is quiet on a better supply, with \$24 quoted on spot shipments. Quotations covering the third and fourth quarter are: No. 1 foundry Northern, \$24@24.50; No. 2, \$23.50@24; No. 3, \$23@23.50; bessemer, \$24@24.40; No. 2 Southern, \$23.85@24.85; 8 per cent. silvery, \$22@22.50.

The coke market is dull, and prices have been shaded somewhat. Foundry is quoted at \$3@3.25 last half, while sales are reported on furnace coke down to \$1.90 against the asking price of \$2.25.

Pittsburg

July 9—The fact that no new business of any consequence is being placed is not apparent in the operation of the iron and steel plants in the Pittsburg and surrounding districts. With but few exceptions, all the mills are running and will be kept going steadily with orders on the books. The Carnegie Steel Company has not an idle mill and but one of its 54 blast furnaces is out. It is the stack at Mingo on which repairs are being made, and the furnace likely will be in blast again next week. The only idle plant of importance in this district is the McKeesport works of the National Tube Company and those will be running in a few days. The new blast furnace of this company at McKeesport is almost completed and is scheduled to be blown in early next month, which will give the company four blast furnaces at that place. Many of the small foundries are idle for repairs, which is unusual, as heretofore repairs were made around the first of the year, when an inventory of stock was taken. Foundrymen at last have learned

that hot weather is the time for repairs and stock-taking, as a foundry is an uncomfortably cold place in the winter.

There is absolutely nothing doing in steel rails and has not been for over two weeks, either for this year or 1908 delivery. The last order of any size booked by the Carnegie Steel Company was taken about the middle of June. The placing of large orders for next year now awaits the result of the conference on specifications between nine representatives of the American Railway Association and a like number of representatives of rail-making concerns. It is not likely the railroads will agree to pay \$5 a ton more for rails, but it seems probable that a satisfactory price will be agreed upon for rolling rails according to the proposed specifications.

Business in all finished lines is extremely light but occasional small orders are being booked at regular prices. None of the lines commands premiums and deliveries are somewhat improved. In sheets and plates, however, shipments are not altogether satisfactory, although the mills are rapidly catching up. There are but few sheet mills idle for repairs, and all the plate mills are being operated to capacity.

Pig Iron—The pig-iron market continues dull, but this is always expected at the opening of the second half. It cannot be said that prices are much weaker as there are few transactions on which to base quotations. Basic iron has declined more than any of the other grades and it is reported that offers of basic at \$22, Valley furnaces, have been rejected. A lot of 150 tons of prompt bessemer sold today at \$23.25, at furnace, which is equivalent to a cut of about 50c. on spot iron. For fourth quarter the minimum quotation is \$23, Valley furnaces. A number of inquiries have been received for bessemer iron for delivery in the fourth quarter and for the first half of next year but there is not likely to be much buying for a few weeks. The furnaces continue to quote \$22, Valley, for bessemer for delivery in the first half. Small lots of No. 2 foundry were sold during the week at prices ranging from \$23.90 @24.90, Pittsburg. Gray forge is remarkably firm. A sale of 150 tons for prompt delivery was made at \$23.40, and a transaction involving 15,000 tons has been closed. As the interests of the seller and buyer are identical, no price was given and it would have no effect on the market. The ascertained average of bessemer iron for June was \$24.15, Pittsburg, a decline of 3c. compared with the selling price for May.

Steel—The crude-steel market shows but little change and no transactions of any consequence are noted. Bessemer billets remain at \$29.50@30, open-hearth billets at \$31@32, sheet and tin bars at \$31. Merchant steel bars are strong at 1.60c. and plates at 1.70c.

Sheets—The mills are catching up on

deliveries, but will not be able to fill all orders on the books before the fourth quarter. Prices are firm, black sheets being quoted at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—The ferro market is weaker and for prompt delivery \$61@62 is quoted. The most important transaction reported was the sale of 1000 tons at \$60, deliveries to begin in August and run through the year.

Cartagena, Spain

June 15—Messrs. Barrington & Holt report as follows for the first half of June: Shipments have been 13,440 tons to Great Britain; 17,150 tons to Rotterdam; 5500 tons to Philadelphia; a total of 36,090 tons. Just now there is little movement in local prices, in fact there is not much inclination shown by ironmasters to buy any heavy quantities of ore for forward shipment; this can only be due to the fact that consumers have large quantities of ore already bought and do not think there is any harm in waiting. Miners are not inclined to listen to lower prices. Some recent freight rates paid have been: Cartagena-Middlesboro, 6s. ½d., f. d.; Cartagena Maryport, 7s. 9d., f. d.; Cartagena Maryport, 8s. f. d.

Current quotations, f.o.b. shipping port, are: Ordinary 50 per cent. ore, 9s. 9d. @ 10s. 3d.; special low phosphorus, 10s. 9d.; specular ore, 58 per cent., 12s. 6d. For manganiferous ore, same delivery, 35 per cent. iron and 12 manganese, is 14s. 6d.; no higher grades on the market.

