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## Magnetic Separation of Iron Ore in Sweden

Twenty-one Plants Are in Operation, Producing Concentrates Containing 63 to 65 Per Cent. Iron from Ore Carrying 25 to 30 Per Cent.

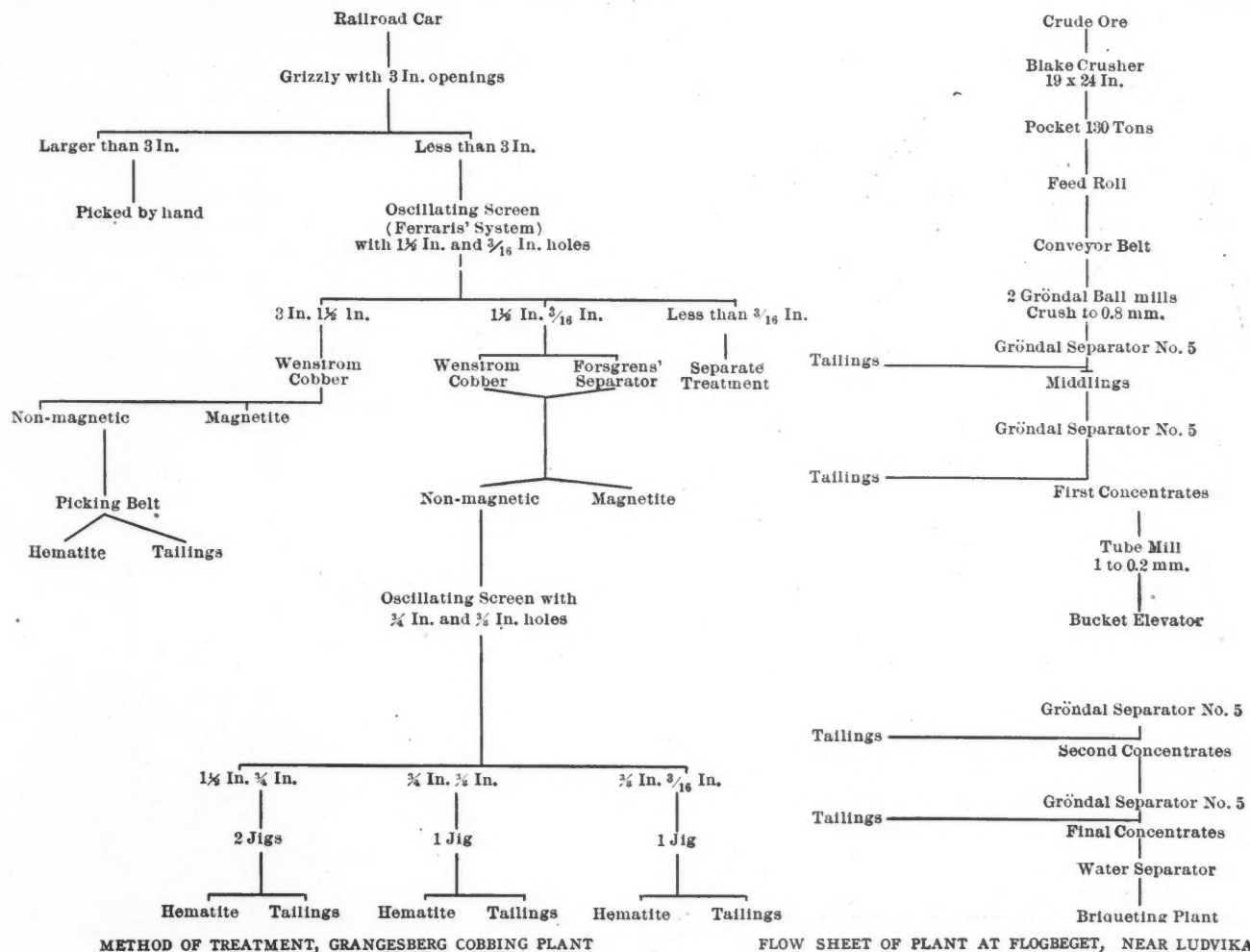
BY G. WALFRID PETERSSON\*

During the last twenty years the magnetic separation of iron ores, for obvious reasons, has become of great importance in Sweden. A great number of the iron-ore deposits in that country consist of magnetic ores, magnetite in a matrix of some combination of several of the following minerals: pyroxene, amphibole,

cause of its sulphur or phosphorus content is less valuable, which has been left when the furnace ore was mined or has been stocked in great piles around the shaft openings of the mines for possible treatment in the future.

There are also in Sweden a great many ore fields containing only such low-grade

concentrates are thus obtained in a finely pulverized state, not very well adapted for smelting in blast furnaces of the construction generally used in Sweden. As soon as Gustaf Gröndal had worked out his method for briquetting fine concentrates, magnetic concentration began to gain in popularity, and at present there



METHOD OF TREATMENT, GRANGESBERG COBBING PLANT

FLOW SHEET OF PLANT AT FLOGBEGET, NEAR LUDVIKA

garnet, clorite, talc, feldspar, quartz, and calcite, sometimes also with iron and copper pyrites, apatite, etc. Generally the Swedish magnetic ores are sufficiently rich and pure for direct charging in the blast furnace, but in many places there are, besides these richer beds, large quantities of ore which is lean, or which be-

or impure ores, which up to recent years have not been considered of sufficient value to be mined, but which now, with the magnetic separating process, can be profitably worked. It was a long time, however, before magnetic ore dressing obtained extensive use. The Swedish magnetic ores are generally so finely grained, and the magnetite is so intimately mixed with the matrix, that fine crushing is necessary before the separation. The

are in operation a great number of magnetic separating plants distributed over the iron-ore districts, and new plants are built every year.

It might be supposed that magnetic separation according to the Wetherill system or some similar method would come into use for the separation of the great deposits of specular hematite which occur in many parts of Sweden in a matrix of quartz, garnet, etc. Yet the many trials

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of such methods have failed, mainly on account of the grains of magnetite, often microscopic, which, mixed with the minerals occurring with the hematite, make them as magnetic as the hematite itself. For this kind of iron ores, the ordinary wet methods with jigs and tables are used, though not yet to any great extent.

In Sweden magnetic cobbing and magnetic separation of iron ores are regarded as separate processes. By the former method, ore pieces more or less magnetic are separated from rock pieces. By the latter, the magnetic particles, which have been freed from the non-magnetic minerals as much as is possible by the crushing process, are magnetically separated from them. In the cobbing process, no crushing takes place, or only a preliminary coarse breaking of the mined ore. In the separating process, on the contrary, fine crushing, approaching as nearly as possible to a "clean crushing," is needed.

MAGNETIC COBBING

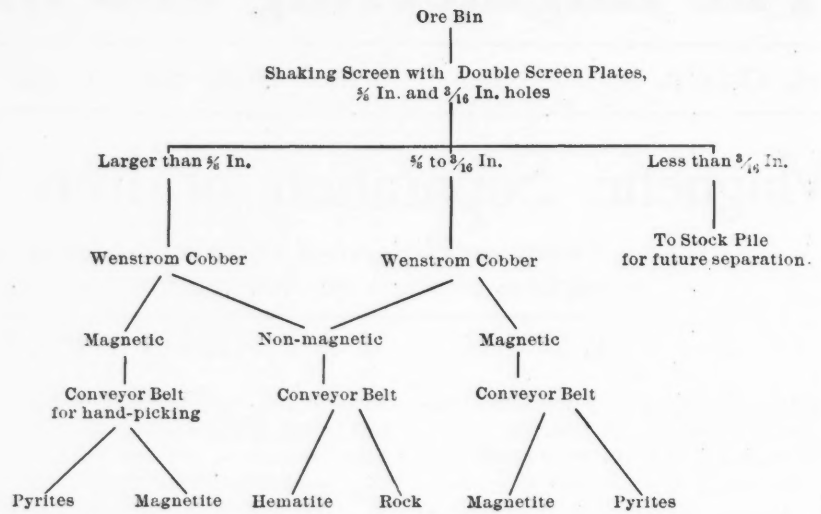
Magnetic cobbing was developed in Sweden in 1884 by Jonas Wenström, who at that time invented his magnetic cobbing machine. It at once obtained wide employment, not only in Sweden, but also in the United States, the East Indies, and other countries, and can still be seen in operation in many mines for the cobbing of ore of sizes from 3 in. to 1/8 inch.

The Wenström cobbing machine consists of a horizontal cylindrical drum built of alternating ribs of iron and wood parallel with the axis of the drum. The ribs

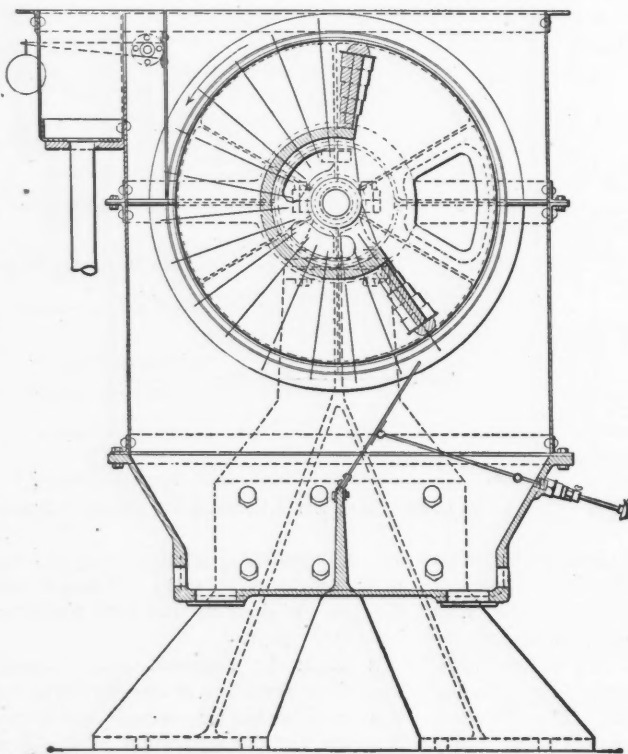
are kept together by means of brass rings. Inside the drum a fixed electro-magnet consisting of an iron cylinder with disk-shaped flanges between which the coils are arranged in such a way that an electric current sent through them will produce north and south poles in the outside edges of the disks, is eccentrically arranged. The drum revolves around the electro-magnet. When the iron ribs on its surface enter the magnetic field, a secondary magnetism is induced in them, whereby they attract magnetic ore pieces. As the drum rotates and the ribs pass out of the magnetic field, they lose their induced magnetism and drop the ore pieces.

The iron ribs are furnished with lugs opposite either the positive or the negative poles, and so arranged that alternate magnetism is induced in the ribs.

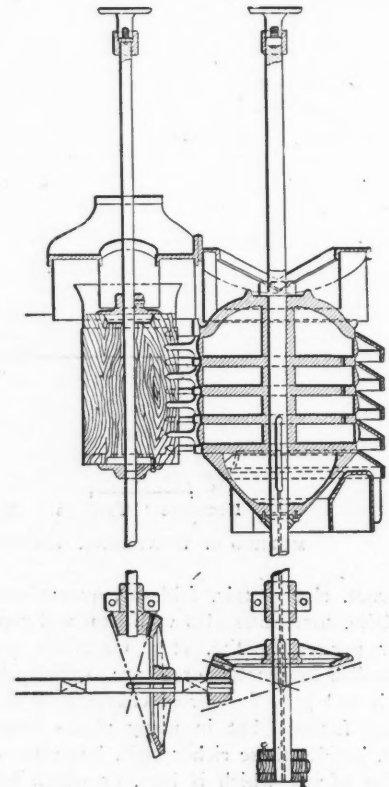
The new cobbing machines are manufactured in different sizes. The distance between the ribs depends upon the size of the material to be treated; the coarser the ore, the greater the distance. For the finer ore, of sizes from 1 1/8 to 1/8 in., the drum is often covered with a sheath of zinc or German silver. For coarser material, the machine is usually constructed with a drum of a diameter from 3 ft. 4 in. to 2 ft. 10 in., and a length of 2 ft. Recently, some machines have been built



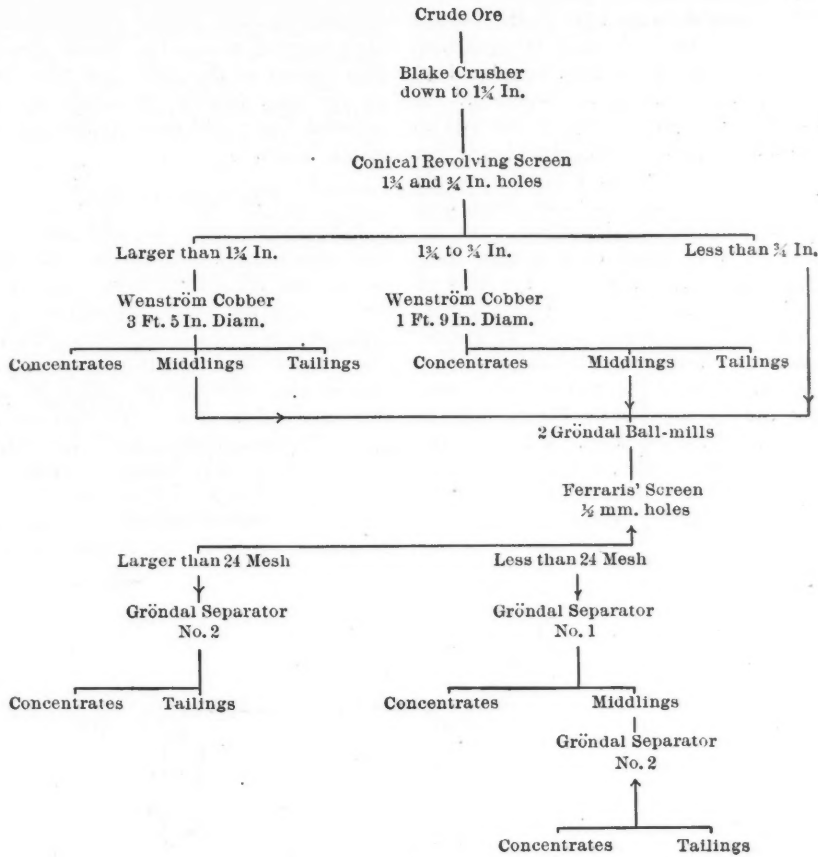
COURSE OF MATERIAL, DANNEMORA COBBING PLANT



GRÖNDAL SEPARATOR



GRÖNDAL, TYPE I



METHOD OF TREATMENT, KLACKA-LERBERG SEPARATING PLANT

with twice this width, divided into two sections, one for coarse, the other for finer material. The drums make from 16 to 20 r.p.m. An electric current of from 15 to 20 amp. and 110 volts is used for the electro-magnet.

The separating capacity of the Wenström cobbing machine is obviously dependent upon the character of the ore fed to it, but it generally varies between 5 and 10 tons of crude ore per hour. The cost of the separation is given as from 24 to 43c. per ton of the finished product. The machine is used either alone, for cob-

bing the small ore necessarily obtained in mining, or, and this has been chiefly during the last few years, in magnetic separating plants for separating the pure rock in the material coming out of the coarse ore, which is afterward crushed and separated.

The Dannemora mill will serve as a typical example of a cobbing plant. This mill was built in 1903 for the purpose of cobbing the small ore obtained in mining. The crude stuff is lifted by an elevator to the top floor and dumped into a bin with a capacity of 1.5 cu.yd. The subsequent

treatment of the ore is shown in the accompanying flow-sheet.

A similar cobbing plant is built at Grängesberg, also for the treatment of small ore, which is taken in ordinary railroad cars directly to the top floor of the plant.

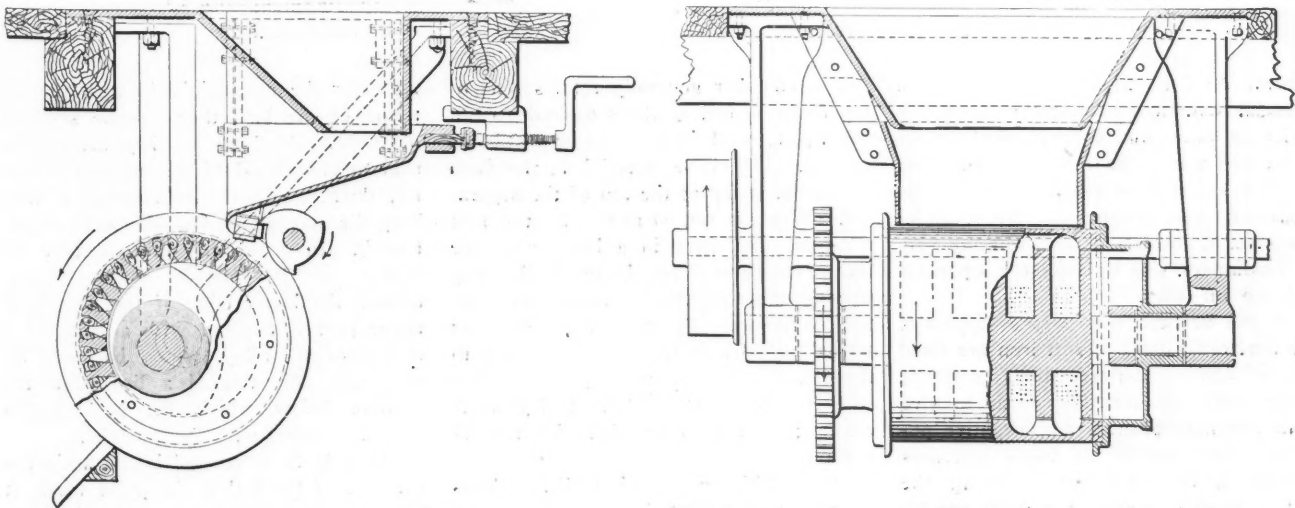
THE GRÖNDAL MAGNETIC COBBING MACHINE

The Gröndal cobbing machine was invented in 1904. It resembles the Wenström machine in the construction of the drum, which is built of alternating iron and brass ribs. The former are 1/2-in. wide, the latter 3/16 in. The drum revolves around a fixed electro-magnet of the cross-section shown in the accompanying drawing. The method of its operation is similar to that of the Wenström cobber. The speed of the drum is 30 r.p.m. A 220-volt current has been used. The machine is used at some plants after the coarse crusher for the purpose of eliminating pure rock pieces in the crude ore.

MAGNETIC SEPARATION

Although, as already mentioned, the magnetic cobbing of iron ores has been in use in Sweden since 1884, the magnetic separation of such ores was not seriously considered before 1894. In that year, a small model of the machine which is known in Sweden as the Monarch separator was demonstrated in Stockholm. This separator, which was a modification of the Ball and Norton machine invented in the United States in 1888, was at once received with great interest, and during the same year a company was formed for the exploitation of the invention in Sweden.

As it first appeared, it was constructed for the separation of dry material, and was in this form used at Herräng from 1894 to 1899, and at Lulea from 1897 to 1904. The great disadvantages connected with the separation of dry ma-



WENSTRÖM COBBER



terial caused a reconstruction of the machine in 1899 in order to make it useful for wet magnetic separation, i.e., for the separation of ore mixed with water. This modified Monarch is furnished with only one drum having a diameter of 2 ft. 6½ in. and a length of 1 ft. 1½ in. It rotates comparatively slowly, 8 to 10 r.p.m., around a system of magnets arranged in the same way as in the older type. Only two products, concentrates and tailings, are obtained. In this form, the machine was used at Herrång from 1899 to 1902; its separating capacity was 2.5 tons of crude ore per hour, with a current of 8 to 10 amperes and 110 volts. To turn the drum, a little less than 1 h.p. was required.

#### THE GRÖNDAL SEPARATORS

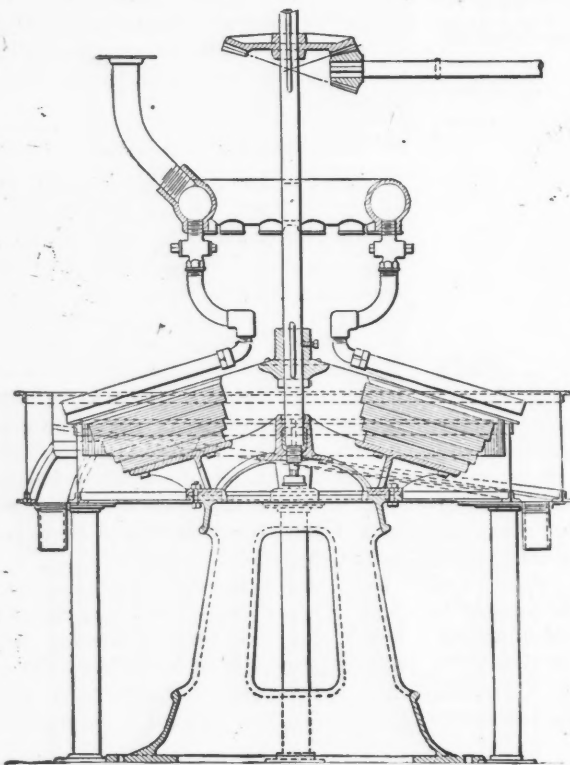
At the Exposition of Industry and the

roller mounted on an iron shaft. On the roller, iron studs of small cross-section, insulated from one another, are placed opposite the magnets on the separator. In their nearest position, they are from ⅜ to 3/16 in. from it. When, during the rotation of the off-taker, they come in the neighborhood of the magnetic disks, they become magnetic by induction. On account of their small cross-section compared with that of the disks, the lines of force are concentrated in them; consequently their attracting power is greater than that of the disks. The magnetic particles attracted to the disks of the separator are by this device drawn over to the studs of the off-taker. When, by the rotation of the roller, the studs are removed from their source of force, they lose their magnetic power and drop the attracted grains.

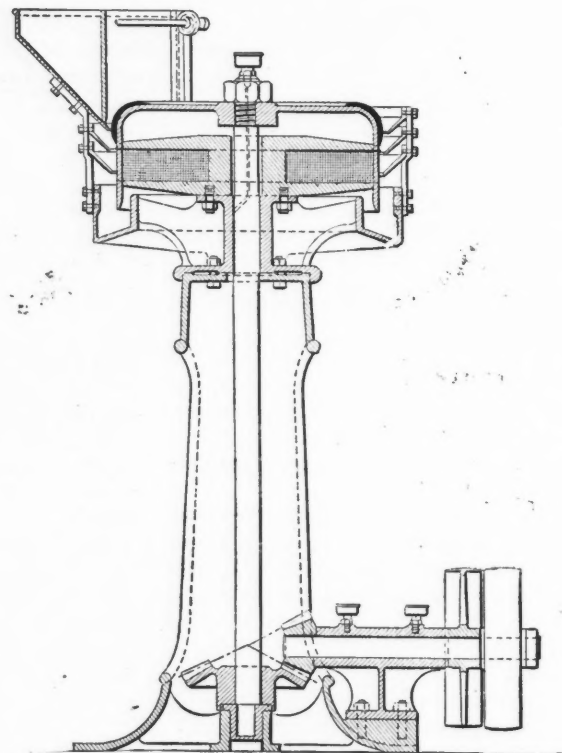
ing capacity, like that of all others of its kind, depends to a certain extent upon the iron content of the crude material. With 30 per cent. iron in the crude ore, the Gröndal No. 1 will treat 30 tons per day of 24 hours.

#### THE GRÖNDAL NO. 2

A few years after the invention of his first separator, G. Gröndal brought out in the market his second type, which combines with its small dimensions great simplicity and easy regulation. The machine has a fixed electro-magnet consisting of two semi-circular disks of soft iron attached to a vertical shaft 2¾ in. apart. Between them the coil is inserted. Around the electro-magnet revolves a bell-shaped sheath of brass, in the outer surface of which a number of iron plates or *lamels* are cast. When the thin *lam-*



FRODING MAGNETIC-TABLE SEPARATOR



GRÖNDAL NO. 2

Liberal Arts in Stockholm in 1897, G. Gröndal exhibited a magnetic separator which at once won a great deal of interest and was to be from the beginning a victorious rival of the Monarch. This separator, now known as the Gröndal type, No. 1, consists of two rotating vertical cylinders, side by side—the separator and the off-taker.

On the vertical axis of the separator, five horizontal disks of soft iron are fixed 2¾ in. apart. Between them, coils of copper wire are arranged so as to give them alternate positive and negative polarity. The number of turns increases downward, by which arrangement, the further down the shaft the disks are located, the more strongly magnetic they become. The off-taker is simply a wooden

The off-taker generally rotates nine or ten times as fast as the separator (about 225 r.p.m., while the separator makes 25 r.p.m.). The crude material, in the form of a pulp, is fed at the top of the separator. What is not attracted by the first magnetic disk runs in a launder to the second one, and so on, the ore in this way passing under continually increasing magnetic influence. By sprinkling with clear water, particles of the gangue sticking to the concentrates are washed away. The coils require 6 amp. of current of 31 volts tension; ¼ h.p. is sufficient for revolving the cylinders.

This machine was used at all the plants erected in the next few years after its introduction, and is still in satisfactory operation in many of them. Its separat-

*els* enter the magnetic field with the rotation of the bell, they become strongly magnetic. As long as they are in the near neighborhood of the magnetic disks, i.e., during half of the revolution, they keep the magnetism, but afterward slowly lose it. In order that the magnetic intensity of the *lamels* shall increase toward the lower edge of the bell, their upper part is covered with a layer of a lead-antimony alloy, which becomes increasingly thin toward a line near the bottom, below which the bare *lamels* come in contact with the material.

The pulp to be treated is fed at the upper part of the bell at the point where it begins in its rotation to pass by the electro-magnets. The magnetic particles are attracted to the *lamels*, while the non-



magnetic particles are washed off. When the lamels, after half a revolution, pass out of the magnetic field the concentrates can be easily removed. About the same current is needed for this machine as for Gröndal, No. 1, but not so much motive power. The machine soon came into operation at several plants, either alone or with others of the older type.

THE GRÖNDAL NO. 3

Not much later a Gröndal No. 3 was

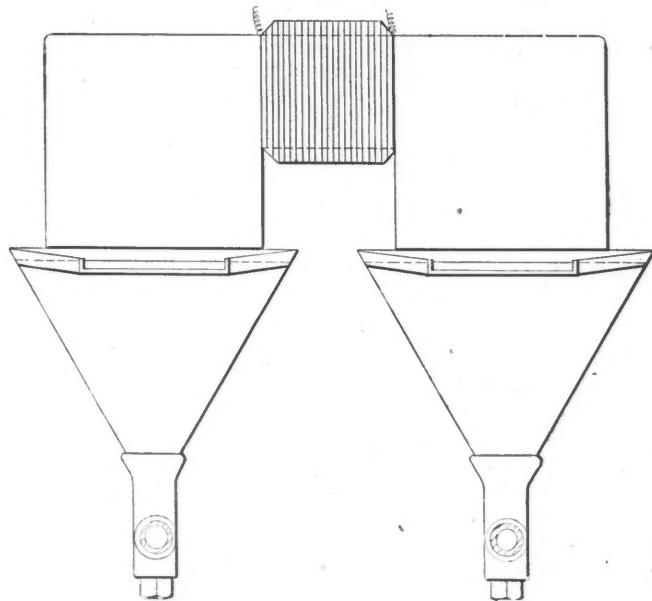
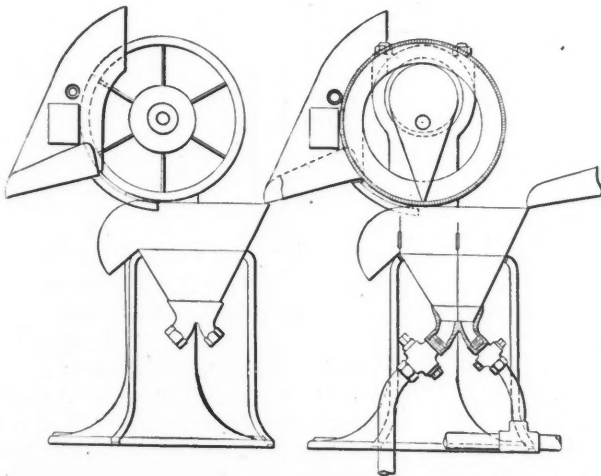
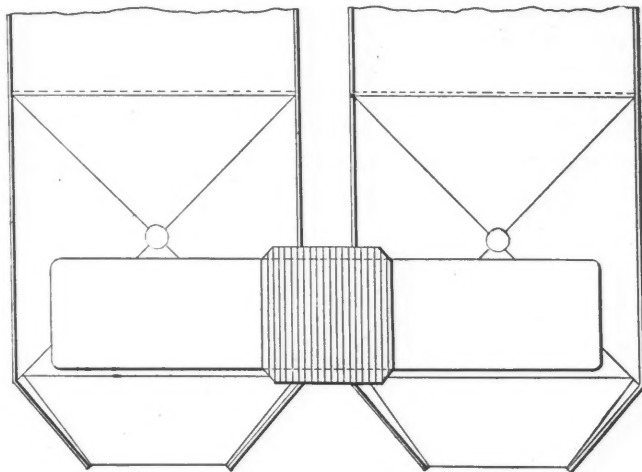
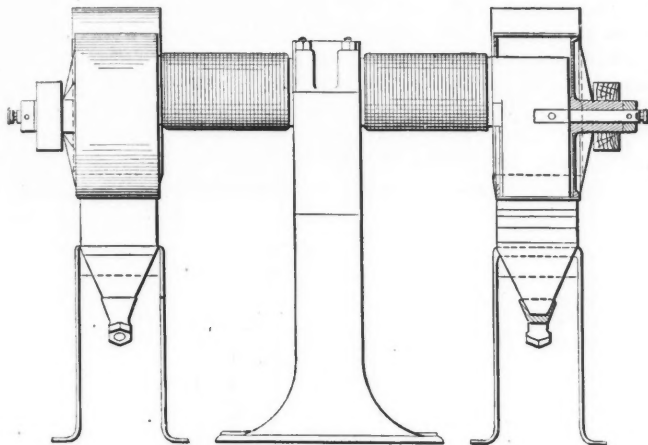
constructed, is thus effected. The characteristic of this separator is that the pulp is not fed directly on the drum, but is brought into the field of the magnetic influence in a weir box under it. On account of the great concentration of the lines of force resulting from the pointed shape of the poles, the most magnetic particles are lifted out of the water, and carried to the lamels of the drum, and carried forward. Once outside of the magnetic field, they are easily washed off.

Less magnetic particles, as, for instance,

motive power of only 2 h.p. For the electro-magnet, a current of only 3½ amp. and 110 volts is usually sufficient. The separating capacity of this machine is stated to be 50 tons in 24 hours. The Gröndal No. 3 has been operated at only a few plants, for the reason that shortly after its invention it was followed by a new type.

THE GRÖNDAL NO. 4

At all the wet-magnetic separating plants, much trouble had been experienced



GRÖNDAL NO. 3

TOP AND SIDE VIEWS OF GRÖNDAL SLIME MACHINE

constructed, and in 1903 it was put on the market. This type is furnished with a fixed electro-magnet with hatchet-shaped pole pieces around which brass drums revolve with a speed of 80 r.p.m. As in No. 2, iron lamels are inserted in the brass. These are alternately magnetic and non-magnetic as, during the rotation of the drum, they pass through or outside of the magnetic field. The magnetic separation, as well as the removal of the concen-

trates, are drawn to the surface of the water and, following the current, are discharged at the further end of the weir box, while the non-magnetic material, the tailings, sinks to the bottom to be discharged. By the lifting of the magnetic particles out of the water, a thorough cleaning from the particles of gangue is effected. Generally, two such separators are combined in a twin machine. Such a twin machine requires a

on account of the high percentage of water in the concentrates produced. Before the product could be briquetted, it was found necessary for the wet concentrates to be stored until the surplus of water had run off, and the concentrates were in a state suitable for the briquetting process. To eliminate this drawback, Gröndal constructed his type No. 4, in which the revolving drum is replaced by a horizontal disk of brass rotating with great speed,

(about 1450 r.p.m.) under a fixed electro-magnet. Each of the pole pieces of this magnet is in the shape of a hollow cylinder, the sides of which, thicker at the top, run to an edge at the bottom.

As in type No. 3, the pulp is fed in a weir box under the magnet. The magnetic particles drawn up against the horizontal disk are immediately thrown out by the centrifugal force and discharged in a nearly dry state. About 1 h.p. is required for the rotation of the disk, and about the same amount of electric current as in the last described type for the magnet. The machine at once went into operation at several plants, and worked quite satisfactorily. The great wear on the rotating disk, however, caused this type soon to make way for a fifth.

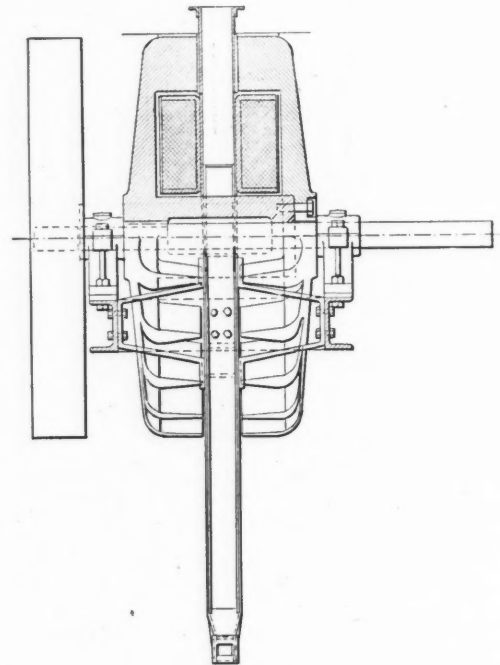
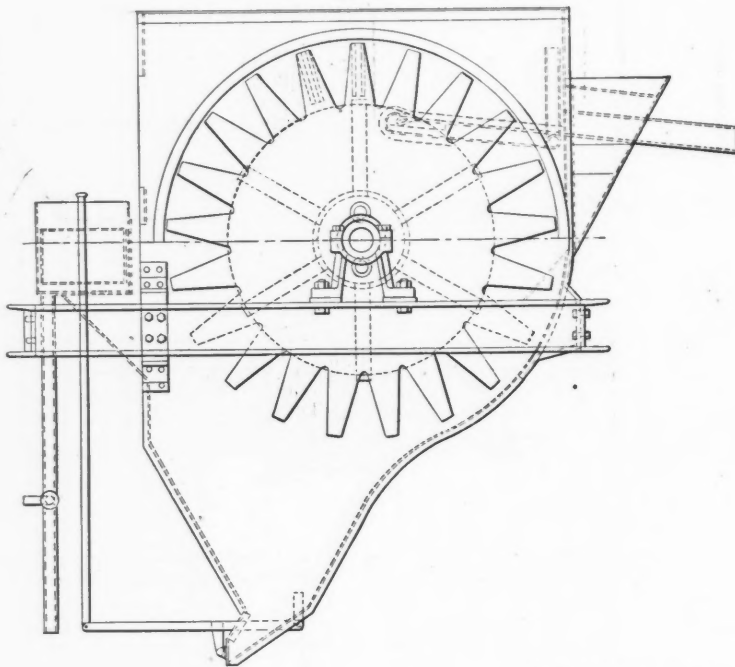
#### THE GRÖNDAL SEPARATOR NO. 5

This separator is now either installed or

water, which in the more recently built plants, is eliminated by water separators consisting of shaking shoes which allow the water to flow away over the further edge of the shoe.

In connection with the separators already described, an auxiliary apparatus, also of Gröndal's invention, should be mentioned. By this apparatus the finest pulp or mud formed in the crushing is successfully treated. Before its introduction, the magnetite in this fine material was generally lost in the separation. The essential feature of this slime-treater is the suspension of an electro-magnet with hatchet-shaped pole-pieces over two pyramidal boxes. When the pulp passes through these, the magnetic particles are stopped by the influence of the magnet, while the others are carried on. The magnetite, collecting in bunches, slowly sinks to the bottom of the box, from

10 r.p.m. over a system of fixed electro-magnets arranged radially side by side, 2 in. apart. They underlie 6/7 of the surface of the table. The pulp is fed at the center over the first magnet. The non-magnetic particles are at once flushed away with the water, while the magnetic particles, retained by the magnets, are carried around with a dancing movement caused by the alternating polarity. This, helped by a sprinkling of clear water under high pressure, cleans the magnetic grains from attached particles of the non-magnetic material. When the last magnet has been passed, the ore is easily washed off. The separator works with a current of 8 amp. at 100 volts, and requires about 1/2 h.p. Of Herräng ore with 25 per cent. iron in the crude state, the machine treated on an average 2 tons per hour in a continuous run of seven months. It is employed at a few plants in Sweden.



KNUT ERIKSSON SEPARATOR

contemplated in a great number of the new plants in Sweden. Inside a horizontally rotating brass drum is arranged a system of electro-magnets of alternating polarity somewhat resembling that of the Monarch separator. The pulp is fed in a weir box, as in the last two types. By the magnets, the magnetic particles are drawn out of the water and against the drum. With a dancing movement caused by the alternating polarity, they are carried past the magnets. Once out of the field, they are washed off by water. The material not lifted from the water is divided into middlings and tailings as in type No. 4. The power required is about 1 h.p.; the current, 4 to 5 amp. of 110 volts. The separating capacity of this machine is, with Herräng ore, 100 tons crude ore per drum in 24 hours. The concentrates from it are highly saturated with

where it can be discharged in any ordinary way.

#### OTHER SWEDISH SEPARATORS

Besides G. Gröndal, several other Swedish inventors have directed their attention to the construction of separators suitable for magnetic ores. Shortly after the introduction of the Gröndal No. 1, the magnetic separator of Heberle was brought out in the market. This, being a modification of the Hoffman machine adapted for wet magnetic separation, has gained only limited use in Sweden; mostly as an auxiliary apparatus for the separation of ores other than magnetites.

Another magnetic separator was constructed in 1900 by M. Fröding. This has the form of a small conical table with its brass top about 5 ft. in diameter, and with a pitch of about 27 deg. It makes about

#### THE ERIKSSON MACHINE

Simultaneously with the Fröding separator, the Knut Eriksson machine was put on the market. Built on a somewhat different principle, it consists of a system of two spider-shaped or star-shaped electro-magnets of different polarity rotating on a horizontal axis. Between the positive and the negative pole-shoes, which are turned toward one another, there is a narrow chamber inclosed by two vertical brass plates; into this the ore is fed, either in a dry state or in the form of a pulp, of which the latter is preferable. The magnetic particles arrange themselves along the lines of force between the poles, forming bunches between the vertical walls. Traveling forward with the rotating magnets, they are carried along to the other side of the machine, where they are discharged. The non-magnetic material is

washed off as soon as it enters the chamber. In wet separation, the chamber is partly filled with water through which the magnetic ore passes, being thus washed clean from attached dust or particles of tailings. The machine is in use in some plants in the middle part of Sweden.

THE FORSGREN SEPARATOR

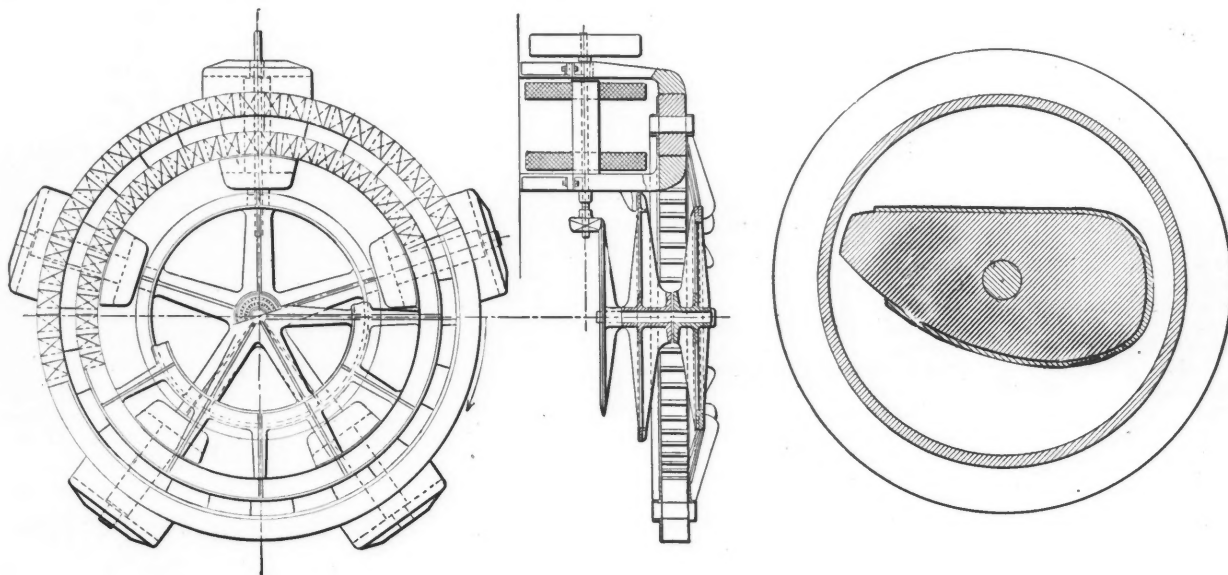
The Forsgren magnetic separator, constructed in 1902, consists of two horizontal concentric rings of brass in which wedge-shaped pieces of soft iron have been inserted with the pointed ends turned toward each other. Attached to the same spider, the two rings rotate with a speed of from 5 to 10 r.p.m. between one or several couples of fixed electro-magnets of opposite polarity, which induce secondary magnetism in the wedge-shaped iron pieces when these pass the electro-magnets, thus forming secondary poles.

same degree for cobbing as for ordinary magnetic concentration, the machine is well worth attention. For the electro-magnets a current of from 3 to 3.5 amp. at 110 volts is used. The power required varies from 1/2 to 2 or 3 h.p., according to the size of the machine. The separating capacity, of course, depends largely upon the character of the crude ore. For instance, a separator with three feed-chutes, working with ore from Lomberget of a size finer than 0.5 mm., treated 5 tons per hour; another with four feed-chutes, built for cobbing Grängesberg ore of sizes from 1 3/8 to 3/16 in., treated 10 tons per hour. The machine is employed at the cobbing plant at Grängesberg, and a few other places in Sweden and other countries.

Besides the magnetic separators already described, there are several other Swedish machines worth mentioning; for instance, those of G. Bring, G. Hallberg, and G. W. Lundberg, the Morgardshammar separa-

a magnetic force that it attracted all the magnetic particles, thus giving tailings and first concentrates, the latter to be carried to a weaker separator, which separated the particles richer in magnetite from the leaner ones, and middlings, which had to be returned to the ball-mill for regrinding.

With increased experience, there arose a demand for more complete extraction. It had been found that generally the magnetite was more finely crushed in the ball-mill than the gangue minerals. By virtue of this circumstance, it was the practice for a time to feed the concentrates from the double separator just described to a traveling endless sieve cloth with very fine mesh, where it was subjected to sprinkling with water under pressure. The fine grains passing through the sieve consisted chiefly of pure magnetite, while the coarser grains were gangue minerals more or less intermixed with particles of



FORSGREN SEPARATOR

GRÖNDAL MAGNETIC COBBER

The crude ore is fed between the rings at the places where the primary magnets are situated. The magnetic particles attracted by the secondary poles arrange themselves in bunches between them, as in the Eriksson machine. The non-magnetic grains drop straight down between the rings. When the secondary poles, in the rotation of the rings, leave the magnetic field and lose their magnetism, the magnetic particles fall off sooner or later, the length of time before they do this depending upon their permeability. The middlings drop first, the pure magnetite last.

It is thus possible to separate tailings, middlings, and concentrates, and the grading between the different classes can be fixed to suit the conditions. The number of ores which can be treated in one machine is equal to the number of electro-magnets employed. Useful for both dry and wet magnetic separation, and to the

tor, and others; but they are still either in the experimental stage or have so recently been put in practical operation that reliable data in reference to their work are not yet available.

MAGNETIC SEPARATING PLANTS

During the first development of magnetic separation in Sweden, the custom was to make the plants as simple as possible. They usually contained nothing but one crushing machine, generally a Gröndal ball-mill, and one or several magnetic separators. Soon, however, it was found that on the one hand a preliminary coarse crushing in a Blake or Gates crusher was necessary before the ore was fed into the ball-mill, and on the other hand that a finer crushing than had been usual was of advantage. It was also found desirable to treat the fine crushed material by a double separation in such a way that it was first fed on a separator of so strong

magnetite, forming comparatively rich middlings to be reground in the ball-mill. It was not long before this principle was carried yet further by the introduction of fine grinding in tube mills of the first concentrates obtained in the double separation.

Simultaneously with the finer grinding of the concentrates, there was introduced at some works, where the ore showed its fitness, a magnetic cobbing of the ore coming from the first breaker in order to eliminate at once pure rock pieces, the feeding of which into the ball-mills and the separators was undesirable.

In the last few years, the magnetic separating plants have thus lost much of their simplicity while they have gained in efficiency. They are still a great deal simpler than the ordinary wet jigging mills.

Illustrating two somewhat different methods of working, the accompanying



flow sheets may serve as typical examples of Swedish practice.

#### ADVANTAGES OF MAGNETIC SEPARATION

By magnetic separation, a product with from 63 to 68 per cent. iron can without difficulty be obtained from a crude ore with from 25 to 30 per cent., if crushed fine enough. The loss of iron with the tailings is generally very small, depending on how much of it the silicates in the gangue contain. It varies, for instance, in amphibole, from 2 to 16 per cent., in pyroxene from 9 to 12 per cent., in garnet from 17.5 to 21.5 per cent.

The phosphorus content is easily reduced, even if the crude ore has a comparatively great amount of it. At Karls-  
vik, for instance, the phosphorus is lowered from 1 per cent. in the crude ore to 0.005 per cent. in the concentrates. The sulphur is also easily reduced, provided it does not exist in the form of magnetic iron pyrites.

solution is complete. The excess of bromine is boiled off, the solution allowed to cool somewhat and 0.75 gram of sodium sulphite added. The solution is boiled down to half its volume to drive off the sulphur dioxide. The beaker and cover-glass are washed down with hot water, a little hydrochloric acid added and the solution heated to boiling. The bromate solution is then added until the antimony is nearly all oxidized, when 3 drops of methyl-orange are added and the titration finished, indicated by the discharge of the color. Arsenic, iron and copper only in large amounts affect the titration.

For hard lead weigh out 0.3 gram of fine lead saw-dust and treat with 20 c.c. of strong hydrochloric acid, boil for a few minutes, add a few c.c. of a saturated solution of bromine in hydrochloric acid and shake occasionally until the alloy is dissolved. The procedure then follows the standardization.

Ores soluble in hydrochloric and bro-

hydrochloric acid and water. The filtrate is boiled to expel the bromine, sodium sulphite added and finished as before.

### Broken Hill South Silver Mining Company

The report of the Broken Hill South Silver Mining Company, of New South Wales, for the half-year ended Dec. 31, 1906, announces the discovery of a large body of high-grade ore at a depth of 970 ft. The financial statement showed a balance of £82,016, against £71,015 the previous half-year. The net liquid assets amounted to £119,572, an increase of £19,907.

There were 105,147 tons of ore raised, averaging 15.4 per cent. lead, 11.9 per cent. zinc, and 5.3 oz. silver; this compares with 95,724 tons raised in the first six months. The cost of producing this ore was: (1) mining, 9s. 9.08d.; filling depleted stopes, 1s. 2.52d.; development, 2s. 11.9d., against a total cost, for these items, of 14s. 3d. in the first period. Concentrating costs were 4s. 0.3d. per ton, a decrease of 4.3d.

Development work for the six months consisted of shaft sinking, 245 ft.; drifts and crosscuts, 2170 ft.; raises and winzes, 800 ft.; diamond drilling, 597 ft.; total, 3812 ft.

Eleven 5-ft. Wheeler pans were substituted for the ball mills owing to the high maintenance cost of the latter, and a tube mill 13 ft. long and 53 in. diameter was erected for experimental work. The new concentration mill was nearly completed at the close of the year.

### Zinc Strips for Electric Fuses

A. Schwartz and W. H. N. James (*Electrician*, 1906, LVI, 184) have studied the behavior of zinc fuses in the form of strips when used as thermal cut-outs in electric circuits. Zinc shows very little deterioration, when run continuously at 90 or even 95 per cent. of the normal fusing current; the oxidation is very slight and the final resistance of the strip is practically the same as its initial resistance. This is a marked advantage in comparison with copper, which becomes red hot with about 75 per cent. of its normal fusing current and above this point oxidizes rapidly. Zinc has, however, certain disadvantages. The mass of the fuse is about 3.5 times, the volume 4.4 times, that of a copper fuse of the same length and for the same fusing current. Moreover, on disruption, the metal is distributed in the form of globules, which are not only red hot, but which continue to burn in air, being accompanied by dense white fumes which deposit heavily on contiguous surfaces.