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

London

June 14—Exports of iron and steel, and of machinery, from Great Britain for the five months ended May 31 are valued by the Board of Trade returns as follows:

	1906.	1907.	Changes
Iron and Steel..	£15,427,300	£19,674,907	I. £4,247,607
Machinery.....	10,710,723	12,441,616	I. 1,730,893
New Ships.....	2,486,616	4,689,095	I. 2,202,479
Total.....	£28,624,639	£36,805,618	I. £7,180,979

The total increase was 25.1 per cent. The leading items of the iron and steel exports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	548,678	861,734	I. 313,056
Wrought iron.....	79,354	93,850	I. 14,496
Rails.....	164,479	171,622	I. 7,143
Plates.....	99,223	141,985	I. 42,762
Sheets.....	184,626	200,130	I. 22,494
Steel shapes, etc.....	76,321	108,434	I. 37,113
Tin-plates.....	152,742	172,487	I. 19,745

The total quantities of iron and steel were 1,732,513 tons in 1906, and 2,216,106 tons in 1907; an increase of 483,593 tons. Exports of pig iron to the United States this year were 262,269 tons, an increase of 165,945 tons over 1906; of tin-plates, 28,432 tons, are increase of 7850 tons.

Imports of iron and steel and of ma-

chinery into Great Britain for the five months were valued as follows:

	1906.	1907.	Changes.
Iron and steel...	£4,024,343	£2,691,815	D. £1,332,528
Machinery.....	2,183,203	2,329,030	I. 145,827
Total	£6,207,546	£5,020,845	D. £1,186,701

The total decrease was 19.1 per cent. The chief items of the imports were, in long tons:

	1906.	1907.	Changes.
Plg iron.....	33,895	29,392	D. 4,503
Wrought iron.....	54,009	25,859	D. 28,150
Steel billets, etc.....	261,873	123,478	D. 140,397
Bars and shapes.....	27,524	5,484	D. 22,044
Structural steel	71,679	35,328	D. 36,351

The total quantities of iron and steel were 617,634 tons in 1906, and 342,366 in 1907; a decrease of 275,268 tons.

Imports of iron ores into Great Britain for the five months were, in long tons:

	1906.	1907.	Changes.
Manganiferous ores.	149,979	153,599	I. 3,620
Iron ores.....	3,308,298	3,149,096	D. 159,202
Total	3,458,277	3,302,695	D. 155,582

Of the ores imported this year 114,840 tons of manganiferous and 2,458,611 tons of iron ores came from Spain.

Dusseldorf, Germany

June 12—Imports of iron and steel, and of machinery, into the German Empire for the four months ended April 30 were, in metric tons:

	1906.	1907.	Changes
Iron and steel.....	143,869	222,202	I. 78,333
Machinery.....	24,781	24,408	D. 3,373
Total.....	171,650	246,610	I. 74,960

Exports for the four months are reported as follows:

	1906.	1907.	Changes.
Iron and steel.....	1,207,792	1,104,407	D. 103,385
Machinery.....	92,203	102,652	I. 10,449
Total.....	1,299,995	1,207,059	D. 92,936

Imports of iron ore for the four months this year were 2,077,040 metric tons; exports were 1,369,738 tons. Imports of manganese ore were 114,184 tons; exports being only 1374 tons.

Duluth

Exploration on the Cuyuna range, west of Duluth, is said to be making a better showing than before, and several deals have been closed recently for tracts there. The most important of these was a lease by Rogers, Brown & Co., for a tract in section 29-47-28, near Rabbit lake, for which they agree to pay at least one year's royalty of 25c. a ton on 25,000 tons, and on which they will sink a shaft at once. This tract was explored by the Oliver Iron Mining Company last year, and abandoned, as the company found nothing of value; but the Orelands Company, owner of the land, did exploratory work later, and states that it has found a width of ore of about 250 ft. running from 55 to 60 per cent. iron.

The Oliver Iron Mining Company is doing a great work at Virginia, where its Oliver, Ohio, Lone Jack and Norman mines are located. The stripping of these mines to form one pit has been under

way since the early part of winter, and shipments are now in full activity, but are not so large as might be made, if the company was not held back by the requirements of furnaces. The pit will be extended and made an immense one.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to June 27:

	1906.	1907.	Change-s.
India.....	£ 9,400,263	£6,049,924	D. £ 3,350,339
China.....	.....	.....	.....
Straits.....	1,750	544,012	I. 542,262
Total.....	£ 9,402,013	£6,593,936	D. £ 2,808,077

Receipts for the week were £7000 from New Zealand, £18,000 from the West Indies, and £147,000 from New York; a total of £172,000. Exports were £38,650 in coin to the Straits; £156,100 in bars, and £26,580 in Mexican dollars to India; \$221,330 in all.

Indian exchange has been slightly easier, and the Council bills offered in London brought an average of 16.06d. per rupee, a slight decline from last week. Shipments of silver to India have been comparatively light.