#### LIST OF MAGNETIC SEPARATION PLANTS IN OPERATION IN SWEDEN.

Name of Plant.	Year of Erection.	Type of Separator.
1 Herrång.	1894	First Monarch, then Fröding, later Gröndal No. 3, now Gröndal No. 5.
2 Svartin by Luleå.	1897	Monarch, Heberle (not in operation).
3 Baggå.	1898	Gröndal No. 1.
4 Stråssa.	1898	Do. Rebuilt 1906 and furnished with Gröndal No. 5.
5 Klacka-Lerberg.	1900	Gröndal No. 1 and No. 2.
6 Persberg.	1901	Gröndal No. 1.
7 Romme.	1901	Gröndal No. 2 (not in operation).
8 Brödsjö.	1901	First Gröndal No. 1, replaced by No. 2, now No. 5.
9 Kallmora.	1901	Eriksson.
10 Blötberget.	1902	Gröndal No. 2.
11 Lomberget.	1903	Forsgren.
12 Björnberget.	1904	Eriksson.
13 Grängesberg.	1904	Eriksson.
14 Kungsgrufvan.	1905	Fröding.
15 Långgrufvan.	1905	Fröding replaced by Morgårdshammar.
16 Guldsmedshyttan.	1905	Gröndal No. 5.
17 Flogberget.	1906	Gröndal No. 5.
18 Hjulsjö.	1906	Gröndal No. 5.
19 Karlsvik at Luleå.	1906	Gröndal No. 4 and No. 5.
20 Uttersberg.	1906	Gröndal No. 5.
21 Vintjärn.	1906	Hallberg.

Of these, Nos. 1, 4, 8, 16, 17, 18, 19, and 20 are combined with briquetting plants according to Gröndal's system which will be the subject of a later article by N. V. Hansell.

To give an idea of economic conditions in a plant of this kind, it may be stated that a combined separating and briquetting plant with a capacity of 50,000 tons of crude ore yearly costs for erection about \$50,000; about 200 h.p. are required, and about 465 gal. of water per minute. Twenty men are sufficient for operating the plant.

### Volumetric Estimation of Antimony

J. B. Duncan (*Chem. News*, Feb. 1, 1907) employs a modification of the volumetric estimation of antimony, using potassium bromate. The potassium bromate solution contains 2.785 grams of the salt in a liter and is standardized by weighing 0.3 grams of pure finely divided antimony, or an antimony salt containing an equivalent amount of antimony, into a 16-oz. beaker, covering with 20 c.c. of strong hydrochloric acid and a few drops of bromine. The beaker is gently warmed and occasionally shaken until

mine are treated like hard lead. Insoluble ores are fused with a mixture of equal parts of sodium carbonate and sulphur. Weigh out 0.3 gram and fuse gently with 3 to 4 times its weight of the mixture in a covered porcelain crucible for 15 min. Extract the fusion with boiling water, filter, wash and extract any antimony remaining in the residue by treating the residue and filter paper with hot hydrochloric acid. Nearly neutralize this solution with caustic soda, add sodium sulphide in excess, boil and filter. Precipitate the antimony from the combined filtrates with hydrochloric acid, allow to settle and filter through a Gooch crucible, using asbestos for the filter. The washed sulphide is transferred with the asbestos to a 16-oz. beaker by means of a glass rod and a jet of strong hydrochloric acid, the volume of acid made up to 25 c.c. and the solution boiled until the hydrogen sulphide is eliminated. The solution is slightly cooled, a few drops of bromine added and again boiled until the sulphur separates, when it is filtered, washing with

# Colliery Hoisting, Haulage and Power Systems

The Cost of Individual Steam-driven Hoist and Power Units Compared with That of the Central Electric Power-station System

BY FRANZ ERICH JUNGE\*

One department which seemed hitherto almost exclusively reserved to direct (steam) drive is that concerned with taking the mine workers up and down the pit, also with lifting the broken ore or rock or coal to the surface, to be there screened, and washed, and finally charged into the (blast) furnace or coke ovens, or to be shipped directly to the consumers. Since hoisting service presents perhaps the most fluctuating of factors which constitute the load curve of a colliery, and since we can only arrive at just conclusions regarding the prospects and limitations of gas power as a claimant for recognition in this class of work by understanding the manner of operation of every important branch of application, and its back effect on the prime movers in the central station, it will be necessary to devote a few explanatory words to the operation of hoisting engines.

Steam hoisting engines are very simple, safe and reliable machines and quite excellent but for the one disadvantage that they are extremely uneconomical owing to the severe and fluctuating demands of the hoisting load. By far the majority of engines tested show an average steam consumption of between 50 and 60 kg. (120 to 132 lb.), some obsolete types as high as 100 kg. (220 lb.), other high-class engines only 29 kg. (64 lb.) per shaft (pit) horse-power hour.

This high economy is chiefly due to the improved type of engines, to the employment of high steam pressures and superheating, to the avoidance of harmful clearance spaces by placing the valves on top and bottom ends of cylinders, to improvements in admission-governing devices and last but not least to the greater depth of the pit which allows the engine to develop its capabilities and to utilize the advantages of compounding and prolonged expansion.

## ELECTRICALLY DRIVEN HOISTS

The economy of operation of electrical driven hoisting (winding) engines for main-shaft winding service depends chiefly on the mode of current adopted. On account of the many advantages which three-phase current possesses over other systems for operation in mines, it would be most desirable to use it also for driving hoisting engines. However, the speed regulation of alternating-current motors in hoisting service is difficult, depending as it does on so many varying influences.

Also it is hard to protect these motors sufficiently against excessive load fluctuations. The use of fly-wheels as equalizers is not satisfactory, while storage batteries with motor generators, though effective, are too expensive in first cost.

Further, it is practically impossible to build three-phase current motors of 100 h.p. for a frequency of 50 periods for a speed of between 40 and 50 r.p.m., while this is possible with direct-current motors, which may therefore be directly coupled to the shaft of the hoisting drum.

Finally, on account of the peculiarities of hoisting service, the consumption of energy in three-phase current motors depends greatly on the skill of the attendant and is usually higher than that of direct-current motors. Therefore the latter type of motors, especially when connected with the Leonard system of regulation—hoisting motor driven by direct-current generator—is coming into almost universal use in Germany.

motor (1) to the varying potential of the armature of the motor (2), the product of both representing the amount of energy consumed by the hoisting motor.

Another great advantage of the Leonard system of regulation is that it offers convenient and perfect means for equalizing load fluctuations. Leaving out of consideration the case that the regulating direct-current dynamo is driven directly by some steam or gas prime mover, though this is often the most economical mode to pursue, we shall here consider what obtains in the majority of cases in modern European practice, viz., that the dynamo is driven by a special motor which works at a constant potential, taking its current from the network of some central station.

## A. C. D. C. TRANSFORMERS

The advantage of having a converter set for transforming the three-phase current delivered by the line into direct cur-

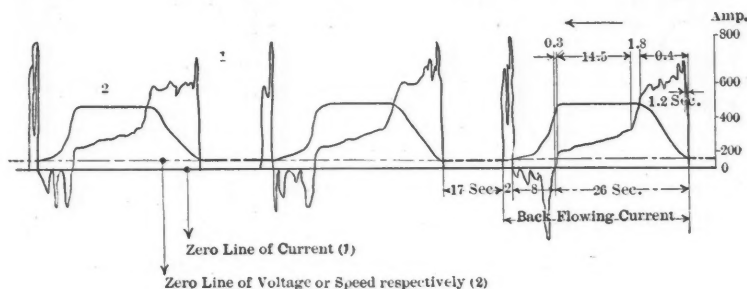


FIG. 1. HOISTING DIAGRAM AT FRIEDRICHSHALL

## LEONARD SYSTEM OF REGULATION

It would go beyond the scope of this study were we to discuss in detail the advantages which this mode of driving embodies over three-phase current work. They may be briefly summarized as follows:

The hoisting speed is independent of the load and can be chosen higher than with either direct steam drive or three-phase current motors. Therefore the rate of output from the pit is increased. The speed of driving is only dependent on the position of the starting lever and the arrangement can be made absolutely safe and controllable.

The consumption of power is not dependent on the skill of the attendant and can therefore be guaranteed beforehand. Diagram Fig. 1, which was presented by Phillipi in a paper read to the Verein deutscher Ingenieure, shows the relation of the current consumed by the hoisting

motor, which is employed for driving the hoisting motor and drum, consists chiefly in that the arrangement allows to connect even the largest main-pit winding engine to any net without disturbing other consumers. It is therefore no longer necessary to provide a power-house for every mine, so long as electric current from some reliable source is available.

The great improvement which Ilgner has introduced in the operation of these alternating-current direct-current converter and hoisting sets consists in that he placed a very heavy fly-wheel, having a weight of from 30 to 40 tons for large work, on the shaft of the motor generator, which absorbs all shocks and fluctuations that are exercised through the direct-current hoisting motor on the direct-current generator, thereby preventing any back effect on the net, which would be harmful to the generators and prime movers in the central station. At

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the same time the fly-wheel acts as an accumulator storing the energy which is furnished from the net at a continuous rate also during the hoisting intervals and giving it out again during the starting period of the hoisting motor.

The direct-current drive of hoisting engines combined with the Ilgner buffer system has rendered hoisting service a constant and beneficial contributor to the station load, and the addition of a special safety device, which we cannot here describe, has made the equipment so controllable and reliable that the hoisting speed in German mines was, by sanction of the mining authorities, increased from 6 to 10 m. per second.

#### ECONOMY OF CENTRAL ELECTRIC DRIVE

Regarding the economy of central electric drive, the opinions of mechanical and electrical engineers are still diverging. Some hold that the economy of high hoisting speed and the safety of operation are

in the last named case such items as larger boiler plant, steam piping, more spacious building for hoisting engine and the far greater consumption of coal, oil and waste must carry considerable weight. A steam consumption of 10 kg. (22 lb.) per shaft horse-power, as recorded with central electric drive, is twice as good as the best result that has so far been obtained with modern high-class direct steam drive under exceptionally favorable conditions of operation.

#### OPERATING EXPENSES

As regards operating expenses with central electric hoisting service the consumption of power will very largely depend on the losses which occur between prime-mover shafts in the power house and hoisting drum. While for large steam engines operating in the central station as low as 5.2 kg. (11.4 lb.) of steam per effective horse-power hour has been attained, the corresponding consumption in the pit was found to range from 14 to 11

clearly, on the one hand, the almost constant power consumption of the motor-generator set, on the other hand, the extreme load fluctuations or demand for current on the direct-current hoisting motor.

On account of the extreme importance which hoisting service occupies in colliery work, being the alpha and omega of operation, I add the views of one of the best authorities on the subject, who has investigated the question of steam versus electric hoisting engine both from the economic and technical standpoint. In addressing the Verein deutscher Ingenieure, Prof. Ad. Wallich, at the end of a very elaborate examination of the problem, arrives at the following résumé:

"None of the two modes of drive deserves preference for all cases, but on collieries which are equipped with steam-generating plants, modern steam hoisting engines should be installed. Where energy can be derived from blast-furnace works, or where electric current can be generated at low cost from available coke-oven gases, there the electric hoisting engine will preserve and extend its field of usefulness; also at side pits, which are located at great distances from mining centers and where the instalment of special boiler plants would not pay. Further, when hoisting from great depths under conditions such as prevail, for example, in the Transvaal, there electrically-driven hoisting engines are preferable, alone for the reason that the supply of energy can be conducted (in cables) much better to engines doing underground service."

It is seen that for the case under discussion, collieries having coke-oven plants attached to them, electric centralization and generation of current in coke-oven gas-engine generators is advocated as the most economical method to pursue, and one which in all-round reliability is equal and in special phases of operation even superior to direct steam drive.

#### ELECTRICAL HAULAGE

M. F. Peltier gives the following interesting results of experience with an electrical mine haulage plant installed at No. 3 mine at the Peabody Coal Company, Marion, Ill.

Prior to installing electric haulage, there were sixteen gathering mules and seventeen mules working in spike teams, pulling from the lyes to the shaft, producing 1400 tons of coal daily. Owing to the size of cars, grade and average haul of 1800 ft. from lyes to bottom of shaft, the output had reached its limit with mule haulage, and it was finally decided to install electrical haulage. Two 15-ton traction locomotives with double-end controller and trolley poles of the reversible type were installed, with No. 4-0 trolley wire, securely fastened to roof with trolley hangers, 8 in. outside of outer rail. Each locomotive is provided with

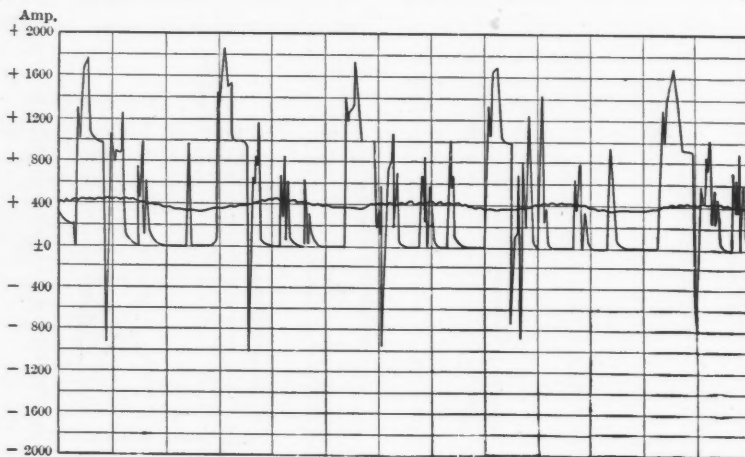


FIG. 2. HOISTING DIAGRAM OF ENGINE AT ZOLLERN II

too dearly bought by the higher initial cost of equipment and the higher losses in transmission and operation, especially through bearing friction of the heavy fly-wheel. Others maintain that, considering all the items which contribute to the total cost of equipment, that is, not only the portion represented in the hoisting plant, but also the corresponding portion of the power plant proper, the comparison comes out in favor of straight centralization.

This refers as well to direct drive by three-phase current hoisting motors, which take their energy directly from the line, as to the direct driving of the regulating dynamo by special prime mover. Of the combination employing three-phase current motors operating from the net without transformers, we have in Germany only few examples, the best known being that on the "Preussen" mine, which lifts a load of 2200 kg. 700 m. high (4840 lb. 2296 ft.) at a speed of 16 m. (52.5 ft.) per second. It is even maintained that straight centralization is cheaper in total cost than ordinary steam drive, and it is true that

kg. (30.8 ÷ 24.2 lb.), giving for a continuous day and night run of 24 hours a total efficiency ranging from 37.5 to 44 per cent., according to the time at which records were taken. Ilgner gives the efficiency between drum shaft at pit and bus bars in the central station as 55 per cent. for large, and as 45 per cent. for small hoisting plants, which are operated directly from the network of a central station.

That this system has its indisputable merits is best proved by the rapid introduction which it has found in German and foreign collieries. Since 1903, when the first plant was built, 60 large equipments fitted with Siemens-Ilgner fly-wheel sets have been installed, aggregating a combined lifting capacity of 40,000 tons within a period of 8 hours. Most of these plants are designed for very large loads (5000 kg. or 11,000 lb.) and high speeds (14 ÷ 18 m. per second, or 46 ÷ 52 ft.).

Diagram Fig. 2 was taken in the mine Zollern II, at Gelsenkirchen, to the power-plant equipment of which the above mentioned data refer. They bring out very



two motors wound for 250 volts, and exerts a draw-bar pull of 8200 lb. on the level. They have pulled seventeen loaded cars up a  $2\frac{1}{2}$  per cent. grade, 1200 ft. long. These cars weigh when empty 1950 lb. and hold on an average of 6600 lb. of coal. So the weight of a loaded train would be over 72 tons.

The track gage is 42 in. The track measures 9000 ft. over all and is laid with 40-lb. T rails, bonded and cross bonded for the return current.

The coal is all caged on one side, and the empty cars taken off on the other. The electrical power for operating the motors in the mine is supplied by a 175-kw. generator belted to a 200-h.p. high-speed steam engine, located in the power-house department of the building containing the hoisting engines. The generator also furnishes light for the underground haulage ways. From the switch-board in the power house the current is transmitted over a 400,000 circ. mils. cable running down the manway and to the main haulage way of the mine.

The entire electrical equipment, including generators, costs \$21,172.79. The average cost of hauling with mules was 2.4 per ton mile, and with electricity is 1.4 cents, the latter figure taking account of interest on investment, depreciation, and taxes, while 2000 tons of coal are daily handled instead of 1400 tons, which was the limit of mine capacity with mule haulage.

#### FANS AND COMPRESSORS

Fans, which are now preferably installed underground, and compressors both offer favorable conditions as far as station-load factor is concerned, on account of the continuance in service. When the compressors are operated by three-phase current motors from the high-tension line they must embody provisions to vary the quantity of air output according to momentary requirements, but without varying their speed. This is done by simply arranging an automatic by-pass from the pressure to the suction side of the compressor, through which part of the air is returned during the delivery stroke. A compressor of this type is operating on the "Rheinpreussen" mine, in Germany, having an output of 8000 cu. m. per hour (282,400 cu. ft.).

#### CONCLUSIONS AS TO COST

Having analyzed the reasons which have led to the introduction of central electric drive for small as well as for medium size and large machinery in combined collieries and coke-oven plants, we are now in a position to arrive at somewhat more definite conclusions as to the cost of operation and equipment. Obviously the only correct indicator for measuring the consumption of power of both the central and the scattered mode of driving is the feed-water of the boilers, since it is only in this item that all losses are in-

cluded. With scattered steam drive, or, better, with semi-centralization (since almost all plants possess nowadays a small central station for lighting and small power demands), and modern engines distributed over the works, an average consumption of 17 kg. (37.4 lb.) per effective horse-power per hour can be assumed. For older plants 24 kg. (52.8 lb.) or even higher would come nearer the truth. Electric centralization of the complete power demand will reduce the consumption to an average of from 8 to 10 kg. (17.6 to 22 lb.) per effective horse-power per hour, so that a saving in steam of at least 7 kg. (15.4 lb.) per effective horse-power per hour is attained.

Now comparing the respective operating cost of central versus scattered gas drive, it is obvious that the saving in gas consumption, which in this case is the proper indicator for the efficiency effected through centralization, will be much smaller, indeed almost nil, for the simple reason that there is no marked difference in the economy of large and small gas plants, the difference in favor of the larger being only one of first cost of equipment per horse-power. Condensation and stand-by losses, which constitute such an important factor in scattered steam drive, are also entirely absent. So the greater economy of gas-power centralization is chiefly based on superior reliability of operation and reduced expenditures for skilled labor in the central power house.

It is certainly short-sighted policy to promote the multiplication of the possibilities of break-downs by advocating the installation of gas engines which will give complete satisfaction only when properly cared for, at places where it would not pay to keep high-class attendance. It must be repeated that for operations in the iron and coal industries the proper place for the (large) gas engine will be in the future, and is even now, in the central station. For certain departments, such as hoisting at main pit, the gas engine of standard design, owing to its peculiar working process, is anyhow entirely unsuitable as at present constructed.

#### COST OF INSTALLATION

While it is now generally conceded that electric centralization is cheaper in fuel consumption and other operating expenses, attendance, lubrication, waste, regardless whether gas or steam is employed, there is still the widespread opinion prevailing that the first cost of installation is higher than with direct drive.

We have discussed this phase of the subject in the preceding paragraphs as far as the separate departments, pumping, hoisting, compressing, etc., are concerned. We can now sum up the situation in the entire plant as follows: While the initial cost of electromotors employed in the various sections is undoubtedly

cheaper than with scattered steam-engine drive, and while there is a considerable saving in the size of boiler plant which can be built smaller on account of the saving in steam consumption, yet the total first cost of equipment is for centralization still higher than for direct steam drive.

Iffland estimates that in a colliery with normal water influx and depth of mine the power demand during the day averages 1 or 1.25 h.p. effective per ton of output. Assuming that output to reach 1500 tons a day, and figuring on 1 h.p. per ton, then there are rendered  $1500 \times 24 = 3600$  horse-power hours per day, or, counting holidays half,  $33.2 \times 3600 = 12,000,000$  horse-power hours per annum. With the saving realized above, of 7 kg. (15.4 lb.) per effective horse-power hour, and assuming a sevenfold evaporation and boiler coal to cost 8 marks or \$1.90 per ton, the annual saving in coal consump-

tion amounts to  $\frac{12,000,000 \cdot 7.8}{1000.7} = 96000$  M.

or \$23,000. To this must be added the saving in firemen, in salaries for engine attendant, lubrication, etc., so that the total saving runs up to at least \$25,000 per annum.

The initial cost of a complete central electric equipment for a plant of this size and including full reserves in the power house will run, in Germany, by from \$36,000 to \$72,000 higher than with direct steam drive of all large machines and central generation of power only for the smaller ones. It is seen that under these conditions the higher first cost of complete centralization will be paid for by the savings realized in operation within one or one and a half years.

When gas engines are employed it is difficult correctly to estimate the gain in operating cost due to reduced attendance, and also to determine what saving in initial capital outlay will result from the elimination of special prime-mover equipments in the different departments and their reserves, which a careful management must provide; further, from the employment of cables instead of gas-supply pipes throughout the works, and last, but not least, from the elimination of the boiler plant.

#### RESULTS FROM ACTUAL PRACTICE

In concluding this discussion reference should be made to the important question of cleaning the coke-oven gas. However, this subject is one so comprehensive in itself that it is hardly susceptible of condensation. So I will merely add a few results which were attained in one of the earliest gas-engine installations on the European continent, namely, that at the Borsig works, of Upper Silesia, Germany, which has been in successful operation since 1902.

In the Borsig works there are altogether 76 coke ovens with a capacity of from 6.2 to 6.5 tons per oven and a coking

period of 32 to 36 hours. There are, therefore, 320 tons of coal coked in 24 hours. As the generation of gas per ton of coal amounts to 14,830 cu.ft., the consumption of 320 tons generates in the neighborhood of 4,745,600 cu.ft., of which 295,100 cu.ft. are used for heating the ovens, while about 179,350 cu.ft., or 74,730 cu.ft. per hour, are available for use in gas engines or otherwise.

The gas when coming from the ovens is first subjected to a treatment, whereby the by-products—tar, ammonia, and benzol—are eliminated; then it is dried in two scrubbers, filled with sawdust and rasensers, which have each a grate surface of 376.6 sq.ft., and four grates. The scrubbers are operated alternately, one being cleaned while the other is working. After leaving the scrubber the gas is perfectly free from harmful impurities, so that the engine in question has been running more than a year and a half without being cleaned.

The composition and calorific value of the coke-oven gas varies considerably within a period of 24 hours. Assuming

## The French Portland-Cement Industry

BY E. CANDLOT

The French portland-cement industry began in France about 1845. At that time, Mr. Demarles started cement works at Boulogne-sur-Mer. Upon the advice of Vicat he manufactured his cement from marls, which are found in large quantities in that section and which, in fact, are still being used today.

Until 1880, almost the entire portland cement produced was manufactured in the Boulonnais; to the factories at Boulogne were added those of Neufchatel and of Desvres, in the same section.

Mention might also be made of another factory in l'Yonne using the dry process and another factory erected by Vicat's son near Grenoble. The total production was then about 150,000 tons per year. From 1880 to 1890, numerous factories were put up in the Boulonnais; from 1890 to 1900, two factories were built in the vicinity of

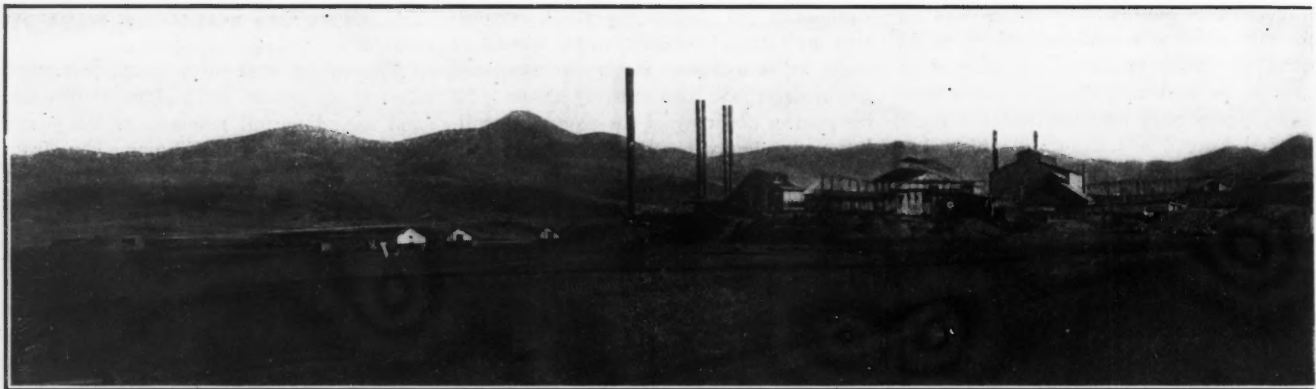
factories and in the Lillie factory. Generally speaking, these kilns measure 30 meters in length and two meters in diameter. Recently kilns of 35 meters in length and 2 meters 10 in diameter have been erected. All the kilns are fitted with clinker coolers.

The factories using the dry process are located at Pernes (Pas-de-Calais), at Pagny-Sur-Meuse, at Prangey and Moutot (Yonne), at Palinges (Saone-et-Loire), at Grenoble and at Valdonne near Marseille.

These factories burn their cement in Dietzsch kilns, Hoffman kilns and the old intermittent kilns and the Schneider kiln.

The grinding is still done in several factories with the ordinary millstones, but most of them now use ball and tube mills. These mills are generally supplied by Germany; however, several French factories are now manufacturing mills of a good quality; among others may be mentioned the firms of Dalbouze, Brachet & Co. at Puteaux and Anker at Albert (Somme).

French cement factories export relative-



GENERAL VIEW OF SMELTING WORKS, CONSOLIDATED ARIZONA SMELTING COMPANY

an average heat value of 370 B.t.u. per cu.ft., there are available 27,500,000 B.t.u. per hour for useful work. Taking the average consumption of a large gas engine as 8333 B.t.u., per brake horse power hour, the total quantity of gas available, when used in a gas engine, will give:

$$\frac{27,500,000}{8333} = 3300 \text{ brake horse-power.}$$

Taking the boiler efficiency in a steam engine plant as 70 per cent., and assuming that 1180 B.t.u. are required to generate one pound of steam, and that the steam consumption per horse-power-hour is 16.3 pounds, then the same quantity of gas would give  $\frac{27,500,000 \times 0.7}{1180 \times 16.3} = 1000$  brake horse-power. In this coke-oven plant the gas is then 3.3 times better utilized in a gas engine than it would be in a steam plant.

Masks of aluminum with breathing holes covered with gauze of the same metal are proposed in *Cosmos*, March 2, for protection against poisoning by mercury vapor.

Mantes, one in Saone-et-Loire, one near Lillie, another one in the east near Nancy; since 1900 two factories have also been erected in the section near Bordeaux.

At the present time the Boutonnais district furnishes about 400,000 tons per year. The Mantes district produces 70,000 tons; l'Yonne 30,000 tons; the Bordeaux district 30,000 tons, which will soon be raised to 40,000 tons per year; the factories in the east, namely, the ones near Lillie, L'Isere, Saone-et-Loire and also one factory near Marseille, produce 80,000 to 90,000 tons.

The present French portland-cement output is from 600,000 to 650,000 tons per year.

All the factories in the Boulonnais district use the wet process and prepare their slurry in practically the same manner. Very nearly all have drying kilns or Johnson kilns. Lately some of the manufacturers have begun installing the rotary kilns. These kilns are now in use in two factories in the Boulonnais, in the two Mantes factories, in the two Bordeaux

factories; the amount exported barely reaches one-tenth (1-10) of the total production.

In addition to the portland cement manufactured in France, we might also mention that there are two portland-cement factories in the French Colonies; one at Rivet in Algeria, which will soon produce 20,000 tons per year, and the other at Haiphong (Tonkin) which turns out 40,000 tons per year. These factories manufacture under the dry process and are equipped with Schneider-Hauenschild kilns and Krupp ball mills.

According to a recent British consular report, the province of Kwangsi, China, is believed to be richer in antimony than in any other mineral, but the export of this ore was made a government monopoly some years ago, and the production, which was once considerable, has since completely ceased. When antimony was at £13 a ton the ore could be laid down in London at a profit. The mines are mostly in very out-of-the-way districts.



# The Copper-Smelting Works at Humboldt, Ariz.

The Plant of the Consolidated Arizona Smelting Company Is Electrically Driven Throughout and Employs Fuel-oil Furnaces

BY E. H. HAMILTON\*

Ground for the smelting works of the Consolidated Arizona Smelting Company, at Humboldt, was broken on July 13, 1905. Smelting operations were begun in the latter part of March, 1906, the first copper was produced on April 1, and copper has been produced regularly since that time. The ore situation developed more rapidly than was anticipated, and a blast furnace plant had to be installed sooner than was expected.

There is a concentrating plant of two sections for dressing the ore from the company's two mines. The concentrates are roasted in Edwards roasters, smelted in reverberatory furnaces and bessemerized to bullion. The water supply is abundant and is obtained from the Agua

into the bins, which deliver to a conveyer belt, which delivers it into a crusher in the sampling mill.

The ore after going through the sampling mill is screened, the fine portion being delivered by a belt into bins, from which it is trammed to the roasting and reverberatory furnaces. The coarse ore is delivered by belt conveyers to the blast-furnace bins, from which it is drawn into the blast-furnace tram cars which deliver it into the blast furnace.

The roasting is accomplished in electrically driven, oil-fired, Edwards roasters. The concentrates and fine ores are loaded into electrically driven, hopper-bottom scale cars of a capacity of 17,000 lb., in which the charge is made up and de-

charge is made up. The total length of the crane runway is 276 ft.

There are two electrically driven converter stands, with six shells, 84x126 in. The material for silicious lining is mixed up in two electrically driven Chilean mills and is tamped by an Ingersoll-Sargent tamping machine. The compressed air for tamping and for other purposes, is supplied by an Ingersoll-Sargent air compressor in the power house.

## THE CONCENTRATING MILL

The concentrating mill built of steel has concrete floors, and consists of two independent sections. Each section has the following equipment: one Blake crusher, 20x10 in.; two crushers, 10x7 in.; three



SMELTING WORKS, CONSOLIDATED ARIZONA SMELTING COMPANY

Fria, which runs through the Company's property.

The track system of the whole plant is standard gage and is laid with 65-lb. rails, all the grades being easy and the curves of sufficient radius to allow trains drawn by standard locomotives to run anywhere in the plant. It is not uncommon for a locomotive with a train to run through the converter room.

## PROGRESS OF MATERIAL THROUGH THE PLANT

The sampling mill built by Allis-Chalmers consists of two sections capable of handling about 300 tons each. It is built of steel, supplied with Vezin samplers and is thoroughly equipped with driers, Englebach grinders, mullers and all appurtenances of an up-to-date sampling mill.

For unloading the ore, cars are set on two sides of a series of hopper-bottom bins. The ore is unloaded from the cars

livered into the hoppers above the roasters. The calcined product is delivered into steel hopper-bottom cars, which carry and drop it into the hoppers over the reverberatory furnaces. The reverberatory furnaces are 100x20 ft.

The waste heat from each reverberatory furnace goes to two Stirling boilers which furnish steam for the power required to run the plant and for the transmission line to the mines.

The slag from the reverberatories is granulated and carried away by water which has previously been used in the condensers and blast-furnace jackets.

The matte from the reverberatory furnaces is tapped into a launder, which delivers it into a ladle in the converter room, where it is poured into the converter by an electric crane. This crane also takes the blast-furnace matte and delivers it into the converter. The crane also takes the hot slag from the converters and pours it into the reverberatory furnaces, and delivers the shells to the place where part of the blast-furnace

elevators; two sets of rolls; a 25-ft. Hancock jig; ten Wilfley tables; eight vanners, and four trommells; eight Callow tanks, besides classifiers of Richards, Johnson and Anaconda types, centrifugal pumps, etc.

A large slime pond has been installed to recover the slimes. The overflow from the slime pond is returned to the mill, thus saving a large proportion of the water. One side of the mill has been considerably improved of late, and the other side is in process of remodeling. The mill is driven by electric motors, with current from the power house, the generators being driven by steam derived from waste heat.

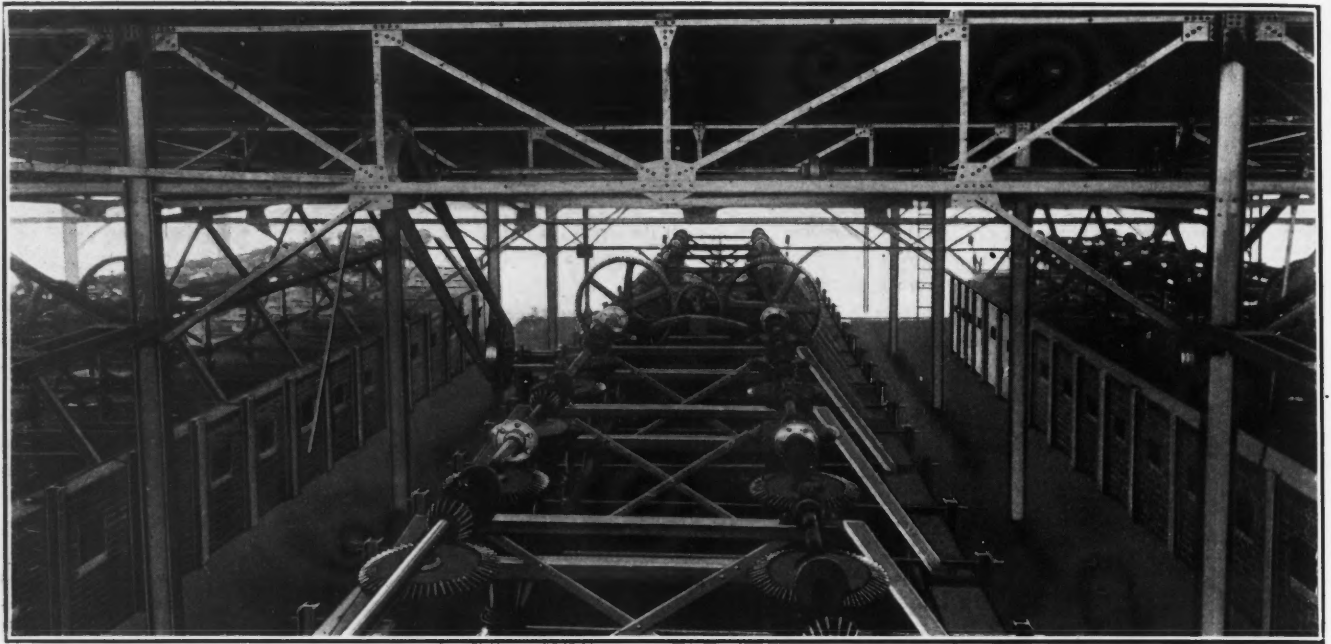
The machinery of this mill was furnished by the Allis-Chalmers Company.

## OTHER EQUIPMENT

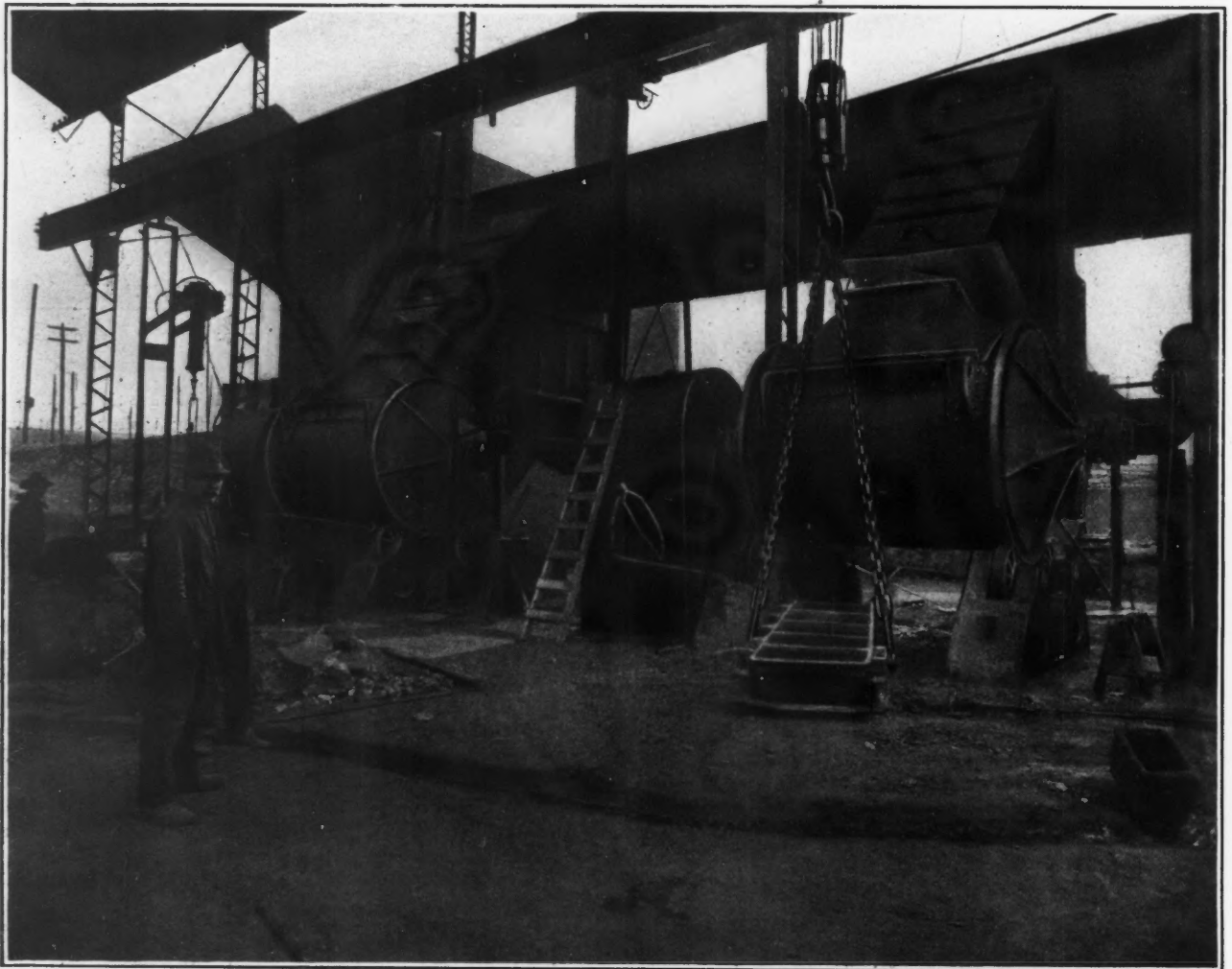
The chemical laboratory and assay office is built of brick, with especial care to secure the best possible light and ventilation. It is supplied with steam heat, electrical equipment, oil-fired assay furnaces, etc.

\*General superintendent, Consolidated Arizona Smelting Company, Humboldt, Ariz.





EDWARDS ROASTING FURNACES, CONSOLIDATED ARIZONA SMELTING COMPANY



CONVERTERS, SMELTING WORKS, CONSOLIDATED ARIZONA SMELTING COMPANY

The tramping system of the plant is electrical throughout, including provision for the haulage of blast-furnace slag. Side-dumping cars tilted by a compressed-air cylinder, are used at the blast furnace, the charges being weighed on standard track scales. Hopper-bottom cars are used for calcined material and hopper-bottom cars with weighing attachments for roaster charges.

The miscellaneous buildings include a steel and iron warehouse, a machine shop, a boiler shop and blacksmith shops supplied with the usual equipment, all electrically driven.

All the steel buildings were erected by the Minneapolis Steel Company.

The pumping station, located on the Agua Fria, consists of two electrically driven, four-stage centrifugal pumps supplied by the Platt Iron works, and one steam pump, the water being carried to the various parts of the plant by one 10- and one 8-in. pipe lines. A dam has been constructed across the stream at the pump house.

The plant was designed by and erected under the supervision of Cyrus Robinson. T. H. Oxnam is general manager of the Consolidated Arizona Smelting Company.

**THE BLAST FURNACE**

The blast furnace equipment consists at present of one 270-ton furnace, supplied by the Power & Mining Machinery Company. The blast is supplied by an electrically driven rotary blower of the Connellsville type. The furnace is also connected with a reserve blower of the same type direct connected to a steam engine.

The charge is drawn from the storage bins into flat, side-dump cars, which are discharged into the furnace by a compressed-air cylinder, and the slag is carried away from the blast furnace in 7-ton pots hauled by electric locomotives.

**POWER PLANT**

The power plant receives its steam from the reverberatory waste heat boilers through a 10-in. pipe line, under a pressure of 150 lb. The plant supplies: air at 15 lb. for the converters; compressed air at 90 lb. for air hoists, tools, etc., about the plant; electric current for running all the machinery in the plant and tramping system of the plant, besides lighting the town, power for city water works, and supplying the power at the mines.

The power plant includes a Nordberg Duplex cross compound blowing engine with 40x42-in. air cylinder, and 18x36x42-in. steam cylinder.

The electric equipment consists of two units, each of 300-k.w. revolving field, 150-r.p.m. 480-volts, 3-phase 60-cycle generators, direct-connected to Nordberg 16x32x36 in. cross-compound engines. The field current is furnished by duplicate exciter sets; one set consisting of a single-cylinder, vertical high-speed engine, direct connected to a six-pole 30-kw., 125-volt generator, and an induction motor-driven

exciter set, consisting of one 3-phase 60-cycle, 440-volt, 40-h.p. motor connected to a 25-h.p. 900-r.p.m. 125-volt compound generator. A 60-h.p. and a 25-h.p. induction motor, each 1200 r.p.m. drive turbine water pumps in the basement.

There is also an induction-motor generator set, consisting of one 90-h.p. 720 r.p.m., 440-volt, 3-phase motor, direct connected to a 60-h.p. direct-current generator, which supplies current for the railway system, cranes and converters.

With the exception of coke for the blast furnace, the only fuel employed in the plant is oil, for which three steel tanks of a capacity of 350,000 gal. are provided.

**Alaska-Mexican Mining Company**

This company owns a large low-grade gold property on Douglas island, Alaska. It also works under lease the 700-ft. claim owned by the Alaska-United Mining Company. The property is equipped with a mill of 120 stamps. The report is for the year 1906. The capital stock authorized is \$1,000,000; issued, \$900,000, in shares of \$5 par value.

The statement of earnings and expenses for 1906 is as follows, with the averages per ton milled:

	Amount	Per ton
Free gold.....	\$392,773	\$1.6512
Sulphurets .....	328,696	1.3819
Interest .....	2,759	0.0116
<b>Total receipts....</b>	<b>\$724,228</b>	<b>\$3.0447</b>
Mining expenses .....	\$332,645	\$1.3985
Milling expenses.....	62,200	0.2615
Sulphuret treatment exps.	25,705	0.1081
Bullion charges.....	3,229	0.0136
General expenses.....	12,117	0.0542
Construction .....	6,424	0.0269
<b>Total expenses....</b>	<b>\$443,100</b>	<b>\$1.8628</b>
<b>Net earnings.....</b>	<b>\$261,127</b>	<b>\$1.1819</b>

From these net earnings dividends amounting to \$216,000, or 24 per cent., were paid, and \$50,000 charged off for depreciation, leaving a balance of \$15,128. Adding \$111,995 brought forward from previous year, made a total undivided surplus of \$127,123.

The mill statement shows that the average value of the tailings was \$0.1882, which would bring the value of the ore up to \$3.2223 per ton. Of the bullion saved 51.8 per cent. was in free gold from the mill, and 48.2 per cent. in sulphurets saved by concentration and afterward smelted. The quicksilver fed in the mill was 0.2519 oz. per ton crushed; the loss of quicksilver for the year was 18,422 oz., or 30.7 per cent. of the total fed. The distribution of the clean-up in the mill was: Barrel, 6.2 per cent.; vanner, 2.1; tanks and tail-boxes, 11.6; blocks, 2; tables, 75.3; traps, 2.8 per cent. The average duty per stamp per 24 hours was 5.69 tons. The total milled was 237,862 tons.

The running time of the full mill for the year was 348 days, 4 hours, 21 min-

utes, during which time steam was used for power 223 days, 47 minutes, and water for power 125 days, 3 hours, 34 minutes. During the year, 1 lb. of chrome steel in the shoes crushed 2.42 tons of ore, and 1 lb. of iron in the dies (which are made by the Treadwell Foundry) crushed 4.80 tons of ore, at a total cost of \$0.0298 per lb. for the iron and steel consumed in crushing one ton of ore.

The mine statement shows 328,627 tons broken, of which 10,860 tons were rejected as waste; 237,862 tons were sent to mill, the balance remaining in stock. Development work included 182 ft. shaft-sinking; 1760 ft. raises; 441 ft. stations and skip-chutes; 4857 ft. drifts and cross-cuts. The ore reserves in sight Dec. 31 were 856,390 tons, of which 240,129 tons were broken in stopes, and 619,261 tons blocked out. All these reserves were below the 440-ft. level.

There was an average of 17.66 machine drills in use. The average work done per drill shift was 36.04 ft. of holes, and 26.28 tons broken; an average of 0.73 ton broken per foot drilled.

A new double-drum, 48x20-in. Allis-Chalmers hoist has been installed at the main shaft. Following out the general plan of substituting crude oil for coal as fuel for the mines on Douglas island, all the piping for pumping the oil to the storage tank and supplying the boilers has been completely installed and the foundation for the oil tank finished. The feed pumps and the steel oil tank are on the ground.

**Cobalt Silver Queen, Ltd.**

The report of the Cobalt Silver Queen, Ltd., for the year ended March 31, 1907, states that development has been hampered by the non-arrival of machinery. With inadequate facilities 442,141 lb. of ore have been shipped and 109,273 lb. remain on hand. The shaft is down 145 ft., and laterals extend east and west at depths of 75 and 125 ft. respectively. Nearly 900 ft. of underground work has blocked out ore worth about \$700,000 and \$120,000 was paid in dividends.

Recently the Orford Copper Company has entered the market as a purchaser of cobalt ore and the Silver Queen expects to derive revenue from the cobalt content of the ore. The ore is graded A1, No. 1 and No. 2, the last averaging from 250 to 500 oz. silver per ton. The ore continues to maintain its width and value; no estimate of the total extent has been made.

The balance sheet shows receipts from the sale of ore amounting to \$157,915; elsewhere it is stated that returns were received from 387,467 lb. This would indicate a value of \$815 per ton. The cost of construction, machinery, etc., was \$17,859, and of mining, labor and supplies, \$34,191. Cash on hand March 31, 1907, was \$32,601.



## A Cornish Concentrator and a Spray for Rock Drills

BY EDWARD WALKER

In my last article I gave some particulars of the system of Cornish practice and in dealing with the dressing plant I mentioned the Acme slime table made by Holman Brothers, of Camborne. I now give illustrations and particulars of this table. The original concentrators used in Cornwall were, as I have already mentioned, stationary buddles and rag frames. Later revolving tables, designed on similar lines to the German tables, but far cheaper to construct, were adopted for treating the concentrates from the rag frames. Some of these were convex and some concave. The Acme is a combination of the concave and convex tables, the combination effecting economy in construction, space occupied and power used.

### PRINCIPLES OF OPERATION

Two sloping wooden surfaces *A* and *B* are arranged concentrically and fixed to the central vertical revolving shaft *C*. The pulp is fed upon the outside surface *A* by the launder extending from *D* to *E* and *D* to *F*. The feeding of the convex surface *B* is effected by means of the greater part *G*<sub>1</sub> to *G*<sub>2</sub> of the launder *G*. From this it runs down the stationary slope to the greater part of the convex revolving surface from *T* to *H*. On the remainder of the concave surface from *H* to *J* pure water flows down from the short part of the launder *G*. At *K* and *J* there are clearing sprays on the outer and inner surface respectively.

The pulp is first fed to the outer launder and is distributed equally around the surface from *E* to *D* and *F*. The slope is so arranged that the heavier particles adhere to the surface and only the light ones pass over into the circular launder *L*. As the table slowly revolves, in the direction of the hands of the clock, the concentrates adhering to the surface come into the zone *F* to *K* where they are washed by the water running down from the launder *F* to *E*, and are brushed by the brushes *M* and *N*. This water carries down some of the gangue which has adhered to the tables and deposits it in the launder *O*. In some cases the water will also carry down some of the tin oxide as well as the lighter particles, so that it is often profitable to return the contents of this part of the launder for retreatment.