The movement of gold and silver in Great Britain for the five months ended May 31, was as follows:

	1906.	1907.
Gold:		
Imports.....	£ 9,660,013	£21,265,381
Exports.....	16,920,029	13,940,864
Excess, imports.....	£ 3,739,984	£ 7,324,517
Silver:		
Imports.....	£ 8,793,056	£ 7,886,541
Exports.....	9,092,738	7,913,492
Excess, exports.....	£ 299,682	£ 26,951

Of the silver imported this year £4,923,946, or 62.4 per cent. of the whole, was from the United States. There was £374,025 imported from China this year.

The movement of gold and silver in France for the three months ending March 31 was as follows:

	1906.	1907.
Gold:		
Imports....	Fr 176,393,000	Fr. 30,299,000
Exports.....	10,918,000	66,018,000
Excess.....	Fr.165,475,000	Fr.35,719,000
Silver:		
Imports.....	38,382,000	36,447,000
Exports.....	36,913,000	25,337,000
Excess, imports....	Fr.1,469,000	I.Fr.11,110,000

Imports of copper and nickel coins for the three months were 29,000 fr. in 1906, and 23,000 fr. in 1907; exports were 95,000 fr. in 1906, and 22,000 fr. this year.

The American Can Company and others have been defeated in litigation over the classification to be accorded scrap tin. The product was returned for duty as waste not specially provided for, with duty at the rate of 10 per cent. ad valorem. It was claimed to be free of duty as scrap made from American tin returned. The further point was made by the importers that as scrap brass is admitted free, and as brass contains tin, scrap tin should also be admitted free. The board is unwilling to grant relief, as the decision says there has been no attempt to comply with the treasury regulations affecting the return of American merchandise.

Metal Market

NEW YORK, July 10.

Gold and Silver Exports and Imports
At all United States Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1907.	\$4,505,444	\$ 2,641,879	Exp. \$1,863,565
" 1906.	5,722,148	34,911,028	Imp. 29,188,880
Year 1907..	12,410,407	20,216,984	Imp. 7,806,577
" 1906..	28,354,322	60,168,698	Imp. 31,814,376
Silver:			
May 1907..	4,326,216	3,496,458	Exp. 829,758
" 1906..	5,539,546	4,405,959	" 1,133,587
Year 1907..	23,858,610	18,803,468	" 5,055,142
" 1906..	28,918,841	19,916,816	" 9,002,025

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 July 6 and years from Jan 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week....	\$ 1,487,400	\$ 12,624	\$ 857,816	\$ 4,974
1907.....	26,087,489	5,754,992	23,526,842	859,176
1906.....	5,889,021	44,915,254	31,995,762	1,105,662
1905.....	37,912,098	635,085	16,658,324	1,902,933

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

The joint statement of all the banks in the New York Clearing House for the week ending July 6 shows loans \$1,115,724,300, a decrease of \$10,814,800; deposits, \$1,078,540,200, a decrease of \$13,491,000, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	\$181,281,000	\$199,710,500
Legal tenders.	84,270,000	70,780,800
Total cash.....	\$265,551,000	\$270,491,300
Surplus.....	\$ 6,465,075	\$ 856,250

The surplus over legal requirements this year shows a decrease of \$1,653,025, as compared with the previous week.

Specie holdings of the leading banks of the world, June 29, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York .....	.....	.....	\$199,710,500
England.....	\$176,044,555	.....	176,044,555
France.....	554,559,850	\$198,150,425	752,710,275
Germany.....	135,760,000	51,920,000	207,680,000
Spain.....	77,745,000	139,385,000	207,130,000
Netherlands....	26,914,500	28,693,000	55,607,500
Belgium.....	15,720,000	7,960,000	23,680,000
Italy.....	161,980,000	24,138,500	186,118,500
Russia.....	580,995,000	32,910,000	613,905,000
Aust.-Hungary..	227,115,000	62,380,000	289,495,000
Sweden.....	22,000,000	.....	22,000,000

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

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.52½	\$0.54
Peruvian soles and Chilean.....	0.47½	0.50½
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.85	3.89
Spanish 25 pesetas.....	4.78½	4.80

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver.		July.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
4	.....	31½	31	8	4.8705	67½	31½
5	4.8695	67½	31	9	4.8695	67½	31
6	4.8700	67½	31	10	4.8660	67½	31

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

Other Metals

July.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			Cts. per lb.	Cts. per lb.
4	.....	.....	99½	.....	.....	.....	.....
5	22½	21½	99½	42½	5.25	6.20	6.05
6	22½	21½	99½	42½	5.25	6.20	6.05
8	22½	21½	100½	41½	5.25	6.15	6.00
9	21½	21½	99	41½	5.25	6.20	6.05
10	21½	21½	97½	41½	5.25	6.15	6.00

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

Copper—In the earlier part of the week the market continued in practically the same condition as for some weeks past. Consumers continued to hold back, and the largest selling interest continued to quote the same price as it has been naming for the past month, without, however, making any sales at that figure. Some sales were made for export by other concerns, at about the prices given in our last issue. The domestic business was largely nominal, and confined to small lots for immediate delivery. On July 9 it was announced that the leading seller, above referred to, had reduced its price for electrolytic copper to 22c., a drop of a fraction over 3c. from that previously asked; thus approaching the point at which actual sales had been made by other interests. This example was followed by one or two other sellers, who had been holding for higher prices. At the same time, it was reported that the Calumet & Hecla had made sales of Lake

copper at 23c. for July and August. These announcements, of course, produced some excitement in the market; but this was coupled with a good deal of uncertainty. The time has been too short to judge properly of the effect upon buyers; but up to date it cannot be said that there has been any special effect upon sales. It is probable that manufacturers have not yet had time to figure upon the effect, but the developments during the next few days ought to show whether or not the lower prices will tend to stimulate the general business. There can be no question but that there is a very heavy reserve buying power which will make itself felt as soon as confidence in the future course of the market is re-established. The close is quoted at 21½@22½c. for Lake copper; 21½@21¾c. for electrolytic in ingots, cakes and wirebars; 20½@21c. for casting copper.

The heavy short interest has helped to sustain the price of near-by deliveries of standard copper on the London Metal Exchange, but the lower quotations for refined sorts have caused heavy selling of the three months' option, resulting in an unusual backwardation. The close is cabled steady at £98 for spot, £90 for three months'.

Refined and manufactured sorts we quote: English tough, £101; best selected, £105; strong sheets, £112.

Tin—The rapid advance in the London market was followed just as quickly by an entire collapse, which caused a break in the price of both options of about £12. The close is cabled at £188 10s. for spot, £180 10s. for three months'.

Consumers here are necessarily very suspicious of the manipulation, and there is a general tendency to await developments before entering upon larger commitments. A small business is being done at 41¼@41½s.

Lead—The quotation for desilverized lead remains unchanged at 5.25c. New York.

The London market has held steady throughout the week, and closes at £21 for Spanish lead, £21 2s. 6d. for English lead.

Spanish Lead Market—Messrs. Barington & Holt report from Cartagena, Spain, under date of June 15: The price of pig lead has been 94 reales per quintal; silver, 13.75 reales per ounce. Exchange is 27.93 pesetas to £1. The price of lead, on current exchange, is equal to £18 16s. 10d. per long ton, f.o.b. Cartagena.

Spelter—Rumors from the West indicate that stocks of spelter are accumulating at the smelting works. This has made buyers very reticent, while, on the other hand, the selling pressure has become much more urgent. The market closes weak at 6.15@6.20c. New York, 6@6.05c. St. Louis.

The London market has rallied somewhat and the closing quotations are

cabled as £24 7s. 6d. for good ordinaries; £24 12s. 6d. for specials.

Zinc Sheets—The base price is \$8.60 per 100 lb.,—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru, in 60-lb. cases for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.50c. per 100 lb. The new classification, effective Aug. 1 next, will make the minimum weight on a carload of sheet zinc to all Eastern points 36,000 lb., equivalent to 60 casks of 600 lb. each, in place of 50 casks, the minimum today; that is, 20 per cent. increase.

Silesian Spelter Market—Under date of June 27, Paul Speier writes from Breslau, Germany, that the market is in the midst of the usual dullness attendant upon the approach of summer.

Zinc dust was in demand, being quoted at 48.75@49.25 marks per 100 kg., f.o.b. Stettin.

The movement of zinc ores and products in Germany from January to May was, in metric tons:

	Imports.		Exports.	
	1906.	1907.	1906.	1907.
Spelter.....	12,861	12,246	22,767	25,527
Zinc sheets.....	36	51	5,870	7,818
Zinc scrap.....	841	540	2,144	2,676
Zinc dust.....	.....	405	.....	983
Zinc oxide.....	.....	2,755	.....	7,166
Lithopone.....	625	903	3,069	3,481
Zinc ore.....	79,126	73,705	17,702	12,429

Antimony—The market continues weak and featureless; the tone abroad is a little stronger but practically no business is being done in either the local or foreign markets. It is stated that the prices given below could be slightly shaded for spot shipment. Quotations are 12½@13c. for Cookson's; 10¾c. for Hallett's; 10¼@10¾c. for ordinary brands.

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

Quicksilver—Current prices in New York are \$41 per flask of 75 lb. for large quantities and \$42 for smaller orders. San Francisco orders are \$38@39 per flask, according to quantities, for domestic orders, and \$37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

The quicksilver output of the A. Auerbach Company, the largest producer in Russia, shows a considerable decrease this year. For the four months ended April 30 the total was 169,221 lb. in 1906, and 120,975 lb. in 1907; a decrease of 48,246 lb., or 28.6 per cent.

Platinum—No new developments occurred during the past week and prices remain stationary. Refiners now believe there will be practically no change in the metal until the fall. Quotations are as follows: Ordinary metal, \$26 per oz.; hard metal, \$28.50. Scrap is quoted at \$20@21 per ounce.