The concentrates still adhering to the surface are removed by the spray *K* into the launder *P* and they are then elevated by a wheel through a pipe to the central receptacle *Q*. From this they are distributed through radial arms to the launder *G* out of which they are distributed down the stationary slope to the inner convex table from *J* around *H*.

On arriving at *H* the particles which adhere to the surface are washed by water from *H* to *J* fed from the launder *G*<sub>2</sub> to *G*<sub>1</sub> and are finally removed by the spray *J* into the launder *S*. The middlings obtained in the launder *R* may be re-treated if desired. The final concentrates, removed at *J*, are in marketable form.

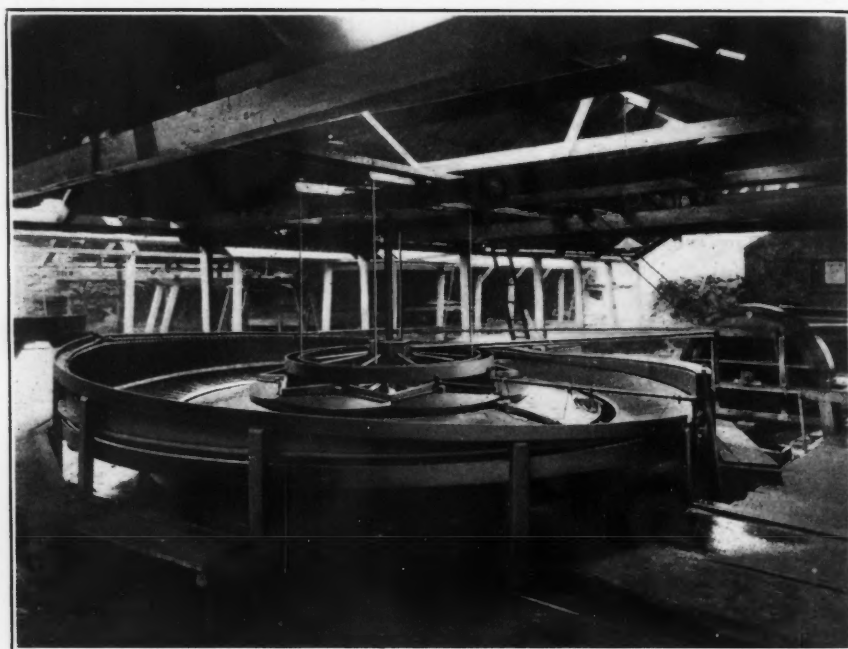
The outside diameter of the table is 18 feet, and about 0.5 h.p. is required to operate it this includes revolving the table and elevating the pulp. The table will treat about eight tons of slimes in 24 hours. The slimes will pass a 50-mesh screen.

At the tin dressing works it is not considered economical to treat the slimes direct on these tables, but it is preferred to concentrate preliminarily on rag frames. The slimes contain on an average less than five pounds of tin oxide per ton, and

The objections may be urged that the slope of the surfaces cannot be varied to suit circumstances, and that the path of the particles down the surfaces is not long enough. The first difficulty is common to all circular tables, and the latter is counteracted by the provision of a gentle slope and the treatment on the two successive surfaces. The work can be varied also by altering the amount and flow of the water and the speed of revolution. Outside critics of Cornish practice are apt to sneer at the Acme table, but considering its comparatively low cost it is as efficient as any slime table. It is largely used in Cornwall with satisfactory results.

### ROPE INSPECTION AND SAFETY DEVICES

I made inquiries as to whether any safety appliances are used for preventing accidents in case of the breakage of haul-



THE ACME SLIME TABLE

the rag frames are used to produce a pulp running 8 or 9 per cent. tin oxide. These concentrates are fed to the Acme table, and the product of the table is stated to be "a marketable product" and I suppose they will run to about 60 per cent. metallic tin. At some of the works the concentrates from the rag frames are put directly on the Acme table and at others they are first calcined. Sometimes the concentrates are first put on the Acme table, then calcined and afterward returned to the table.

It will be seen that the Acme table does not embody any new principle in dressing. It is really only a modification of the ordinary round, revolving table, giving two treatments in one machine. In many cases no middlings are obtained. According to circumstances, the divisions between the launders *L*, *O* and *P* may be moved up or down; similarly with the divisions between the launders *T*, *R* and *S*.

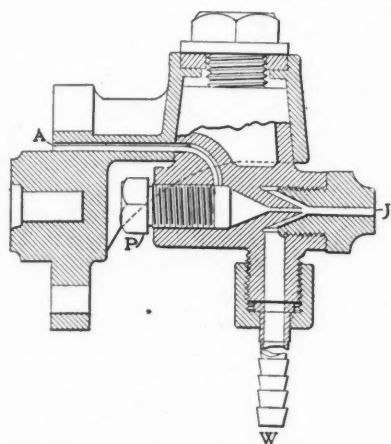
ing ropes in Cornish mines. I find that the Cornish miner does not pin his faith to any of these automatic appliances, but trusts to the daily inspection of the rope itself. He is skeptical of the value of an appliance which rarely comes into action. His faith in these appliances has also been rudely shaken by failures of experimental tests of more than one of them.

### SPRAY FOR ROCK DRILLS

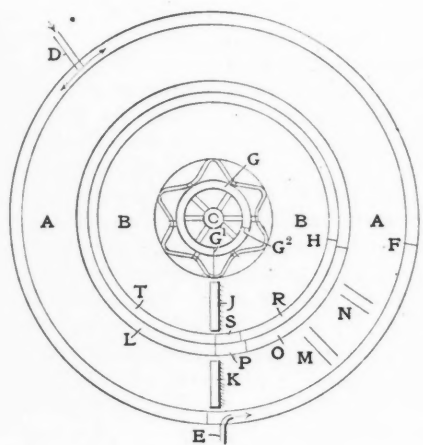
The spray adopted by the Holmans on their rock drills is shown in the accompanying illustrations. The apparatus is mounted by means of a swivel joint upon the top of the cylinder of the drill. The air inlet is at *A*, and the air passing up through the conical surfaces draws up the water from the inlet *W*, and forces the spray through the orifice *J*. The air inlet can be opened or closed by simply turning the apparatus round its swivel mount, and the amount of the spray is regulated by



opening or closing the passageway between the conical surfaces by means of the screw *P*. The apparatus does not cause a fog or cloud, but produces a coarse spray. By altering the inclination of the apparatus and by regulating the air



SPRAY ATTACHMENT FOR ROCK DRILLS



SURFACE PLAN AND SECTION, ACME SLIME TABLE

inlet the spray can be directed upon the hole.

Dormoy's apparatus for the application of plumbiferous enamels to cast-iron articles consists of a chest with glass walls which can be raised to give access to the interior, and a bottom constructed of small rollers in such a manner that the red-hot casting placed on them is held firmly even when the bottom is tilted (by an external lever). The powdered enamel is dusted over the casting by a sieve which is shaken by electric means, and the excess is returned automatically.

### Determination of Sulphur in Roasted Zinc Blende\*

By V. HASSREIDTER

It is generally understood that the sulphur, which determines the quality of a roasted zinc blende is not the total amount present, but this total, minus the sulphur combined with lead, lime, magnesia and barium. This combined sulphur is not available for acid making; but, on the other hand, it cannot be a ground for reasonable complaint on the part of the consumers.

The agreement is often made between producer and consumer, that the "objectionable" sulphur; i.e., the sulphur that can still be expelled, is to be figured as the difference between the total sulphur *a*, and the sulphur *b* combined with the elements named, figured as sulphate. Here the tacit assumption is made that these elements are completely sulphatized in the roast, and cannot be further desulphurized. On this understanding it would follow that the differences  $(a - b) = c$  represents the sulphur present as zinc sulphate *d*, and sulphide *e*, so that  $(a - b) = (d + e) = c$ .

Now the question arises whether it is preferable to determine *c* as the difference  $(a - b)$  or as the sum  $(d + e)$ . Against the former method a number of objections suggest themselves. In the first place, estimations by difference are always liable to give inaccurate results, especially if a number of analyses are involved, and the difference is small as compared with the total material analyzed, as in this case, rarely more than 1 per cent.

There is also a good deal of uncertainty as to the degree of sulphatization of the lead and magnesia in the roast. For example, the percentage of lead sulphate may be considerably depressed by the presence of quartz, which leads to the formation of lead silicate. On the other hand it is very doubtful whether magnesium sulphate is stable at the temperature of the roasters.

One method which has been used, in the endeavor to avoid the sources of error inherent in the estimation by difference, is actually to extract the sulphur present in the form of sulphates. The solvent may be either ammonium acetate in acetic-acid solution, or hydrochloric acid in exclusion of air, to prevent oxidation of the hydrogen sulphide liberated. But here again there are difficulties; while it is safe to assume that gypsum is soluble in ammonium acetate, little is known with regard to the solubility of strongly ignited anhydrous calcium sulphate. On the other hand, if hydrochloric acid is

used, the lead sulphate dissolved by the hot hydrochloric acid is re-precipitated on subsequently diluting with water, and thus escapes determination. In either case the zinc sulphate goes into solution along with the other sulphates and must therefore be determined in a separate sample by extraction with water.

#### METHOD OF ESTIMATION

Evidently then the estimation of "objectionable" sulphur by difference presents serious difficulties. It is more satisfactory to determine directly the sulphur combined with zinc.

The following method serves to determine the sulphur present as zinc sulphate. A 25-grams sample of the roasted ore is extracted with warm water in a ¼-liter flask. The solution is allowed to cool, made up to a measured volume, filtered, and the zinc, together with any cadmium dissolved, is determined in 200 c.c. by Schaffner's method. Every 65.4 parts of zinc present corresponds to 32.06 parts of sulphur as zinc sulphate.

For sulphide sulphur the following method may be used: Two or three grams of the roasted ore is dissolved by boiling in a flask provided with reflux condenser together with hydrochloric acid and zinc chloride<sup>1</sup>, 30 grams chemically pure zinc dissolved in 1 liter of hydrochloric acid of sp.g. 1.19. The hydrogen sulphide which is disengaged quantitatively is passed through a ten-bulb tube containing 30 to 40 c.c. of bromine-hydrochloric-acid mixture, by which it is oxidized to sulphuric acid. This reagent is preferable to hydrogen peroxide, as it furnishes a means of observing the progress of the reaction, which is accompanied by a gradual discoloration of the mixture. It is therefore always possible to ascertain whether the bromine is present in excess. After expelling the excess of bromine, and approximately neutralizing the hydrochloric acid with sodium carbonate, the sulphuric acid is precipitated with barium chloride.

In this way it is possible to estimate, rapidly and accurately, the "objectionable" sulphur in the roasted blende; and at the same time some valuable indications are obtained as to the course of the roasting operation. Thus a high percentage of zinc sulphate would show that the temperature was not high enough at the last shelf, or that too much air enters the furnace. A product running high in sulphide would indicate a local fusion of sulphide, which afterward tenaciously resists desulphurization; or that the material was not sufficiently stirred; or, lastly, that there was a deficiency of air in the furnace.

\*Abstract from *Zeit. f. angew. Chem.* 1906, No. 4, p. 137.

<sup>1</sup>Hassreidter and Van Zuylen, *Bull. Soc. chim. Belgique* (18), 11.12; *Zeit. f. angew. Chem.* (18), 1777, 1905.

# The Mineral Industry of New South Wales

The Output for the Year 1906 Shows an Increase in Value of £1,083,000 as Compared with the Production of 1905

B Y F . S . M A N C E \*

The under secretary for mines, E. F. Pittman, has furnished a preliminary statement of the mineral production of this State for the year 1906. The value of the mineral output for the year 1906 is £8,169,624; this is an increase on that for the year 1905, and which previously stood as a record, of no less than £1,083,731. In the course of the years 1905 and 1906 the mineral industry has thus shown an expansion of £1,777,860. The aggregate value of all the minerals won in this State to the end of 1906 is £172,560,382. The total number of persons employed in and about the mines during the year is estimated at 42,546, being 3614 in excess of the number employed in 1905.

## GOLD

The gold won in New South Wales to the end of 1906 amounts to 12,786,638 oz. fine, valued at £54,314,152. The yield recorded for 1906 is 253,987 oz. fine, valued at £1,078,866; this is 20,280 oz. fine, and £86,147 in value less than in 1905. These figures do not, however, accurately reflect the position of the industry, as gold to the further value of £160,118 was purchased from the mines within this State, but was not lodged at the mint, and could not be included in the official figures for 1906. This gold has therefore to be carried forward to the year 1907. It is thus gratifying to be able to state that the gold-mining industry showed no actual retrogression, and that the results bear favorable comparison with those of previous years. The yield was contributed by the established mines, no new finds of importance having been recorded during the year. The Cobar district may be said to be the chief producing center, and the value of the output for the year amounted to £224,052. The Mount Boppy mine still maintains the honor of contributing by far the largest yield of any gold mine in the State.

The value of the yields from the other more important divisions is as follows: Wyalong, £83,921; Araluen, £57,551; Hillgrove, £52,394; Wellington, £43,987; Stuart Town, £35,445; Adelong, £34,711; Forbes, £27,067; Peak Hill, £26,709; Orange, £21,557.

## DREDGING

The value of the yield obtained by the gold and tin dredges during the year was £261,762, an increase of £74,768 over that of the previous year. Since 1900 the

dredges have furnished an output valued at £952,474.

The Araluen division is still the chief center of gold-dredging operations, but the yield secured by the fourteen plants at work there during the year is below that of the previous year, the value of the production being £54,478. The deficiency of this division has been more than made good by the other plants, and the total gold yield which amounts to 33,218 oz. fine, valued at £141,101, exceeds that for the previous year by 1180 oz. fine, and £5011 in value.

The dredging for tin has given very gratifying results, the quantity of tin won totalling 1032 tons, valued at £120,661. There were 27 dredges in operation in the Inverell-Tingha divisions during the year, and they secured 943 tons of tin ore valued at £110,582. The dredging for tin is also to be started on a large scale in the Emmaville division. The treatment of the stanniferous gravels by the dredges has proved so successful, that a constant and remunerative production may confidently be looked for. There were 68 dredging plants in operation in the State at the close of the year, valued at £315,537, and some four or five additional plants were in course of erection.

## SILVER, LEAD AND ZINC

The value of the exports from the silver-lead mines is as follows: Silver, silver-lead, concentrates ores, etc., £2,862,973; lead (pig), £1084; zinc (spelter and concentrates), £292,806, a total value of £3,156,863. This exceeds the value of the output for 1905 by £438,999, and since the year 1903 the value of the output has increased by £1,530,287. The Broken Hill field stands out as the chief center of mining activity in this State, and the average number of men employed there during 1906 was 8457.

For a portion of the year under review operations were restricted by underground fires, and "creeps" at several of the mines, and the total quantity of ore raised, and concentrates produced, is accordingly less than in the preceding year. The companies, however, secured the full benefit of the increased prices of silver, lead and spelter. Although progress in the matter of the profitable treatment of the accumulated heaps of tailings has not been as rapid as anticipated, still good headway has been made, and from now on, operations may be expected to be conducted on an extensive scale.

The Yerranderie mines furnished an

output somewhat below that of the previous year, but a substantial advance is shown in the value of the yield. The Cobar field has for the first time supplied lead-ore in quantity, the output coming principally from the C. S. A. mine. The Conrad Stannite Mines Ltd., at Howell, has carried on active work, and a large tonnage of ore was dealt with. The total value of the production of the silver-lead mines to the end of 1906 is £44,127,033. The number of men employed in this branch of the industry during the year was 9414.

## COPPER

The value of the output of copper from the mines of New South Wales for the year 1906 is £789,527, an increase of £262,124 on that of the previous year. This result is all the more gratifying when it is considered that the returns for the year 1905 previously constituted a record, and not only is the value of the output for 1906 much the largest but the production also reached high-water mark. The Cobar field furnished an output valued at £516,320, representing an advance of £71,462 on that of 1905. The production, however, from this field does not come up to that of the preceding year, and the result shown is due to the enhanced value of the metal. The great Cobar mine was acquired during the year by a new company, and operations on a larger scale are foreshadowed. The output of the Queen Bee mine has been considerably augmented.

The mines held by the Nymagee Copper Mining Syndicate and the Crowl Creek Company were also actively worked. The Girilambone and Mount Hope mines were reopened during the year, and copper to the value of £11,966 and £14,672, respectively, was obtained.

Great interest was aroused during the year by the discovery made in the Budgetry mine, situated about three miles from Hermidale, and 108 applications for mineral leases were made for areas in this district. From the Lloyd Copper mine, Burruga, an increased output is recorded, and the indications are favorable to the production being well sustained.

Among other copper mines which came prominently into notice during the year, mention may be made of the Cadia mine, in the Orange district, and the Cangai mine, in the Grafton district. Much attention is being devoted to prospecting, and in further developing the numerous copper lodes throughout the State, and

\*Mines Department, Sydney, New South Wales.



altogether the outlook is a very encouraging one. The value of the copper produced in the State to the end of 1906 is £8,472,629. In this branch of the industry 3047 men were employed during 1906, or 876 more than in the previous year.

TIN

The tin and tin-ore recorded as having been produced during the year is valued at £255,744, and is in excess of that of the previous year by £29,634. This output exceeds that of any other year since 1888. The satisfactory returns secured by the dredges are chiefly responsible for the gratifying output recorded, and the industry generally has been greatly helped by the high price ruling for the metal. The dredges as already stated won 1032 tons of tin ore, valued at £120,661, against 532 tons valued at £50,904 in 1905.

The bulk of the yield was drawn from the Tingha-Inverell divisions and the production from these centers for the year

the Deepwater, Wilson's Downfall and Glen Innes divisions. The success which has attended the operations of the dredges goes to show that our tinfields are capable of maintaining a large output of ore for some years ahead.

The value of the output from the tinfields of this State to the end of 1906 is £7,744,509, and the number of men employed in this branch of the industry during 1906 was 3795, an increase of 911, compared with the previous year.

COAL, COKE AND SHALE

The coal raised in New South Wales during 1906 was 7,626,362 tons, valued at £2,337,227, and exceeds that of the previous year by 994,224 tons and £333,766 in value. These figures constitute a record and in the course of the last two years the output has shown an expansion of 1,606,553 tons.

The output from the respective districts is as follows: Northern, 5,336,188 tons,

£28,470, which is an increase of £7223 on that of the previous year. The opening up of further supplies of shale is receiving a marked degree of attention, and a largely augmented production should result.

OTHER MINERALS

The value of the other minerals produced during the year is as follows: Alunite, £4637; antimony, £52,645; bismuth, £5700; diamonds, £2120; iron (from scrap), £112,848; lime, £15,573; limestone flux, £7463; portland cement, £128,487; marble, £1518; molybdenite, £4798; opal, £56,500; platinum, £623; scheelite, £7647; wolfram, £9057; sundry minerals, £2704.

The Russian Platinum Industry \*

In consequence of the troubles in Russia the exportation of platinum to European markets has been considerably reduced so that at present there is a shortage in the supply. This is felt more seriously because during the last two or three decades 95 per cent. of the world's supply of platinum was drawn from the Ural deposits. The price of platinum, which is now 500 roubles per kg. continues to advance.

Concerning the enormous importance which the Ural deposits have in the world's market it is well to bear in mind that in the Ural the platinum industry has been developed since 1825, when the first discovery of little pieces of platinum was made on the estate of Count Shuwalow, and also on neighboring estates on the river Issa and Wissa, and on the government properties of the Goroblagodatsk district. At that time the occurrence was considered of no importance so that regular prospecting for the metal did not begin until 1869.

Since 1869 the production of platinum has been as follows: 1869, 140 pood; 1874, 120; 1882, 250; 1886, 270; 1893, 310; 1895, 253; 1896, 301; 1897, 344; and in 1898, 368 pood. During the years 1899 to 1904 the average yearly output was 359 pood.

The price of platinum has varied, sometimes in sudden fluctuations. In 1869 the price per pood was 1600 roubles; 1890, 12,000; 1891, 6000; 1894, 13,000; and in 1904 16,000, 19,000 roubles.

The Companhia de Mozambique (main office at Lisbon, Portugal) reports the discovery of a rich gold deposit in schist formation in the Revue valley, very near Winifred, in Manica. The formation can be traced for nearly a mile, but the width has not been proved. The presence of ancient workings leads to the belief that the true source of ancient production has been discovered, free gold untraveled, mostly nugget, being found.

\*Translated from the Russian "Gornui Journal" (Mining Journal), St. Petersburg, January, 1907, by N. Korff, Irwin, Penn.

THE MINERAL PRODUCTION OF NEW SOUTH WALES IN 1905 AND 1906

Minerals.	1905.		1906.		Increase in Value.	Decrease in Value.
	Quantity.	Value.	Quantity.	Value.		
<b>Metallic:</b>		£		£	£	£
Gold, oz. fine.....	274,267	1,165,013	253,987	1,078,866	.....	86,147
Silver, oz. fine.....	417,529	52,196	284,994	36,431	.....	15,765
Silver-lead and ore, ton....	441,447	2,441,856	371,939	2,826,542	384,686	.....
Lead-pig, etc., ton.....	210	2,657	59	1,084	.....	1,573
Zinc spelter & conc'trates, ton	103,532	221,155	103,666	292,806	71,651	.....
Tin ingots and ore, ton.....	1,957	226,110	1,671	255,744	29,634	.....
Copper ingots and ore, ton...	8,592	527,463	9,755	789,527	262,124	.....
Antimony and ore, ton.....	388	5,221	2,451	52,645	47,424	.....
Bismuth, ton.....	55	20,763	25	5,700	.....	15,063
Wolfram, ton.....	86	7,361	132	9,057	1,696	.....
Scheelite, ton.....	138	10,122	109	7,647	.....	2,475
Molybdenite, ton.....	19	2,507	33	4,798	2,291	.....
Platinum, oz.....	398	825	205	623	.....	202
Iron (made from scrap).....	.....	85,693	.....	112,848	27,155	.....
<b>Non-metallic:</b>						
Coal, ton.....	6,632,138	2,003,461	7,626,362	2,337,227	333,766	.....
Coke, ton.....	162,961	106,306	186,090	110,607	10,301	.....
Kerosene shale, ton.....	38,226	21,247	32,446	28,470	7,223	.....
Alunite, ton.....	2,702	6,750	1,856	4,637	.....	2,113
Lime, ton.....	18,018	15,019	21,126	15,573	554	.....
Limestone flux, ton.....	14,941	9,519	12,788	7,463	.....	2,056
Portland cement.....	.....	88,100	.....	128,487	40,387	.....
Ironstone flux, ton.....	6,801	4,525	935	723	.....	3,802
Marble.....	.....	2,420	.....	1,518	.....	902
Diamonds, carat.....	6,354	3,745	2,827	2,120	.....	1,625
Opal, carat.....	.....	59,000	.....	56,500	.....	2,500
Sundry minerals.....	.....	2,919	.....	1,981	.....	938
<b>Total, £.....</b>	.....	<b>7,085,893</b>	.....	<b>8,169,624</b>	<b>1,083,731</b>	<b>Net Increase</b>

has been estimated at 1481 tons of ore valued at £169,871. Of this quantity the dredges won 943 tons, valued at £110,582, there being 27 plants in operation. The balance of the yield from these divisions represents the result of the efforts of a large number of men, who owing to the sustained price of the metal were able to make a living by mostly reworking ground which had been previously treated. In the Emmaville division several of the areas which in the past have supported numerous parties of working miners were acquired during the year for dredging purposes.

The withdrawal of the men from these areas pending the completion of arrangements for commencing dredging is responsible for a temporary decrease in the output of this division. Satisfactory increases are recorded in the output from

valued at £1,718,178; Southern, 1,783,395 tons, valued at £494,871; and Western, 506,779 tons, valued at £124,178.

The coal exported during the year amounted to 4,901,760 tons, valued at £2,076,223. This is much the largest quantity ever despatched from the State, and shows an increase of 1,183,707 tons and £592,245 in value on that for the previous year. The number of persons engaged in the mining for coal during the year was 14,929—an increase of 910 compared with 1905.

The value of the coke manufactured during 1906 is £110,607, being an increase of £10,301 on that of the previous year, the industry having benefited largely by the greater activity in metalliferous mining.