Missouri Ore Market

Joplin, Mo., July 7—The highest price paid for zinc was \$51 per ton on an assay price of \$46@48 per ton of 60 per cent. zinc; the average price was \$46.44.

The highest price paid for lead was claimed to be \$60 per ton, but the week's end price was \$57, averaging \$56.94.

The Fourth of July was made the occasion of a holiday of from one to three days, reducing the output approximately 25 per cent. and the shipment correspondingly.

Following are the shipments of zinc and lead from the various camps for the week ending July 7:

Camps.	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	2,575,690	657,940	\$ 79,279
Joplin.....	1,694,200	198,400	46,316
Galena-Empire	927,250	153,430	26,161
Duenweg ..	740,330	99,160	20,222
Prosperity	607,090	172,570	19,184
Alba-Neck City.....	646,100	7,160	16,033
Aurora.....	645,660	14,610	11,981
Oronogo	222,070	.....	5,409
Zincite	193,020	.....	4,439
Badger	151,240	.....	3,781
Spurgeon.....	106,810	47,570	2,805
Sherwood.....	99,700	5,570	2,447
Cave Springs.....	93,780	.....	2,156
Sarcoile.....	64,870	.....	1,492
Baxter Springs.....	65,100	.....	1,427
Playter.....	54,570	5,070	1,426
Stott City.....	52,790	.....	1,214
Reeds.....	42,330	.....	973
Carthage.....	38,980	.....	954
Totals.....	9,021,580	1,341,470	\$247,699

27 weeks.....325,026,070 50,895,710 \$9,621,514
Zinc value, the week, \$209,494; 27 weeks, \$7,586,868
Lead value, the week, 38,205; 27 weeks, 2,034,646

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

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January ...	47.38	45.84	January ...	75.20	83.53
February ..	47.37	47.11	February ..	72.83	84.58
March	42.88	48.66	March	73.73	82.76
April	44.63	48.24	April	75.13	79.76
May	40.51	45.98	May	78.40	79.56
June.....	43.83	44.82	June.....	80.96	73.66
July.....	43.25	.....	July.....	74.31	.....
August.....	43.56	.....	August.....	75.36	.....
September.	42.58	.....	September.	79.64	.....
October....	41.55	.....	October....	79.84	.....
November..	44.13	.....	November..	81.98	.....
December..	43.68	.....	December..	81.89	.....
Year.....	43.24	.....	Year.....	77.40	.....

Wisconsin Ore Market

Platteville, Wis., July 6—The price of 60 per cent. ore went up to its usual pitch this week, selling at \$48. Nearly all the ore that was mined was sold and was in great demand, leaving no surplus in the bins. All the mills seem to be producing and working a full force of men, although the supply of men does not as yet meet with the demand, there still being a scarcity of jig men all through the district. Several of the new mills in the district are nearing completion, which will mean a rise in tonnage. One of the camps in the Platteville district recently purchased a roaster, which will be put in operation within a few weeks. The general outlook, from the producers' point of view, is very

good, and if the car supply and better railroad facilities are supplied, the district will be the "Mecca of southwest Wisconsin."

The price of 75 per cent. lead was off this week, selling at \$31 per 1000 lb. The bins will continue to have a surplus while the market is dropping, as the producers claim that they will not sell under prevailing conditions.

Dry-bone and sulphur remain about the same.

Following is the shipment of the district, by camps, for the week ending July 6, 1907:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	277,870	31,020	.....
Benton	593,890	.....	.....
Hazel Green.....	604,500	.....	.....
Livingston.....	153,000	.....	.....
Cuba City.....	145,840	82,670	.....
Galena.....	141,500	.....	.....
Total for week.....	1,916,600	113,690	.....
Year to July 6.....	51,825,415	2,072,800	229,160

Owing to the condition of the wires we were unable to get a report from several of the larger camps, but expect that the tonnage will be included in next week's report.

Chemicals

New York, July 10—The general chemical trade is quiet and dull, which is usual at this time. There are no special features in the market, the general line being dormant.

Copper Sulphate—Trade is limited and the reduced prices still hold. It is not expected that the tone of the market will change for some months. Prices remain at \$7.25 for carload lots, with smaller parcels bringing \$7.50 per 100 pounds.

Nitrate of Soda—The market is quiet but firm. The consumption of nitrate continues steady and prices have not changed. We quote 96 per cent. for 1907 at 2.55c., with 95 per cent. at 2.47c. For next year's delivery these grades are quoted at 2.55½c. and 2.50c., respectively.

Messrs. Mortimer & Wisner, of New York, give the following statistics of nitrate for the United States, in long tons, as of date July 1:

	1906.	1907.	Changes.
Stocks, Jan. 1.....	13,100	13,050	D. 50
Arrivals, 6 mos.....	153,680	133,045	D. 20,635
Total supplies.....	166,780	146,095	D. 20,685
Deliveries, 6 mos.....	154,955	144,595	D. 10,360
Stocks, July 1.....	11,825	1,500	D. 10,325
Afloat for U. S.....	80,000	120,000	I. 40,000

The quantities afloat include all cargoes due to arrive at United States ports by Oct. 15 next.

Mining Stocks

New York, July 9—The tone of the market strengthened early in the week and mining stocks gave promise of a small boom. However, this strength was not

maintained and prices receded a little and stocks closed fairly weak. Amalgamated Copper had a decided rise, closing up \$5 to \$91 on quite large sales. American Smelting common closed at \$118½ after touching \$120 Tuesday. United States Steel common closed at \$37, the same price as a week ago; the preferred advanced slightly, closing at par. The rest of the stocks on the Exchange were without special feature.

The curb market developed strength only to lose some of the gains at the close of the week; the coppers were fairly steady, the leaders being Cumberland-Ely and British Columbia Copper. The Cobalt stocks were weak, Nipissing declining to \$10¾ at the close. Other Cobalts were without interest. The Nevada stocks showed some activity and fairly large sales were recorded. Goldfield Consolidated was active and closed strong around \$8¾. There was little or no activity among the industrial stocks on the curb.

Boston

July 9—The first effect of the breaking of the deadlock today between the producer and consumer of copper was to cause prices to slide back after a week of strong market in copper shares. This is expected to be only temporary and cannot be considered a bear point. It has been a week of little news of importance, but prices have been strong. Amalgamated has been boomed by Lawson, with the result that a \$7.62½ advance has been recorded to \$93.87½, the close tonight, however, being at \$90.87½.

North Butte enjoyed a good rise, touching \$90, with the final tonight almost \$5 better than a week ago, at \$87.50. Copper Range rose \$4 to \$85.25, closing tonight at \$83. Mohawk is up \$4 to \$87; Parrot \$2.25 to \$22.75; and Utah Consolidated \$1 to \$54.50. The latter stock continues under pressure and is less buoyant than the rest of the list. Trinity has been heavy after a good rally on Lawson's return. It has gone off \$3.25 to \$25.75. Calumet & Hecla is up \$30 to \$845, and the other stocks of better grade have been buoyant, although showing slight net changes for the week. Atlantic had a \$3 spurt to \$16; Franklin rose almost \$2 to \$16.75; La Salle \$2 to \$16.50, and Arcadian crossed \$8.

It is figured that 20 dividend-paying copper stocks listed on the local exchange are disbursing at the rate of \$52,375,800 per annum, an average of \$8 on 6,675,300 shares. The par value of the same is \$350,305,500, which shows returns of 14.95 per cent. on the par. The point is made by President Paine, of the Copper Range Consolidated, that the copper industry in the future must look to low-grade ores for supplies, as is now being done in iron.

The merger of the British Columbia Copper Company, Ltd., and the Dominion Copper Company is talked of as a possi-

bility. Both are curb issues. The former is around \$9 and the latter \$6.

Superior & Pittsburg made a \$3.25 spurt on the curb, touching \$19.75. Nevada-Utah holds well around \$6.

Colorado Springs

July 6—The local stock market is still dull and featureless. Prices are lower than for many months. Portland made a substantial advance in the last week, but this stock is never very active. The declaring of a dividend of 4c. per share is the probable cause of the advance. Sinking has been resumed at the 1200-ft. level in shaft No. 2 of this mine. The Isabella is reported to have made a good strike in virgin ground, but the report has not caused the shares to advance.

STOCK QUOTATIONS

NEW YORK July 9		BOSTON July 9	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	1	Adventure.....	3
Am.Nev.M.&P.Co.	.....	Allowz.....	.....
Amalgamated*.....	91	Am. Zinc.....	37
Anaconda*.....	59 1/2	Arcadian.....	7 1/2
Balaskia.....	10 1/2	Atlantic.....	.....
British Col. Cop.....	9 1/2	Bingham.....	.....
Buffalo Cobalt.....	.....	Boston Con.....	28 1/2
Butte & London.....	.....	Calumet & Ariz.....	171
Butte Coalition.....	27	Calumet & Hecla.....	845
Butte Cop. & Zinc.....	.....	Centennial.....	31
Cobalt Contact.....	.....	Con. Mercur.....	.....
Colonial Silver.....	2	Copper Range.....	82 1/2
Cum. Ely Mining.....	9 1/2	Daly-West.....	16 1/2
Davis Daly.....	13	Franklin.....	16 1/2
Domintion Cop.....	5 1/2	Greene-Cau.....	17
El Rayo.....	5	Isle Royal.....	21
Foster Cobalt.....	68	La Salle.....	16
Furnace Creek.....	1 1/2	Mass.....	.....
Giroux Mine.....	9	Michigan.....	16
Gold Hill.....	2	Mohawk*.....	86 1/2
Granby, New.....	.....	Mont. C. & C.(new)	.....
Greene Gold.....	1 1/2	Nevada.....	15
Greene G. & S.....	1 1/2	North Butte.....	87
Greenaw' & D.Val.....	75	Old Colony.....	.....
Guanajuato.....	3 1/2	Old Dominion.....	47 1/2
Guggen. Exp.....	212 1/2	Osceola.....	132
Hanaph.....	50	Parrot.....	22 1/2
McKinley Dar.....	1 1/2	Phoenix.....	.....
Micmac.....	4 1/2	Quincy.....	122
Mines Co. of Am.....	1 1/2	Rhode Island.....	5 1/2
Mitchell Mining.....	3 1/2	Santa Fe.....	4
Mont.Sho. C.(New)	7 1/2	Shannon.....	18 1/2
Nev. Utah M. & S.....	6	Tamarack.....	.....
Newhouse M. & S.....	17 1/2	United Cop., com.	68 1/2
Nipissing Mines.....	11	U. S. Oil.....	10 1/2
Old Hundred.....	2 1/2	U. S. Smg. & Ref.....	49 1/2
Silver Queen.....	1 1/2	U.S.Sm. & Re., pd.	43
Stewart.....	2 1/2	Utah Copper.....	53
Tennessee Copper	39	Victoria.....	8
Union Copper.....	3 1/2	Washington.....	.....
Utah Apex.....	6 1/2	Winona.....	8 1/2
West Columbus.....	11	Wolverine.....	165
		Wyandotte.....	1 1/2