The kerosene shale raised during the year amounted to 32,446 tons, valued at



# Vacuum-flotation Process for Concentration

The Elmore Process Employs Reduced Pressure to Increase by Expansion the Lifting Power of Gas Bubbles in a Liquid Medium

BY ALEXANDER STANLEY ELMORE\*

The vacuum process for the concentration of ores, the invention of F. E. Elmore, after exhaustive test and experiment, is about to be installed on an extensive scale, many mines having given orders for large plants. The process is based primarily upon the fact that, in a flowing pulp of crushed ore and water, oil has a selective action for the metallic mineral particles as distinct from the rocky particles or gangue. This selective action is materially increased in some cases by the presence of an acid; and secondly, upon the fact that the air or gases dissolved in water are liberated, partially or entirely, upon subjecting the same to a pressure less than that of the surrounding atmosphere. These liberated gases may be augmented by the generation of gases in the pulp or by introduction from an external source. The gases attach themselves to the greased mineral particles, and being largely increased in volume as a result of the partial vacuum applied, cause the greased particles with their attendant bubbles of air or gas to float to the surface of the liquid.

## METHOD OF OPERATION

The simplicity of the apparatus for carrying out this process is shown in the accompanying sketch. The pulp from the crushing mill flows continuously into the mixer *A*, into which also is introduced small quantities of oil and, if required, of acid also, at the point *B*. The required agitation is brought about by the rotation of the beaters *C*. The agitated pulp flows continuously from the mixer into the funnel *D*. The concentrates discharge-pipe *E*, and the tailings discharge-pipe *F* are both sealed with water in the tanks *G* and *H*, respectively.

The upper end of the feed-pipe *D* enters the center of the conical separating vessel *I*. Upon the application of a vacuum through pipe *J*, the pulp from the mixer is caused to ascend the feed-pipe and fill the conical chamber *I*. The rate of flow of the pulp down the pipe *F* being slightly less than the in-flow up the feed-pipe *D*, a small amount of the liquid overflows the lip of the annular space *K*, this quantity of liquid being sufficient to carry the concentrates down the pipe *E* into the tank *G*. The rakes *L* are caused to rotate slowly by means of the worm and wheel *M*, the angle of the rake blades being such as to cause the solid matter in the pulp to travel from the center to the periphery of the conical chamber, whence the tailings

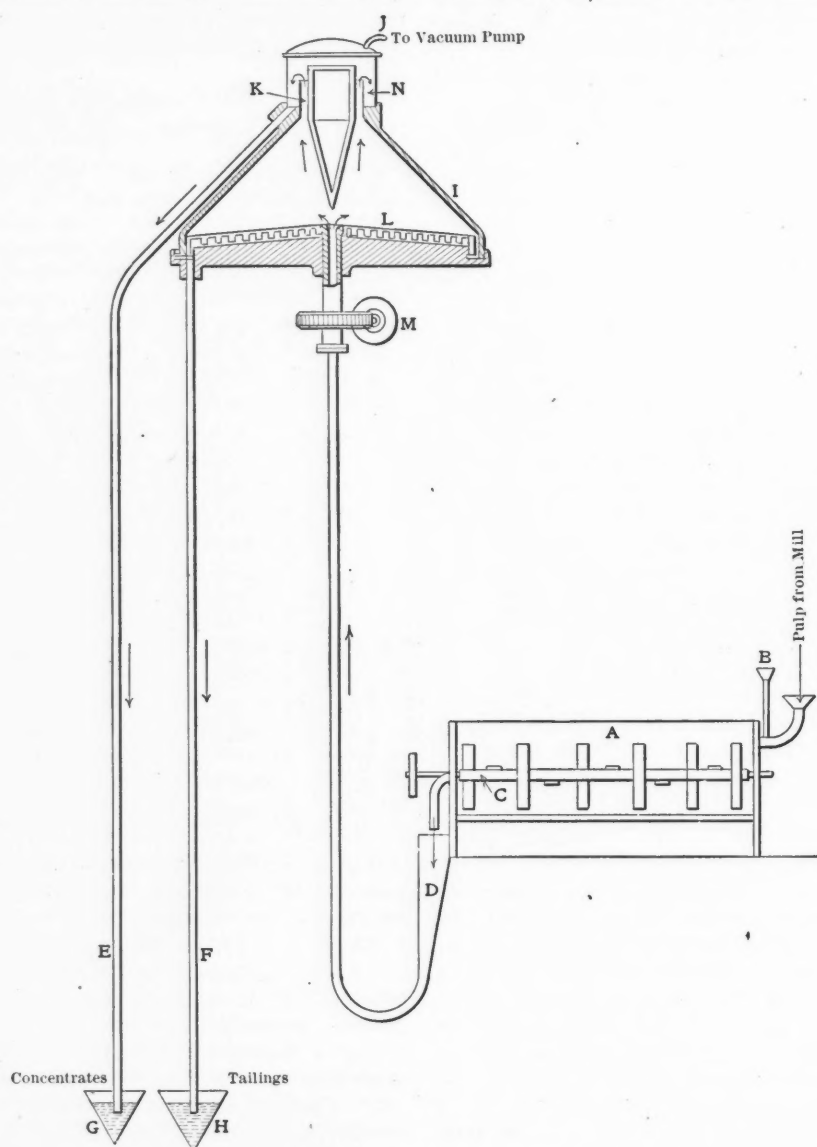
continuously discharge down the pipe *F*. The feed-pipe *D* is usually about 25 to 30 ft. long, the tailings and concentrates pipes *E* and *F* being a few feet longer, so that in effect the feed-pipe and tailings pipe form the long and the short leg of a siphon; thus the power required to elevate the pulp into the conical chamber is supplied by the falling column of pulp in

the concentrates over the lip of the annular ring may be observed.

## CONSTRUCTION AND CAPACITY

The apparatus is constructed of metal with the exception of the glass windows, the mixer being a simple wooden trough with wooden beaters.

The power required for a 5-ft. unit of



ELMORE VACUUM CONCENTRATOR

the tailings pipe. So long as a continuous flow of pulp is supplied to the mixer, a continuous and entirely automatic discharge of tailings and concentrates is secured. The annular space *K* is surrounded by a thick glass cylinder, or by a metal cylinder with one or more thick glass windows, through which the discharge of

plant does not exceed 2 to 2½ h.p., including that required for driving the vacuum pump, mixer, and separator. The apparatus is usually constructed in standard units the conical separating chamber of which is 5 ft. in diameter. Including the mixer, conical separating chamber, vacuum pump, all piping, etc., complete, it

\*Chairman, Ore Concentration Company, Ltd., 4 Broad Street place, London, E. C.

costs f.o.b., London, approximately £350.

The capacity of the apparatus naturally varies with the kind of ore to be treated, the fineness to which the ore has to be ground, and other conditions, but a 5-ft. machine will ordinarily treat from 35 to 45 tons of crude ore per 24 hours.

The cost of the plant is low for so large a capacity. No expensive foundations are required, because the beaters in the mixing cylinder only make 30 to 40 r.p.m., and the rakes in the conical separating chamber only one or two revolutions per minute. Vibration is, therefore, entirely absent. No sizing of the pulp is required, and the operation of the plant is entirely automatic.

The quantity of oil and acid required is not the same for all ores, but usually amounts to not more than a few pounds, say, from 3 to 10 lb. per ton of ore treated.

are quite impossible of concentration by usual methods. For instance, chalcopyrite is readily separated from magnetite and spathic iron gangues; galena and zinc blende, from a gangue of baryta; and copper sulphides, from oxide of tin, leaving the tin in the tailings to be subsequently separated by the usual methods. Zinc copper and lead minerals may be separated from garnets and similar heavy gangues; and such minerals as antimony or molybdenum sulphides which because of their very friable nature suffer prohibitive losses in water concentration, are found amenable to treatment by the Elmore vacuum process. Cinnabar, and iron pyrites carrying gold, are readily concentrated, yielding high-grade products with practically clean tailings. The native metals, gold, silver and copper, when in a fine state of division, are found to concentrate readily, and with very small loss.

plant has been running for five months the ore treated, contains 0.802 per cent. copper; the tailings, 0.123 per cent. and the concentrates, 23.86 per cent.

The various patents covering the process are held by the Ore Concentration Company (1905) Ltd., with offices at 4, Broad Street Place, London, E. C. The company began work about 15 months ago with £50,000 cash working capital.

### Wallaroo & Moonta Mining and Smelting Company, Ltd.

The report of the Wallaroo & Moonta Mining and Smelting Company, Ltd., of South Australia, for the year ended Dec. 31, 1906, shows a gross profit for the year of £160,127, from which £27,978 was written off, leaving a net profit of £132,149. Out of this £80,000 (10s. per

EXTRACTION OF METALS AND MINERALS BY THE ELMORE VACUUM PROCESS.

DESCRIPTION OF ORE.	METALS EXTRACTED.	GOLD AND SILVER, OZ. PER TON. OTHER METALS, PER CENT.			PER CENT. EXTRACTION.	DESCRIPTION OF ORE.	METALS EXTRACTED.	GOLD AND SILVER, OZ. PER TON. OTHER METALS, PER CENT.			PER CENT. EXTRACTION.
		ORE.	TAILINGS.	CONCENTRATES.				ORE.	TAILINGS.	CONCENTRATES.	
Graphite ore.....	Graphite.	56.7	19.3	80.3	86.6	Chalcopyrite quartz, feldspathic gangue.....	Copper.	5.38	0.20	24.25	97.0
Australian gold ore.....	Gold.	0.22	0.035	1.04	86.6	Spathic iron with chalcopyrite..	Copper.	0.99	0.07	14.70	93.4
Galena with quartz gangue.....	Silver.	13.20	1.56	57.34	90.6	Amber-blende, quartz gangue....	Zinc.	23.9	2.25	50.70	95.3
Argentite and discolored quartz } gangue.....	Lead.	6.30	0.66	22.50	91.0	Blende, shale gangue.....	Zinc.	5.5	0.9	44.50	85.1
Low-grade "Banket" from South Africa.....	Silver.	19.32	0.727	77.45	96.78	Spathic iron ore with blende....	Zinc.	5.92	1.27	43.90	81.0
Rand "Banket," sulphide of iron quartz gangue.....	Gold.	0.03	0.005	0.05	85.50	Blende and barytes.....	Zinc.	18.2	0.40	64.50	98.9
Galena and pyrites, barytes } gangue.....	Gold.	0.150	0.015	2.80	90.7	Blende, garnet and rhodonite gangue.....	Zinc.	19.9	1.37	44.30	96.3
Cupreous barytes ore.....	Gold.	0.305	0.04	8.00	87.4	Broken Hill, tailings.....	Zinc.	16.9	2.85	48.45	97.7
Chalcopyrite, feldspathic gangue.....	Lead.	3.35	0.28	14.60	93.3	Broken Hill, tailings.....	Zinc.	30.00	2.40	48.40	96.7
Cupreous barytes ore.....	Silver.	31.60	3.00	139.24	92.5	Rhodonite and garnet gangue....	Gold.	.....	0.06	26.20	95.2
Chalcopyrite, granitic gangue....	Copper.	3.66	0.25	22.56	94.0	Stibnite, which floats badly.....	Molybd'm.	3.40	0.25	40.80	93.2
Chalcopyrite, quartz, feldspathic gangue.....	Copper.	1.97	0.188	26.04	91.1	Pyrites and quartz gangue.....	Lead.	7.95	0.35	38.50	96.4
Chalcopyrite, limestone gangue..	Copper.	3.48	0.05	21.99	98.8	Molybdenite, feldspar gangue....	Gold.	1.26	0.09	10.51	93.7
Chalcopyrite, basic gangue with magnetite and garnet.....	Copper.	1.23	0.07	6.92	95.2	Galena, pyrites, quartz.....	Antim'y.	6.33	0.22	54.20	96.9
Copper glance, chalcopyrite, quartz gangue.....	Copper.	0.77	0.11	13.02	86.5	Pyrites and stibnite, feldspar....	Gold.	1.20	0.08	19.10	93.8
Spathic iron with chalcopyrite... Bornite and chalcopyrite.....	Copper.	1.05	0.17	21.88	88.5	Stibnite, gold quartz gangue....	Molybd'm.	2.30	0.06	51.57	98.1
Spathic iron and chalcopyrite.... Chalcopyrite with magnetite schistose gangue.....	Copper.	0.92	0.10	26.00	90.2	Molybdenite, gangue containing magnetite and much garnet....	Silver.	13.35	1.36	126.42	90.0
	Copper.	1.36	0.14	18.20	90.4	Galena, quartz gangue.....	Lead.	5.6	1.00	55.70	90.0
	Copper.	2.56	0.11	17.60	96.2	Gold quartz with schist, sandstone, some chalcopyrite and tetrahedrite.....	Gold.	0.38	0.04	4.86	90.0
	Copper.	1.53	0.16	17.47	93.1	Rand "Banket".....	Gold.	0.20	0.03	5.29	85.5
	Copper.	2.56	0.11	17.60	96.3	Galena, barytes gangue.....	Silver.	13.35	1.37	138.22	90.7
	Copper.	2.00	0.06	14.60	97.4		Lead.	5.60	1.00	60.90	83.5

A large variety of oils and similar substances has been tried and found suitable. Californian crude oil, Texas crude oil, Texas residuum, fuel oil, Russian crude, Borneo, Sumatra and similar cheap oils, tars, blast-furnace oils, olive-oil residues, oleic acid, kerosene, a variety of light oils and fish oils.

#### APPLICATION OF THE PROCESS

A large number of trials, both on a small scale and with a full-sized apparatus, have been carried out on a great variety of ores, and although it is not claimed that the process and plant are applicable to all ores the accompanying table shows that its field of application is very wide.

The process has been applied with success to the concentration of ores which because of their peculiar characteristics

At present the company has either supplied or is constructing a total of about 70 machines.

The results obtained in regular work with an installation at a mine in Cornwall where low-grade waste ores from the mine dump are being treated are as follows: Pulp, 0.412 per cent.; tailings, 0.128 per cent.; concentrates, 8.176 per cent. copper.

At one of the copper mines in Scandinavia, a plant has been running for several months. An order for 18 additional machines has been received from the same plant.

The ore treated contained 1.81 per cent. copper; the tailings after concentration 0.037 per cent. and the concentrates 6.83 per cent.

At another mine in Sweden where a

share) was paid in dividends. The balance of assets over liabilities was £201,396.

There were 203,167 tons of ore produced from the mines and these concentrated to 53,517 tons, averaging 10.2 per cent. refined copper.

The production of refined copper was 7561 tons, including 875 tons electrolytic; gold, 2326 fine oz.; silver, 8250 oz. (996 fine); copper sulphate, 327 tons; sulphuric acid, 5126 tons. The metallic production resulted from the treatment of 55,882 tons of concentrate, matte and precipitate.

The cost of producing a ton of copper at both mines was £72 11s., consisting of; mining, £54 10s. 9d.; smelting, £16 15s. 10d.; miscellaneous charges, £1 4s. 5d. The profit per ton was £17 7s. 2d.

# Mining Exhibits at the Jamestown Exposition

Mineral Products of the South Are Especially Prominent. Geological Survey Will Conduct Fuel Tests and Experiments in Ore Concentration

BY H. CONNOR BROWN\*

Prominent among the larger buildings on the grounds of the Jamestown Ter-Centennial Exposition, which was opened by President Roosevelt on April 26 at Hampton Roads, Va., is that devoted to the Department of Mines and Metallurgy. The building consists of two wings and a connecting pavilion. In one of the wings is housed the main exhibit of the Department of Mines and Metallurgy, consisting of an elaborate and comprehensive display of minerals and ores from several States and special and collective exhibits made by private producers. The other wing is devoted exclusively to a display of the mineral wealth of Virginia.

## EXHIBITS OF THE UNITED STATES GEOLOGICAL SURVEY

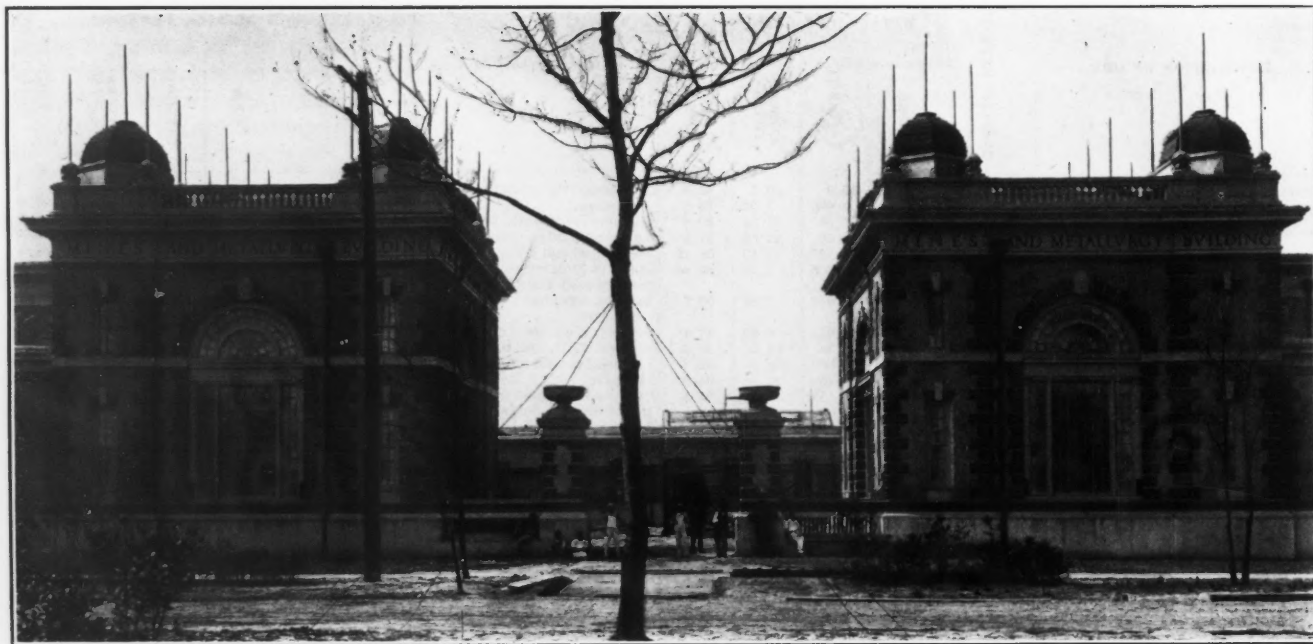
Although not included technically in the exhibits of the Department of Mines and Metallurgy, the exhibit of the United States Geological Survey installed in the display of the Department of the Interior in one of the Government buildings will be of great value to those interested in this country's mining interests, and the part the Government plays in developing them. It is in three parts, illustrating the activities of the three great branches of survey work, the geologic, the topographic, and the hydrographic.

Rappahannock river and the battlefield of the Wilderness. A model of this furnace with its primitive blowing apparatus is among the curios of the exhibit.

Virginia also furnishes exhibits of zinc, of copper, and of gold. The gold ores of Virginia ceased to be interesting with the development of Western fields incomparably richer, but the modern methods of extraction recently developed give to the low-grade ores of Virginia an importance they have not enjoyed for many years.

## MINERALS OF THE STATES

Eight States have made appropriations for exhibits of their mineral resources at



MINES AND METALLURGY BUILDING, JAMESTOWN EXPOSITION

In the pavilion between these two wings is an exhibit of concentrating machinery directed and operated by members of the United States Geological Survey. At two other points on the grounds are exhibits which belong to this department. One is West Virginia's coal monument and the other is the Power and Alcohol building, where tests of coal and denatured alcohol will be made during the summer, also under direction of the Geological Survey.

General supervision of the Department of Mines and Metallurgy is in the hands of Dr. David T. Day. In direct charge of the work of assembling and placing exhibits is Dr. Joseph Hyde Pratt, chief of the North Carolina Geological Survey.

\*Member, U. S. Geological Survey.

It is the mission of the Department of Mines and Metallurgy at the Jamestown Exposition to draw the attention of capital to the fact that there are enormous and undeveloped mineral deposits of great value throughout sections of the South. Largely through the exertions of Prof. T. L. Watson, the recently appointed State geologist, Virginia makes on this occasion for the first time a display worthy of her mineral greatness. The exhibits of iron ores and coal from southwestern Virginia are especially emphasized. Of historic interest are several pigs of iron that were manufactured at the old Spottswood furnace, the first blast furnace in the United States. These pigs were found by W. H. Adams in the ground between the

this exposition. They have been given space around the walls of the Mines building, the individual exhibitors taking, in most cases, space in the center of the hall.

Under the direction of W. S. Yeates, the State geologist, Georgia makes a specially fine exhibit. Besides a systematic collection of the minerals of Georgia, there is an exhibit of the economic minerals of the State, a series of large photographic transparencies of Georgia scenery, and a number of big mineral specimens mounted on pedestals. The most conspicuous object in the exhibit is a marble column 15 ft. high, with a base 18 in. square, which altogether weighs about 4500 pounds.



Maryland's exhibit does not occupy much space. It consists entirely of maps, charts, and models, all made under the direction of Prof. William Bullock Clark, the State geologist.

Ohio's exhibit, which was arranged by J. A. Bownocker, of Columbus, is made up of the individual exhibits of many firms, but all are planned with the idea of bringing out the importance of Ohio as a mining and ceramic State. Maps and charts help to interpret the other exhibits.

Samples of the iron and copper ores of Michigan have been arranged by W. H. Johnston, of Ishpeming. These include a collection of native copper ores and an exhibit of copper plates from the Calumet & Hecla mine.

Alabama's exhibit, which is in the hands of G. H. Malone, of Dotham, consists of samples of building stones, coal, iron ores, and mining machinery. Of picturesque interest is an iron statue of Vulcan, 75 feet high, the first of iron masters, which has done duty at other expositions.

Vermont's exhibit was prepared by George H. Perkins, of Burlington, the State geologist. It consists of marble, slate and other quarry products installed in six glass show cases. A wainscoting of Vermont marbles and marbleized slate surrounds the exhibit.

Kentucky's exhibit, of which C. J. Norwood, of Lexington, has charge, consists mainly of samples of coal, cement materials, asphalt, and building stone. Among the exhibitors is Malcolm H. Crump, of Bowling Green, who has on view samples of rock asphalt and its crude products. The asphalt is arranged in the form of a pyramid 25 ft. high and represents the actual thickness of the stratum. Two pavements made from the crude and prepared asphalt are shown.

Objects for North Carolina's exhibit were collected by Joseph E. Pogue, of Raleigh. They consist mainly of building stones and clay products, including rough and cut stone and crude and finished clay products, monazite gems and gem minerals, corundum and mica, together with manufactured products illustrating their uses; gold and silver ores; and copper ores.

#### COLLECTIVE EXHIBITS

A feature is made of what are called "collective" exhibits, minerals of States not officially represented. An effort has been made to have the building and decorative stones of the Atlantic coast completely represented.

The collection and installation of the cement exhibit is under the direction of E. C. Eckel, the cement expert, of the United States Geological Survey. It embraces cement and cement products, including the raw materials, different brands of manufactured cement, and lime and plaster. The value of all this as an object lesson is greatly increased by the

presence in the exhibit of an array of books and papers.

Machinery of the Keystone Driller Company is installed and in operation in one of the center sections of the building. This includes a percussion core drill and machine for operating it, a placer gold-prospecting machine with appliances, a water well-drilling machine with appliances and a blast-hole driller. These items comprise three drilling outfits, each mounted on wheels with boilers and engine complete.

#### ABRASIVES AND RARE MINERALS

In a collective exhibit of abrasives are shown all the various types of abrasive materials on the market. The Pike Company exhibits a series of large photographs which show quarries and works; an obelisk composed of abrasives of all sizes and kinds, and a large block of garnet, weighing 500 lb. Alundum is a feature of the Norton Company's exhibit, which includes a variety of millstones and grindstones. Samples of crude garnet rock are furnished by the Highland Forest Company. The same material crushed as it is ready to be fed to the rolls is exhibited, also jars of rolled material, and jars containing samples of various sizes of garnet as it is marketed. Lumps of crude carborundum are exhibited by the Carborundum Company, also charts showing the growth of the production of carborundum as an abrasive.

Worthy of special notice is an exhibit of coal made by the Pocahontas Coal Operators' Association of Bramwell, W. Va. The exhibit consists of one section of coal that measures 4x4x8 ft., specimens of lump coal, run of mine, nut, steam nut, and slack coal, about 40 specimens of coke, 5 maps and 20 photographs of mines and works.