N. Y. INDUSTRIAL

Am. Agri. Chem.....	.....
Am. Smelt. & Ref.....	118 1/2
Am. Sm. & Ref., pf.	107
Bethlehem Steel.....	.....
Colo. Fuel & Iron.....	32
Federal M. & S., pf.	16
Inter. Salt.....	62 1/2
National Lead.....	98 1/2
National Lead, pf.	.....
Pittsburg Coal.....	26 1/2
Republic I. & S.....	84
Republic I. & S., pf.	.....
Stoss-Shefeld.....	504
Standard Oil.....	.....
Tenn. C. & I.....	.....
U. S. Red. & Ref.....	87
U. S. Steel.....	100
U. S. Steel, pf.....	27
Va. Car. Chem.....	.....
Va. I. Coal & Coke.....	.....

BOSTON CURE

Ahmeek.....	80
Ariz. Com.....	5 1/2
Black Mt.....	10 1/2
East Butte.....	9 1/2
Hancock Con.....	9 1/2
Keweenaw.....	2 1/2
Majestic.....	1 1/2
Raven.....	55
Shawmut.....	.....
Superior.....	17 1/2
Superior & Pitts.....	1 1/2
Troy Man.....	.....

LONDON July 10

Name of Com.	Clg.
Dolores.....	£1 6s 3d
Stratton's Ind.....	0 3 0
Camp Bird.....	1 1 6
Esperanza.....	2 1 3
Tomboy.....	1 11 3
El Oro.....	1 8 9
Oroville.....	0 17 0
Somera.....	.....
Utah Apex.....	1 7 6
Ariz. Cop., pf.....	3 3 3
Ariz. Cop., def.....	8 2 1

Cabled through Hayden, Stone & Co., N. Y.

S. FRANCISCO July 3

Name of Comp.	Clg.
Belcher.....	.24
Best & Belcher.....	.70
Caledonia.....	.15
Chollar.....	.08
Con. Cal. & Va.....	.61
Crown Point.....	.17
Exchequer.....	.39
Gould & Curry.....	.16
Hale & Norcross.....	.50
Mexican.....	.42
Ophir.....	1.80
Overman.....	.12
Potosi.....	.09
Savage.....	.66
Sierra Nevada.....	.35
Union.....	.26
Utah.....	.05
Yellow Jacket.....	.88

NEVADA July 10

Name of Comp.	Clg.
Belcher.....	.24
Best & Belcher.....	.70
Caledonia.....	.15
Chollar.....	.08
Con. Cal. & Va.....	.61
Crown Point.....	.17
Exchequer.....	.39
Gould & Curry.....	.16
Hale & Norcross.....	.50
Mexican.....	.42
Ophir.....	1.80
Overman.....	.12
Potosi.....	.09
Savage.....	.66
Sierra Nevada.....	.35
Union.....	.26
Utah.....	.05
Yellow Jacket.....	.88

New Dividends

Company.	Payable.	Rate.	Amt.
Acacia.....	July 10	\$0.01	\$15,000
Anaconda.....	July 17	1.75	2,100,000
Bald Butte.....	July 1	0.03	6,000
Baltic, Mich.....	July 1	10.00	1,000,000
Buffalo Mines, Ltd.....	July 10	0.03	27,000
Central C. & C., com.....	July 15	1.50	76,875
Central C. & C., pf.....	July 15	1.25	23,438
Columbus Con.....	July 5	0.20	56,707
Coniagas (Cobalt).....	July 1	0.02	20,000
Crows Nest Pass.....	July 1	0.62 1/2	87,500
El Oro.....	July 12	0.36	388,800
Esperanza, Lp.....	July 18	1.32	600,600
Monon R. C. & C.....	July 25	3.50	350,000
Newhouse.....	Aug. 31	0.60	.....
Nipissing.....	July 20	0.15	180,000
North Star.....	June 27	0.20	50,000
N. S. St. & Coal, com.....	July 15	1.50	74,814
N. S. St. & Coal, pf.....	July 15	2.00	20,600
Oroville.....	July 6	0.12 1/2	87,500
Osceola.....	July 29	7.00	673,050
Philadelphia Gas.....	Aug. 1	0.75	434,296
Portland.....	July	0.04	120,000
Tamarack.....	July 23	4.00	240,000
Tenn. C. I. & R. R., com.....	Aug. 1	1.00	225,536
Tenn. C. I. & R. R., pf.....	Aug. 1	2.00	4,960
Tonopah of Nev.....	July 22	0.25	250,000
United Copper.....	Aug. 6	1.75	787,500

Assessments

Company.	Delinq.	Sale.	Amt.
Allegheny, Cal.....	June 22	July 13	\$0.03
Birchville, Cal.....	July 10	Aug. 1	0.02
Black Copper, Utah.....	July 9	July 30	0.01
Challenge Con., Nev.....	June 19	July 10	0.10
Crown Point, Nev.....	July 24	Aug. 14	0.10
Emerald, Utah.....	Aug. 15	Sept. 7	0.01 1/2
Exchequer, Nev.....	July 8	July 30	0.05
Forty-nine G. Pl., U.....	June 26	July 15	0.01
Honeric, Utah.....	June 25	July 20	0.20
Julia Con., Nev.....	June 24	July 16	0.03
La Palma, Mex.....	June 20	July 10	0.10
Mexican, Nev.....	July 15	Aug. 5	0.10
Nev. Superior, Utah.....	July 17	July 5	0.10
Sheba G. & S., Utah.....	July 30	Nov. 2	0.10
Wabash, Utah.....	July 8	July 30	0.05
West'n Mines Co., N.....	Aug. 1	Aug. 31	0.02
Yellow Jacket, Nev.....	July 3	Aug. 10	0.15
Zeitbright, Cal.....	July 15	Aug. 6	0.05

Monthly Average Prices of Metals
AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January.....	65.288	68.673	30.113	31.769
February.....	66.108	68.835	30.464	31.852
March.....	64.597	67.519	29.854	31.325
April.....	64.765	65.462	29.984	30.253
May.....	66.976	65.981	30.968	30.471
June.....	65.394	67.090	30.185	30.893
July.....	65.105	.....	30.113	.....
August.....	65.949	.....	30.529	.....
September.....	67.927	.....	31.483	.....
October.....	69.523	.....	32.148	.....
November.....	70.813	.....	32.671	.....
December.....	69.050	.....	32.003	.....
Year.....	66.791	.....	30.868	.....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

Month.	NEW YORK.		LONDON.	
	1906.	1907.	Electrolytic.	Lake.
			1906.	1907.
January.....	18.310	24.404	18.419	24.825
February.....	17.869	24.853	18.116	25.256
March.....	18.361	25.055	18.641	25.560
April.....	18.375	24.224	18.688	25.260
May.....	18.475	24.048	18.724	25.072
June.....	18.442	22.668	18.719	24.140
July.....	18.100	.....	18.588	.....
August.....	18.380	.....	18.704	.....
September.....	19.083	.....	19.328	.....
October.....	21.283	.....	21.722	.....
November.....	21.833	.....	22.388	.....
December.....	22.885	.....	23.350	.....
Year.....	19.278	.....	19.616	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January.....	36.390	41.548	July.....	87.275	.....
February.....	36.408	42.102	August.....	40.424	.....
March.....	36.662	41.313	September.....	40.501	.....
April.....	38.900	40.938	October.....	42.852	.....
May.....	43.313	43.149	November.....	42.344	.....
June.....	39.260	42.120	December.....	42.754	.....
			Av. year.....	39.810	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January.....	5.600	6.000	16.850	19.828
February.....	5.464	6.000	16.051	19.531
March.....	5.350	6.000	15.922	19.708
April.....	5.404	6.000	15.959	19.976
May.....	5.685	6.000	16.726	19.688
June.....	5.780	5.760	16.813	20.188
July.....	5.750	.....	16.526	.....
August.....	5.750	.....	17.104	.....
September.....	5.750	.....	18.494	.....
October.....	5.750	.....	19.350	.....
November.....	5.750	.....	19.281	.....
December.....	5.900	.....	19.009	.....
Year.....	5.657	.....	17.970	.....

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

AVERAGE PRICE OF SPELTER

MONTH.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January.....	6.487	6.732	6.337	6.582	28.226	27.125
February.....	6.075	6.814	5.924	6.664	26.844	25.938
March.....	6.209	6.837	6.056	6.687	24.568	26.094
April.....	6.078	6.685	5.931	6.535	25.781	25.900
May.....	5.997	6.441	5.846	6.291	27.000	25.563
June.....	6.006	6.419	5.948	6.269	27.728	24.469
July.....	6.006	.....	5.856	.....	26.800	.....
August.....	6.027	.....	5.878	.....	26.938	.....
September.....						