An interesting and instructive group of exhibits is that of the iron and steel-hardening metals. Tungsten and molybdenum ores and salts, with the metals manufactured from them, are exhibited by the Primos Chemical Company. The occurrences of bauxite and the uses of aluminum, the metal derived from bauxite, are illustrated in the exhibit of the Aluminum Company of America. Rare earths and metals of the platinum group are exhibited by Eimer and Amend, who show how chemical compounds are developed from these different minerals.

One of the interesting installations in the Mines building is the collective exhibit of lighting materials. Prominent among these is platinum, long employed as the filament in incandescent electric lights. Monazite and other rare earths and the chemicals obtained from them and employed in the manufacture of incandescent gas mantles are shown in various stages of manufacture. Samples of zircon and gadolinite, used in the manufacture of the Nernst electric lamp, are shown.

#### RADIUM AND GEMS

A radium exhibit has been prepared by George F. Kunz and Truman Abbe. It contains samples of the various minerals that show radio-activity and samples of radium salts. Photographs made with the aid of radio-activity minerals are exhibited. There is a dark room in which the various radium compounds are exhibited.

In the space allotted to Roessler & Hasslacher are exhibited oxone, which is a preparation of fused sodium peroxide for the production of oxygen gas on contact with water; and an air regenerator, which is a device to automatically maintain the normal percentage of oxygen and to absorb carbon dioxide as well as other toxic parts of air by means of oxone.

In the center of the building is installed the collective exhibit of gems and gem materials, one of the most attractive in the building. An exhibit of silicified wood is furnished by Dr. George F. Kunz and one of agate by J. T. Hayward. This agate comes from Colorado and is shown in the rough, as well as polished and cut and made up into souvenirs.

The Standard Oil Company shows an oil-well derrick modeled to exactly half scale. Besides this, there are collections of crude oils, of oil-bearing rocks, and of transparent photographs illustrating the production, refining, and transportation of petroleum.

The exhibit of the Myles Salt Company contains a statue of white rock salt which represents Lot's wife. Polished crystal white salt bricks and a case containing several grades of crushed and ground salt are also shown.

#### MINE AND CONCENTRATING PLANT

The far West finds representation in the Mines Building through the Colorado Gold Mine Company, of Denver, which exhibits a model of a Colorado gold mine, showing the complete surface and underground workings.

The concentrating plant installed in the pavilion of the Mines building is similar to the one erected at Portland, Ore., at the time of the Lewis and Clark Exposition. It consists of various concentrating tables such as the Wilfley, Pinder, and Standard, a Wetherill magnetic separator, a crusher, a classifier, and other apparatus. A complete assay laboratory is maintained in connection with this plant. Investigation will be made here during the summer, of the gravel deposits and sands of the Atlantic coast in the way in which the Pacific sands were studied at Portland.

Outside the Mines building one of the most conspicuous objects on the exposition grounds is a mineral exhibit. It is West Virginia's coal monument. The State appropriated \$8,000 for the monument, but the cost came to \$15,000, the deficit being personally contributed by members of the West Virginia Jamestown Commission.

# Handling Cars with Rolling Device for Dumping

The Banner Shaft Coal Mine, Ala., Employs a System Which at the Standard Mines, Pa., Handled 3200 Tons of Coal in Eight Hours

BY ERSKINE RAMSAY\*

The car-handling and dumping device shown in the accompanying illustration is used in connection with the Robert Ramsay transfer and rams, an arrangement used at many of the largest and best equipped American mines. It was first installed during 1887 at the Standard mines of the H. C. Frick Coke Company, Mt. Pleasant, Penn., where an output of over 3200 tons of coal has been made in something over eight hours, actual working time.

## METHOD OF OPERATION

The empty mine car on the transfer track *K*, shown in the illustration, is pushed by the piston of the cylinder *L*, against the loaded car standing on the shaft hoisting cage *N*, the stroke of the pusher or ram being just sufficient to move the empty car upon the cage, and at the same time, to push off the loaded car ahead of the empty. The empty by this operation, takes the place of the loaded car on the cage and is ready to be lowered into the mine to be loaded.

The loaded car runs by gravity on track *P*<sup>1</sup>, into the revolving or rolling dump *A*<sup>1</sup>, and is prevented from moving too far, i.e., running through or partly through the dump, by the bumpers *DD*, and from rebounding by the bumpers *D*<sup>2</sup>. These bumpers are automatically depressed by the car as it passes over them, and, as they are kept up by springs, they immediately assume the normal position shown in the drawing when the car has passed over.

When the loaded car has passed into the dump *A*<sup>1</sup>, and an empty car has passed, by gravity, upon the truck *K*<sup>1</sup>, the man in charge, standing between the tracks *P*<sup>1</sup> and the shaft and the transfer truck-pit, moves the valve lever which turns on the steam to the cylinder *J*. In making the complete stroke the transfer trucks *K* and *K*<sup>1</sup> are moved from opposite the tracks *O* and *P*<sup>1</sup> to a position opposite the tracks *P* and *O*<sup>1</sup>. The same stroke of the piston, by means of the sheave and rope arrangement, moves or rolls the two dumps *A* *A*<sup>1</sup> from opposite the tracks *O*<sup>1</sup> and *P*<sup>1</sup> to the tracks *P* and *O* respectively, and in moving this distance the dumps and with the in the mine car, make one complete revolution, during which the inverted loaded car empties all of the coal into the hopper *Q*. The tracks *P* and *P*<sup>1</sup>, extending from the shaft hoisting cages to the dumps, are spread apart to give each

of the dumps such a distance to travel as will cause both of them to make exactly a complete revolution.

When dump *A* moves from the position shown to track *P* it is ready to receive a loaded car from the cage, and dump *A*<sup>1</sup> at the same time has moved to track *O*, where the car now empty runs out by gravity, on its way to the transfer-truck *K*<sup>1</sup>. Before it reaches the truck it is automatically stopped by the dog *W* at the point shown, this dog being caused to move across the rails by a suitable shaft and crank arrangement operated by the truck *K*<sup>1</sup> in such a way as to release the car automatically when the truck is in position to receive it, but as soon as truck *K*<sup>1</sup> begins to move to a position in line with track *P* the dogs automatically set and prevent the next empty car from passing beyond until the transfer truck is again back in position to receive it.

The dumps *A* *A*<sup>1</sup> in making a complete revolution each, move a distance twice as great as the stroke of the piston of the cylinder *J*, and while they move this distance one pays off, and the other winds up, an amount of rope equal to twice the distance of the travel of the dumps.

## OPERATING MECHANISM

In order to make one motive cylinder move the two transfer trucks and the two dumps at the same time, it is necessary to employ the sheaves *HH*, placed on the ends of the piston rods, and also the stationary sheaves *GG*, located as shown, which arrangement gives a travel to the rope of four times the stroke of the piston. That the transfer trucks may move in opposite directions to the dumps, the ropes passing around these sheaves are carried to the opposite sides of the structure and around the sheaves *FF*, thence to the sheaves *CC* and up over the sheaves *BB* to a grooved ring on each of the dumps. There is also provided a connecting rope which is passed around the grooved ring on the dumps in such a manner as always to keep them the exact distance apart, thus always keeping the tracks in the dumps in exact line with the fixed empty and loaded tracks.

The dump *A*<sup>1</sup> in the position shown, has its car track on a level, but when it moves from in line with track *P*<sup>1</sup> to track *O* it takes a position similar to that shown by dump *A*, in which case the track grade is sufficient to cause the car to run by gravity out of the dump on its way to the transfer track. This change in grade is accomplished by placing the

rail *E*, upon which the dump travels on a level, while the opposite rail has considerable down grade beginning at a point in line with the centers of tracks *P* and *P*<sup>1</sup> and extending to the centers of tracks *O* and *O*<sup>1</sup> respectively.

In case it is desired to pass a loaded car through the dump without dumping, the bumpers *DD* are lowered so as to allow the car to pass over. The same arrangement is provided for passing a car across the transfer trucks.

## ADJUSTMENT AND CONTROL

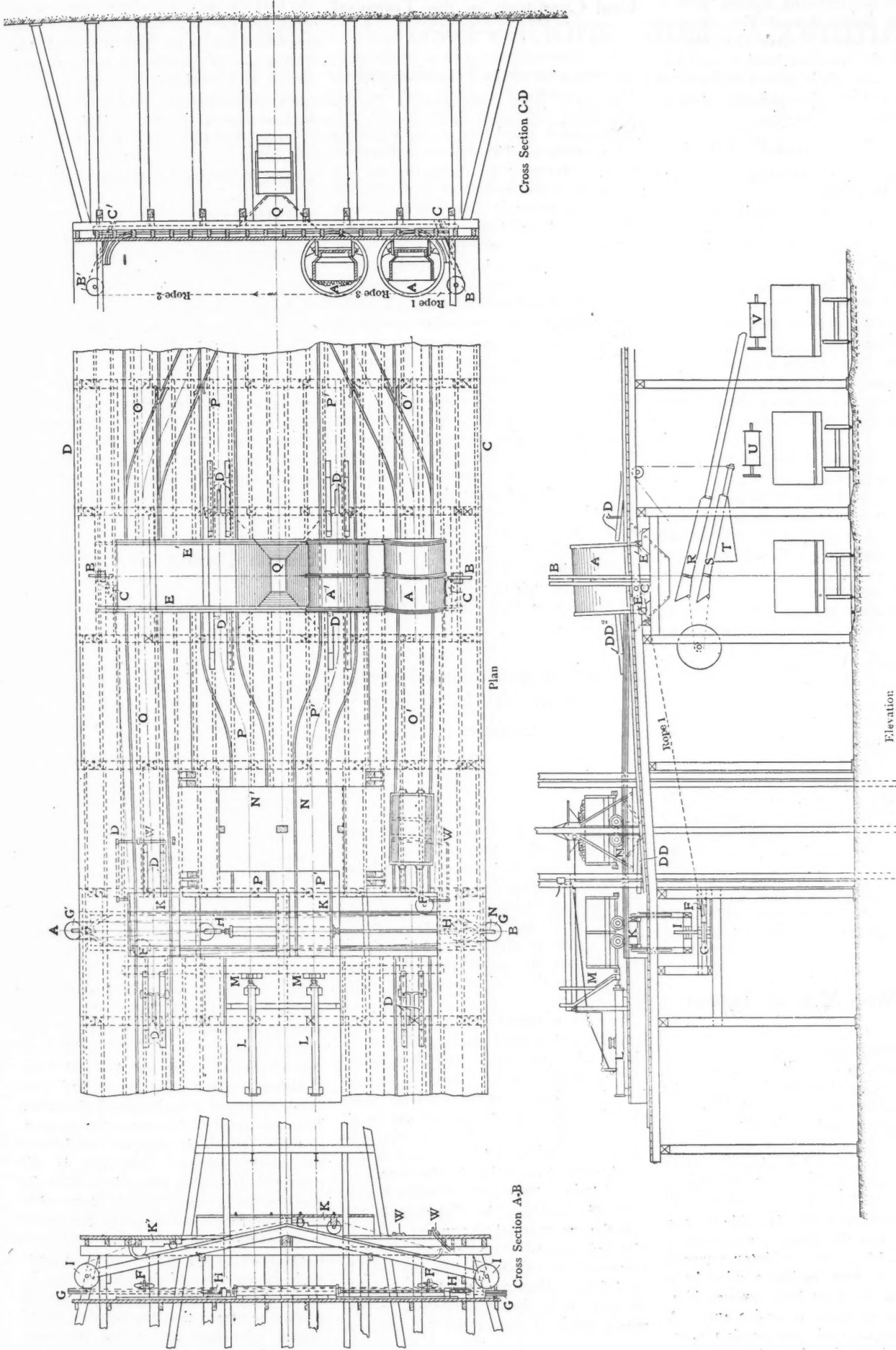
It is absolutely necessary that the dumps *A* *A*<sup>1</sup>, in making the complete revolution, while moving from one track to another, should not slip, but always move the exact distance required to bring the tracks in line with those on which the loaded cars enter and the empties leave the dumps. This is accomplished by making the tracks *E* *E*<sup>1</sup>, on which the rings of the dumps roll, somewhat in the form of a rack instead of a plain rail. The tracks have pins projecting at regular intervals, and holes are provided in the rings of the dumps, at corresponding intervals, so that the dump cannot slip.

The rope marked No. 3, connecting the two dumps, acts as a pulling rope on the dump *A* when the dump *A*<sup>1</sup> is being pulled by rope No. 2 from track *P*<sup>1</sup> to *O*, thereby insuring the movement or revolution of the dump *A* to an extent which will bring it in the exact required position at track *P*, and at the same time that dump *A*<sup>1</sup> has reached track *O*. The ropes Nos. 1 and 2 are arranged with proper adjusting screws so they may be adjusted from time to time as stretching may require. They are attached to the cross-heads of the piston-rods at the points where the sheaves *HH* are located. The connecting rope No. 3 is also adjusted by means of screws at the points where it is fastened to the dumps. The proper movement of the dumps is therefore accomplished to a nicety and without any special care other than the movement by the operator of the valve lever admitting steam to the cylinder *J*.

In order to maintain the cars in a fixed relation to the dumps *A* *A*<sup>1</sup> as the latter revolve and the cars are inverted, guard rails, placed over the tread or hub of the car wheels, are provided, supported by the brackets.

In the plan shown the coal passes from the hopper *Q* to the upper shaking screen *R*. The lump coal passes over the screen and onto the traveling picking band *V*

\*Vice-president, Pratt Coal Company, Birmingham, Ala.



CONSTRUCTION DETAILS OF THE CAR HANDLING AND DUMPING DEVICE



and upon the traveling picking band *V* slack coal passes through the screen *R* and into the screen *S*, over which the nut passes to the traveling band *U* and into the car. The slack passes through the screen *S* and into the slack car or into a storage bin or coal washer.

#### ADVANTAGES

This system of dumping has these points of advantage:

1. Cars without end-gates (the cars being inverted in dumping) are used.
2. This permits the installation of cheaper cars.
3. The cars are stronger and more substantial.
4. The repairs on the cars are less.
5. Lighter cars.
6. Less dead weight to transport in proportion to coal hauled.
7. Having no end-gates there is less spilling of coal on the tracks and therefore
8. Less expense in keeping the tracks in good condition.
9. There is no accidental opening of end-gates (because there are none), thus doing away, to a large extent, with wrecks on the haulage ways with the consequent knocking out of props and disarranging of haulage appliances.
10. A lighter car for the miner to handle in his room, which means less manual labor.
11. Capacity to handle large outputs expeditiously.
12. Less wear and tear on cars in the dumping operation, as compared with the effects of the jar and shock incident to the old-fashioned "horn," or more modern cross-over tippie.
13. Ability to dump very slowly when desired, furnishing an opportunity to carefully examine the contents of the cars as they are being dumped.
14. A low cost of handling the product of a mine, because one man handles and looks after the entire car-handling and dumping operation, no matter how large the output.

### The Mine Mule in Indiana

The Indiana mine mule has caused much trouble, great cost to miners and operators, and serious personal injury to drivers. Strikes have been called because men were discharged for cruelly beating a mule. Others were called because the mules were not well fed, and still others because a mule was not washed after a day's work in the dust of a mine. But the most novel instance of trouble where a mine mule was the direct cause occurred last week when a jury at Linton returned a verdict for \$175 against a mine boss, who during the noon hour amused himself by flipping stones at a mine mule. A stone missed the mule and struck a miner in the eye, destroying the sight.

### Coal Conditions in the Transvaal

The financial year of most of the mining companies of the Transvaal ended on Dec. 31, 1906. The reports of the coal companies show that many of the collieries are in a bad way, as far as profits are concerned. The dull times have seriously effected some of the mines, and competition has become so keen that the year's operations at many plants show a big loss. The gold mines have, of course, benefited by this competition, and coal is now cheaper than it has ever been before; however, the present state of affairs cannot continue indefinitely. What will probably happen is that the weaker companies will go to the wall, and the big producers will come to some understanding about prices. At the present time there is no money in coal in the Transvaal.

The coal mines had a most creditable showing, from the technical side, and there seems to be great efficiency in the production of coal. Consumers can buy fuel of good quality, at the pit's mouth, for \$1.20 to \$1.44 per ton for round, and \$0.84 to \$1.02 for nut. This compares favorably with prices at coal mines in other parts of the world, and yet the railroad rates are so high that this coal landed at the gold mines costs from \$2.64 to \$2.88 per ton.

### Influence of the Prolonged Storage of Coal on Its Coking Qualities \*

BY F. HANNACK

When stored in the air for some time, bituminous coal loses a considerable quantity of gas, the amount so lost being increased when the coal is small and is in a damp state (with 12 to 15 per cent. of water), as is the case in storage towers. From a number of recent experiments, it appears that the average loss of weight sustained by the coal in a week is about 1.7 per cent.

Now in a cokery of 50 ovens to be emptied and refilled daily, each with a charge of seven tons of slack, it is necessary to keep a stock of 700 tons of coal in order to insure regular working. This quantity will lose 10 tons of gas in 48 hours, equivalent to a loss of 1870 tons of gas per annum, and corresponding to a considerable diminution in the output of by-products. The loss of ammonia is especially apparent, the coal used in the experiments containing 1.37 per cent. of nitrogen, about 50 per cent. of which is recovered as ammonia when the coal is used fresh. Moreover, the loss of gas is attended with certain difficulties in the management of the ovens; for instance,

the heat can only be uniformly maintained when there is a sufficient volume of gas available, and when this is absent, the fluctuations of temperature cause unequal strains in the brickwork, which then becomes liable to crack. Still another drawback of storing the coal is that the coke is never first-class with regard to size, the presence of an abundance of gas greatly facilitating the caking of the coal in the oven.

Wedding explained the phenomenon of coking by the assumption that the hydrocarbons in the coal are decomposed at high temperature, ethylene, for instance, being split up into carbon and methane, the small particles of this carbon then cementing the small lumps of coke together. When the coal is poor in gas, the formation of these particles of carbon in sufficient quantity is precluded, the coal cracks and powdered coke is the result; more labor being required to sort out the spongy lumps from the hard resonant good coke, to say nothing of the softer coke breaking to pieces in transit and giving rise to complaints on the part of the consumer.

### Electric Blasting in Coal Mines

BY RICHARD LEE

The practice of simultaneous blasting by electricity has recently become more popular in many of our non-gaseous coal mines. When more than one shot is to be fired electrically, the various fuses may be connected to the exploder either in series or parallel. In the former system the current passes from one firing main through all the fuses in turn and back to the other firing main. It is also a fact that when the wires are arranged in this manner, the resistance varies directly as the length, and the total resistance is the sum of the resistance of each fuse added to the resistance of the line conductors.

In the parallel system the resistance of a number of fuses is less than that of a single fuse, and the sectional area of the main conductors must be in proportion to the current required. When this method is employed, each fuse should be connected directly to both mains, so that the current divides among the different fuses.

Although low-tension fuses are commonly arranged in series and high-tension fuses in parallel, the series arrangement is more suitable in practical work than the parallel system. Especially is this true in shaft-sinking where it is often desired to fire a range of side shots without interfering with the work carried on in the sump; with the parallel method, it is necessary to use more wire in order to avoid taking some of the wires across the shaft. As to the efficiency of each system, it may be stated that the number of recorded miss-shots are about the same with both methods.

\*Abstract of an article in *Stahl und Eisen*.

# 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 a mine where furnace ventilation is used, it has been found that the exposed metals rapidly corrode. This condition is caused by the action of sulphuric acid, produced by sulphur in the burning coal.

At present but one-fifth of the total forest area of the United States is embraced in national forests. The remaining four-fifths have already passed or are most likely to pass into private hands.

In transmitting electric power over long distances, a current of high tension electricity is used in preference to low tension. The advantages of the former system are: first, less cable is required; second, greater economy in first cost; third, more economy in transmission of power.

One capable engineer, after numerous experiments, says that the lignites of the Northwest, which contain as high as 35 to 45 per cent. ash, when placed in a gas producer, gave a better quality of gas for power purposes than the best West Virginia steam coal produced under the same conditions.

Orders were issued by the Lehigh Coal and Navigation Company, announcing the indefinite suspension of the No. 12 colliery in Panther Creek valley. The faces of the workings in the mine are near the old Green Wood workings which have been flooded for several years. The operation of the No. 12 colliery is practically stopped until this body of water is tapped.

Since the return air current in a mine contains more carbonic acid gas and moisture than the intake, and because mine timbers take up a large amount of carbon and moisture, which two elements set up chemical action that results in decaying the props, it has been found that the timbers used on the return air ways are sooner destroyed than those used in other parts of the workings.

Investigation shows that coal containing 5 and 10 per cent. of sulphur, which would not be put on the market for use in an ordinary steam boiler furnace, can be used in a gas producer where the sulphur is converted into heat units. The gas which is formed from such fuel explodes in the cylinder of the engine and does no injury as long as the engine is kept dry and at a high temperature.

Carefully tabulated statistics prepared by the Baltimore & Ohio Railroad show that during every decade of the past 70 years the amount of coal hauled during any one 10-year period was equal to that hauled during all of the preceding 10-year

periods; so that for example, the amount of coal hauled over that railroad from 1895 to 1905 was equal to that which the railroad had hauled during the entire 60 years preceding 1895.

The width of various pillars in coal seams depends principally upon local conditions and the laws governing the question. In the anthracite field those seams above water level have pillars varying in width from 10 to 30 ft., while those below water level are sometimes as much as 300 ft. in width. The general practice is to leave 60-ft. pillars on each side of the property, so that the total thickness of the entire pillar will be about 120 feet.

Professor Brittain, of Strassburg, Germany, has perfected an apparatus which will detect the presence of fire-damp in the air of a mine when the gas is present in the atmosphere in so small a proportion as one two-hundredth of one per cent. The invention consists of a column of metal supported above a cup and below a rod, connected with an electric current. Between the little inverted cup at the top and the rod below is placed a graduated tube, bell shaped, into which is introduced the gas for analysis. It is said that the apparatus will show the existence of fire-damp in small quantities before it becomes dangerous.

As the outcome of the terrible catastrophe at the Courrières colliery the president of the Central Committee for Collieries has informed the French Minister of Public Works that in addition to the laboratory experiments undertaken to investigate the influence of atmospheric dust on explosive mixtures it has been decided to fit up a special subterranean gallery for further tests. For this purpose the colliery owners have subscribed the sum of \$60,000 with which to install a suitable testing station and laboratory in a proper locality. About \$10,000 will be used to carry on experiments underground, where all the surroundings necessary to reproduce exactly the conditions present in a coal mine will be provided.

The excessive and careless use of timber throughout the United States is resulting in a general advance in the price of our available supply, and is furthermore causing a scarcity that has excited considerable apprehension among mining companies who use millions of feet of timber in underground development each year. It is interesting to note that every person in the United States is using over six times as much wood as each inhabi-

tant in Europe. Our country as a whole is consuming nearly four times as much wood each year as is grown in all the forests of the United States during the same period. Careful investigation also shows that each acre of forest lays up a store of only 10 cu.ft. annually, whereas more than 30 cu.ft. are being taken from it.

The highest degree of fuel combustion is only attained by perfect firing, and for this reason it is important to know what degree of efficiency is taking place. In order to provide this information, an automatic self-registering gas-analyzing apparatus has recently been introduced in Europe. This arrangement is attached to the stack, and its method of operation is to draw the products of combustion of a big amount of fuel into the machine, where the gases are passed into a strong solution of potassium hydroxide, which absorbs all carbonic acid gas ( $\text{CO}_2$ ). The volume of the remaining gases is measured and the percentage of  $\text{CO}_2$  is thus determined and plotted on paper. The firemen are paid premiums according to the efficiency of combustion, as shown by the carbon dioxide content of the waste gases.

In considering the adaptability of mining machines to thin coal seams where operations by pick mining could not be successfully carried on, one instance may be cited where a seam only 16 in. thick was mined with machines, actually producing 45 per cent. of large coal, when the best previous estimate considered that only 10 per cent. could be obtained. Although mining machines are best adapted for level seams, the statement that a steep seam is an insurmountable obstacle is not true. At several mines in the United Kingdom there are instances where machines are successfully cutting up and down on gradients having a pitch of from 20 to 30 deg. In cutting down hill, when the gradient is steep, it is often necessary to use a back balance, or a brake, on the wheels of the machine to retard its forward motion; otherwise the pressure on the disk is too great. In order to retard the travel of the machine in cutting down hill on a heavy gradient, it is sometimes the practice to substitute sledges instead of the usual wheels on rails; in this case, however, a hard floor is required. One of the disadvantages attending the use of mining machines in steep seams is the extra power required to haul the machine up a high gradient.



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## Notice

Hereafter the subscription price of the ENGINEERING AND MINING JOURNAL, weekly, to Canada will be \$6.50, and the monthly \$1.50, postage paid. This raise of price is made necessary by the new postal treaty, which increases the cost of mailing papers to Canada a matter of 400 per cent.

## What Defense Have the Lambs?

We receive many letters from persons, most of whom evidently are unacquainted with the mining business, inquiring as to certain mining companies in which they have made investments. These are straws wafted from the cyclone of fraudulent or exaggerated mining promotions that are consuming the savings of many thousands. In most cases the inquiries that we receive relate to enterprises of which we have never heard, although we are distinctly in a position to know what is going on in mining; in many cases they relate to concerns of which we have reasons to be suspicious. In almost no case does it appear probable that the investment will come to any other result than the loss of the money. What can be done to protect such persons against the mining sharks and against themselves? We have repeatedly pointed out several desirable things that can be done, but the most important of all, namely, the education of the public, is not easy to accomplish.

The average investor does not know how to protect himself against his own stupidity. The communications which we receive are the gropings for information by the more intelligent, although the latter class in most cases apparently parted with their money previously. For example, we receive letters like the following: "They make great claims for their property (such as an average of 20 per cent. copper ore, and millions of tons of it). I should like to get some information other than the company's own. I cannot afford to pay the expenses of an engineer to visit the property. Mr. A.B.C. has reported very favorably upon it. Can you not obtain for me some corroborative information?"

This correspondent asks for professional advice, which it is not our function to give. We can give him the news as is commonly reported; if the importance of

the case is sufficient justification, we can, and frequently do, make special efforts to secure the information; but we cannot give advice as to whether a particular investment is good or bad. That is the professional function of the practising engineer. It is perfectly true that the majority of these investors cannot afford to pay the expenses of an engineer to visit the property, but they can afford to pay the moderate fee for which many good engineers would examine the reports presented by the promoters and pronounce them to be probable or improbable, reasonable, suspicious or dangerous, as the case might be. This is a perfectly feasible way whereby any person who is tempted to listen to the siren songs of the promoters can protect himself if he sees fit to do so.

## The Guilt in Colliery Accidents

If the history of colliery accidents during the last decade were written, it would appear that a great majority of the disasters have been directly due to gross carelessness and criminal neglect. In some instances they are attributable to ignorance on the part of the cosmopolitan labor employed; in many cases, however, the facts compel the belief that all excuses are misplaced, and sympathy is deserved only by the unfortunates who have suffered through the carelessness of others.

At a large anthracite colliery, not long ago, some of the miners had tampered with the locked safety lamps there used, and by means of a hole drilled in the rim of the body had succeeded in making it possible to open the lamps while underground and thus endanger their own and the lives of all the other men in those workings. If mine managers can in any way punish such men by imprisonment, and fail to do so, the blame for disasters resulting from such criminal recklessness falls back upon them (the managers).

The coroner's inquest on the six men killed at the recent Genwen colliery explosion in England brought forth the startling evidence that a pipe lay near one of the dead men, and another victim had a pipe in his hand and a match in his pocket. These men may have been smuggling such forbidden articles into the mine time and again without causing any fatal accident, but at last they paid the penalty. The misfortune is that it is not always the guilty alone who suffer.



Last week we were reading of the rescue of the six men in the Berwind-White mine at Foustwell, Penn., where for six days those unfortunates were imprisoned underground, not knowing what minute the water would rise and drown them. In this case two miners were carelessly blasting in dangerous ground, where an immense volume of water was dammed back.

Neither education nor preaching will wholly eliminate such disasters, and the greatest good must come from stricter laws, which, after more careful investigations into the causes of all accidents, will administer severe justice by punishing any and all who are proved neglectful or careless. If we attack the problem in this way, sparing neither operator nor superintendent, nor miner, much good is sure to result, and the present practice of investigation and inquests—useless mockeries, with conclusions often framed according to the quality of the cigars furnished by the operating company—will be done away with.

### Cement Dams in Floods

In a recent issue our San Francisco correspondent noted the failure of the large restraining dam on the Yuba river at Daguerre point in California. This dam was built to hold back tailings from the mines; it was chiefly of cement, and gave way during the heavy floods of early April. The wreck has now been examined by the Government engineers who have decided that the cause of the break in the barrier was the action of the large amount of cobble stones, gravel and coarse sand that was washed over the cement work during the recent flood. The attrition of these coarse materials acted as an abrasive on the cement work and ground it away like chalk. At first it was thought that the back-wash of the waters had caused the dam to break, but this was a mistake.

### Copper Production of Mexico in 1906

In our issue of Jan. 5, 1907, we reported the copper production of Mexico in 1906 as having been 135,800,000 lb., this figure being based on the net imports into the United States (assuming those in November and December to have been at the average of the 10 months previous) to which

was added the Boleo production. Computing the production in the same way, but with the statistics of net imports for the full year, we obtained the figure of 135,425,846 lb. In the meanwhile, however, we have received reports from all the smelters, showing a total of 138,208,000 lb., which figure is adopted as representative of the copper production of Mexico in 1906. The production in 1905 was 144,350,962 lb. The decrease was due chiefly to the smaller output of the Greene company. However, the latter continued to be the largest producer of Mexico, the other large producers being the Boleo, Moctezuma, and Teziutlan companies. It is probable that the copper production of Mexico will regain its lost ground in 1907.

### The Elmore Vacuum Process

The article by Mr. Elmore, which is published elsewhere in this issue, is particularly valuable, being the first authoritative account of the new process which is now attracting widespread attention. The subject is of particular interest to American readers, because we understand that an installation of this process is contemplated at Ely, Nevada, by the Nevada Consolidated Mining Company. At all events, an extensive series of tests on ore from its Ruth and Eureka mines has been made. One of these ores works very readily by the usual vacuum-flotation method, giving an extraction in the neighborhood of 90 per cent., while the other ore contains a rather large percentage of soluble matter, and requires special treatment; however, it appears that it also will give a satisfactory extraction.

Unfortunately, we have not yet received any data as to the cost of treatment of ore by this new process. When a process is applied to the treatment of low-grade ore, differences of only a few cents per ton multiply themselves enormously when referred to the basis of the concentrated product. It is well recognized that an extraction of 90 per cent. by a rather costly process may give an inferior economical result, as compared with a process that extracts only 70 per cent. of the mineral at a lower cost. This was the prime cause of the failure of the original Elmore oil process, which in many respects was a beautiful process. However, it was decidedly more costly per ton of ore than

ordinary jigging and tabling, and its promoters made the mistake of applying it to the treatment of crude ore in which it could not successfully compete with the older and ordinary processes, whereas if it had been applied to the treatment of a semi-concentrated product, very likely it would have resulted successfully. No doubt Mr. Elmore and his associates have carefully considered this experience in the development of their new process. We have had no opportunity to study the details of its cost of operation, but we are informed by independent engineers who have, that in their opinion it will be a comparatively cheap process. We wish that data on this subject could be communicated from some of the plants in Europe and elsewhere, at which it is actually in operation.

### The Production of Broken Hill

At the semi-annual general meeting of the Broken Hill Proprietary Company, at Melbourne, Feb. 22, 1907, the chairman of the company, Harvey Patterson, communicated some highly interesting information as to the record of the mining of Broken Hill. He stated that the approximate total output of the Barrier Fields (Broken Hill) from the beginning of mining had been 20,000,000 tons of ore, yielding 2,500,000 tons of lead, and 250,000,000 oz. of silver. The total value of the production has been £60,000,000, of which £13,750,000 has been paid in dividends, bonuses, etc. It certainly is a grand record when a mining district as a whole yields approximately 23 per cent. of its output as profit. Out of the total dividends paid, the Broken Hill Proprietary Company alone has paid £9,152,000, a total which is exceeded by only a few mining companies of the world.

AS ILLUSTRATIVE of the part which the daily press have played in the mine-promotion evil, it may be remarked that the L. M. Sullivan Company, of Nevada, an extensive and spectacular advertiser which came to grief early this year, received as high as \$140,000 in a single day from the sale of the stocks, it was promoting. Yet these great receipts were overbalanced by the expenses, of which advertising was the largest item, and eventually the company found itself out of funds and had to be reorganized.

# 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

### Collecting Black Sand

The article in a recent issue of the JOURNAL, suggesting and inviting correspondence on the subject of "Treatment of Black Sand," is interesting and I submit a few suggestions. I have been actively engaged in gold and tin dredging for a number of years, both here and in Australia and Borneo. The question of concentration, on a dredge, has always been an absorbing one to me, more especially in river dredging, where there is usually a large percentage of black sand and the gold is of a thin, scaly character. It is when situated in this way that the dredge master gets to thinking and trying out his ideas, how and in what way to arrest these thin scales of gold that will persist in traveling over the black sand.

Take the ordinary cocoa matting and expanded metal on tables, for example. If much black sand is present the matting is filled after 10 minutes' run, after which scaly gold will not remain on the tables, but will travel with the current. The same applies to riffles; much of the scaly gold gets away with the black sand unless it happens to get amalgamated. But frequently—I know of one case in Borneo—nearly half the gold is foul, covered with a thin film of arsenic or sulphur, which, although to the eye perfectly clean, will not amalgamate. It then becomes necessary to clean up often, and it is this part of concentration that I wish to bring before your readers.

#### POSSIBILITIES OF THE HANCOCK JIG

I recently witnessed the Hancock Jig in operation on copper sulphides and saw it handling the same quantity of material that was previously sent to 20 ordinary jigs, and it was handling the material without any trouble, making quite as clean a concentrate. Here, then, is a step in the right direction for handling the black sand, or for concentrating the tailings or silt after it has been sized as fine as, say,  $\frac{1}{4}$  in. through trommels or reciprocating screens.

Hitherto the main trouble with handling tailings by concentration has been the limited space available on the dredge, but the Hancock jig only requires floor space of about 23x5 ft. and will handle up to 700 tons per 24 hours. I think the ideal to aim for is a rough concentrate which could be removed as it accumulates to a small concentrating plant of one or two vanners situated ashore in the vicinity of

the dredge, where one man could attend to the product.

There are many points in favor of the Hancock jig for this purpose, among others its large capacity, the small floor space covered, the small amount of horsepower required (5 h.p.), and its clean concentrate. It is automatic in the delivery of its concentrates, so that there would be no delays, and no further water supply would be needed—in fact, this would have to be reduced.

Anyone familiar with dredging will appreciate these points. A modern dredge handling, say, 2000 cu.yd. of ordinary gravel, using, as in California, a revolving or reciprocating screen, would probably deliver about 800 tons of fine material sized to  $\frac{1}{4}$  in. This amount could easily be handled by two Hancock jigs and all the concentrates would be saved and handled ashore. Much of the fine gold now known to escape would be caught in these concentrates.

#### MARTYN'S DEVICE

Thus far I have never heard of any other machine that would work successfully on a dredge and handle the amount this machine will, with the exception of a machine used on two tin dredges in Stanthorpe, in Queensland, Australia. The features of this machine are covered by the patent of W. H. Martyn, of Sydney, N. S. W. The device has been in operation for about two years and consists of an endless belt of rakes traveling against the current on the tables and thus constantly stirring the heavy concentrate of tin and iron that accumulates. It appears to give satisfaction, handling all the fine material of 4-cu.ft. bucket dredges. Whether this machine would save the thin, scaly gold usually associated with black sand I cannot say, as there is not any appreciable amount of gold in the tinfields around Stanthorpe.

There is no doubt that if we are to save the light particles of thin gold, and the rusty gold, concentration in a more automatic manner than the usual tables with matting or flumes with riffles now in general use will have to be employed, and for this purpose the Hancock jig offers many possibilities. It might be necessary to alter it in some respects, but I think it bids fair to be one of the machines for the proper equipment of the dredge of the future.

#### AMALGAMATION OF PLATINUM

The fact that Dr. Day discovered that platinum will amalgamate if sodium is

used in the mercury recalls an experience I had in Borneo about three years ago. I had cleaned up in an amalgamating barrel, as usual, nearly 50 per cent. of the gold being foul. Having used sodium to prevent the mercury from sickening, on this occasion, I found on smelting the retorted cake, which was very dirty, that it was very pale. Thinking that some lead or other impurities had perhaps become amalgamated, I melted the bar four different times, adding niter each melt. To my disgust, however, it remained pale. I sent it to the Chinese merchant who purchased our gold. He reported that he could do nothing with it, that it was "too hard" and brittle. One of the Chinamen suggested that I had dropped a few dollars in and made "Maas Putti," white gold (Malay). Since I alone had handled the clean up I suspected platinum. I later found it in the residue.

Butte, Mont.

W. BRAZENALL.

### Cornish Method of Crushing and Ore Dressing

I have read with some interest an article by Edward Walker, which appeared in the JOURNAL of April 13. It seems to me that Mr. Walker does not go far enough back in history to "locate" the origin and development of the methods. The "everlasting credit" to the Cornishman is that after importing stamps and other means and methods from Germany (about 300 years ago, when lode mining in Cornwall was in its infancy, while in Germany lode mining for tin was in full operation), and keeping up the Phœnician methods introduced into Cornwall about 3000 years ago, he has conscientiously stuck to the same thing and practically all the improvements made are on the same old lines of working. Otherwise, the Cornishman has escaped the gradual development in mechanical dressing, and now many engineers call this standstill Cornish methods.

#### CAUSES AND EFFECTS

The facts are well known and fully admitted by Cornish engineers, but they assert, and they are in many respects right, that under the conditions then existing, both as to abundance of cheap labor and cheap water power, it paid better to adhere to their methods, especially since modern plants in many cases could not prove a closer saving at equal or lower cost.



The old commercial system of working had a lot to do with the starting and working of a mine, because any good prospect on a lode was immediately taken up and worked for the recovery of tin. The fact that all tin smelters bought any size parcel of tin oxide from a few pounds upward enabled a prospector to work alone, with members of his family, or with outside helpers and not only to make his work pay but in many cases to earn large profits. This he could do because his stamping, tying and buddling was mostly worked automatically by water power and did not require any attention until his drags, tyes and buddles were filled. Meanwhile he would work his lode and periodically have his "clean-up" by means of buddling, vanning and kieving. As he could take his produce immediately to the smelter, and receive his check or cash within a few hours of delivering the mineral, he did not require any working capital.

In a great many Cornish mines the entire dressing plant has grown up from the prospector's first outfit by simply adding a number of appliances of the same kind to cope with a larger output. The old dressing floors both in East and West Cornwall, cover acres of ground with simple and effective old appliances, and bear evidence to these facts.

The Cornishman was right in adhering to what he had under the circumstances then prevailing, abundant cheap labor of men and women, and of boys and girls down to the age of 10 years. Boys and girls received as little as three, four and five cents per day at the beginning, and that within the memory of present workers. Without proof of greater saving of mineral at a lower cost of production, Cornishmen were justly averse to discarding their working plants and erecting new ones at great cost.

#### CHANGED CONDITIONS

Conditions have changed now in Cornwall; labor is dearer, and good miners and dressers are scarce while female labor on the dressing floor has almost disappeared. Mines abandoned for years have no assets in old plants. When they resume operations they can and must employ modern methods of machine dressing. As for the statement that no capital was devoted to experimental work, the books of several mines prove that large sums of money have been spent in testing chemical processes for the separation of wolfram from tin, which, however, all proved unprofitable.

The same applies to the separation of pyrites from tin oxide which is now being carried on by magnetic separation in many mines outside of Cornwall. Magnetic separation has proved a failure in some places, but a great success in others, and the main reason for failure was that ore from dumps or concentrates which had been exposed to atmospheric influence for

a considerable time were treated. Freshly mined complex ores containing two or more minerals of different magnetic affinity, and receiving the exact amount of roasting can be successfully treated by magnetic separation which then gives excellent results.

#### BUDDLES

Mr. Walker's description of the Cornish buddle is somewhat vague. His reference to "a concentrator on which the heavier particles are caught and kept in position until a thick bed is formed that can then be dug off and removed," applies to all the old appliances. Drags, strips or tyes are really buddles. Buddling ore is the process of counteracting the force in flowing water and distributing and thereby reducing such force to the requirements for washing over the lighter particles and allowing the mineral to settle.

The square buddle was in existence before the round buddle and the latter is an improvement on the former to obtain the largest area possible, namely, the circumference of a round cone for distributing the pulp. The sizes of cone in round buddles vary according to the nature of material and are smallest for coarse and larger for finer sand. These buddles are called convex or center feed buddles.

In slime treatment the size of the cone required is necessarily large and this naturally led to the invention of the concave or periphery-fed buddle. It is only a small step from the concave stationary to the Børlase (Cornish) concave revolving buddle.

Many improvements have been made in the automatic self-discharging buddle. These are nearly all linked with the inventor's name in describing them. They are divided into two classes: The stationary-feed and clear wash over a revolving surface, and the revolving-feed and clear wash over a stationary surface. The "Acme" mentioned in the article is one of the numerous varieties and has no special features apart from being a two-deck combination concave and convex buddle.

Mr. Walker has not found the true reason for the failure to make frequent chemical analyses. Such analyses are made, but owing to the time required for a chemical assay of tin, and the fact that the difference between the chemical and the vanning assay is known to be 22½ per cent. (with very slight variations) and also that the smelters purchase the mineral on a smelting test, and not on a chemical assay, the vanning assay is a good method for a quick determination of value and for a close estimation of actual results in dressing.

I may add that a close study of the so-called ancient methods is of great value to the engineer. When followed step by step through all the improvements it enables him to make his preliminary test in a simple form and assists him in arriving at a

correct decision in selecting his plant and in working it to the best advantage.

J. F. C. ABELSPIES

Holguin, Cuba, Apr. 27, 1907.

#### Resistance and Ventilating Fans

I submit for publication and discussion in your correspondence columns the following statements which were made by a prominent engineer, in addressing the members of a mining institute:

"Let me state that a fan and its engine are performing their greatest work in foot pounds when the fan is running free and open to the atmosphere, and the greater the mine resistance, the easier the work is on the fan and its engine at a given speed.

"We need never fear that a fan will run away if some accident should cause the doors in the mine to be blown out, and short-circuit the air. The fan will slow down instead of running away. The fear of a fan running away is all imaginary."

I trust that other mine managers and engineers who are interested in the subject will express their opinions concerning this phase of ventilation.

MINING ENGINEER.

West Virginia, April 28, 1907.

#### Moisture in English Chalk

I am anxious to ascertain the average moisture content of English chalk, imported into the United States. W. C.

Chicago, March 29, 1907.

English chalk is usually shipped without precautions against exposure to weather, and 90 per cent. is received wet, containing about 30 per cent. moisture. Ordinary drying will remove all but about 10 per cent., and kiln-drying will remove practically all of the contained water.

Preparations are being made at the Great Cobar copper mine, New South Wales, for doubling the present output. The new plant will consist of three large blast furnaces, each of 500 tons daily capacity. Each furnace will have a blower capable of delivering 30,000 cu.ft. of air per min., up to a pressure of about 3 lb. per sq.in. The slag from the furnaces will be handled by electric locomotives hauling cars of 25 tons capacity. The cost of the new plant is estimated at £160,000, its nominal capacity being 100 tons of ore per day, the intention being to have one blast furnace always in reserve.

The weight and fineness of the new dollar in the Straits Settlements and the Federated Malay States has been fixed at 312 and 900 respectively. The 50c. piece is to be of the same fineness, but exactly half of the weight of the new dollar.



## New Publications

**CONCRETE FACTORIES.** An illustrated review of the principles of construction of reinforced concrete buildings, including reports of the Sub-Committee on Tests, the United States Geological Survey and the French Rules on Reinforced Concrete. Compiled by Robert W. Lesley. Pp. 152; illustrated. 7x10 in.; board covers. Price, \$1. New York, 1907. Published for the *Cement Age* Company by Bruce & Banning.

This book contains reports of a sub-committee on tests of the joint committee on concrete and reinforced concrete appointed by several engineering societies, together with the French rules on reinforced concrete and several articles on reinforced concrete construction, concrete in factory construction, the value of concrete as a structural material, etc. The book embraces much that is of interest and much that is valuable in the way of information on the present state of the art of concrete and reinforced construction.

**"ROCK MINERALS, THEIR CHEMICAL AND PHYSICAL CHARACTERS AND THEIR DETERMINATION IN THIN SECTIONS."** By Joseph P. Iddings. Pp. 548; illustrated. 6x9 in.; cloth, \$5. New York, 1906: John Wiley & Sons.

Contents. Chemical principles and characters. Physical principles and characters in part. Optical properties. Description of the rock minerals according to groups.

This is especially a book for the student of petrology. Its treatment of the abstruse subject to which it pertains is considerably beyond the limits of the practising mining geologist; it is far beyond those of the ordinary mining engineer. Among specialists in petrology it will be highly esteemed, and to the student of that science it will be a particularly valuable guide. Indeed, the first part of the work, relating to the chemical and physical principles that underlie the science of petrology, will be valuable to all geologists, the presentation of those principles being clear and concise.

**"THE GEM CUTTERS' CRAFT."** By Leopold Claremont. Pp. 296; illustrated. 6½ x9½ in.; cloth, \$5. London, 1906: George Bell & Sons.

This is a handsome book, that deals with a subject of general interest. Who is there who is not interested in the beautiful stones that are cut for gems? What is more fascinating than a visit to a lapidary's shop, where the various processes of cutting can be observed? Mr. Claremont's book is the next best thing to such a visit. In many respects it is decidedly superior, because he tells many things that the casual visitor would not observe even if he had the opportunity to do so. As he says in the preface:

"There are many books upon the subject of precious stones, but the present one is the first to be written by a practical gem-cutter. I have frequently been asked: What do certain gems look like before they are cut? How can one tell one kind of precious stone from another? What gems are likely to be found associated with such and such minerals?"

Mr. Claremont, who is a well-known gem-cutter of London, and also an experienced author (having been a contributor to the *JOURNAL* and "The Mineral Industry") has answered these questions, and many others, in a popular way in his book. We think the latter will be found to be a useful assistant. There will be no question that it is interesting.

## Palmarejo and Mexican Goldfields, Ltd.

In the report of the Palmarejo and Mexican Goldfields, Ltd., for the year ended June 30, 1906, the financial statement is condensed as follows:

Receipts:	
Concentrates .....	£14,494
Cyanides .....	41,650
Slimes and export ore.....	10,886
Stores, rents and exchanges.....	2,221
Transfer fees and interest.....	449
Total .....	£69,700
Expenses:	
Salaries, wages, etc., in Mexico.....	£56,529
London expenses.....	8,016
Difference in years stocks.....	1,835
Total .....	£66,380
Balance for 1906.....	£3,320
Previous balance.....	6,184
Carried forward.....	£9,504

No costs of mining, milling, supplies, etc., are separately enumerated in the report, nor is there a specific statement of underground operations.

## Tennessee Coal, Iron and Railroad Company

This company owns extensive coal and iron properties in Alabama and Tennessee. It also owns and operates 16 blast furnaces, of which 6 are at Ensley, 5 at Bessemer, 2 at Oxmoor, 1 at Birmingham, Ala., and 2 at South Pittsburg, Tenn.; steel works at Ensley, comprising eleven 50-ton basic open-hearth furnaces, one 250-ton primary furnace, one 15-ton Bessemer converter, blooming mill, rail mill, etc., and in process of construction two 20-ton Bessemer converters, four 65-ton open-hearth furnaces and a 36-in. rail mill of 25,000 tons monthly capacity; rolling mill at Bessemer, having 24 single puddling furnaces, muck mill and bar, guide, plate and fire bed mills. At the coal mines there are 2974 coke ovens in operation. The report is for the year 1906.

The company has outstanding \$124,500

preferred and \$25,931,018 common stock. The bonded debt amounts to \$14,269,000 in all.

The financial statement for the year is as follows:

	1905.	1906.	Changes.
Gross earnings..	\$10,951,979	\$13,265,971	I. \$2,313,992
Work'g expenses	8,467,840	10,512,811	I. 2,044,971
Net earnings..	\$2,484,139	\$2,753,160	I. \$ 269,021
Depreciation and renewals.....	\$ 625,090	\$ 770,678	I. \$ 145,588
Interest, etc.....	890,765	895,145	I. 64,380
Total charges .	\$ 1,455,855	\$ 1,665,823	I. \$ 209,968
Net income....	\$ 1,028,284	\$ 1,087,337	I. \$ 59,053

From the net income in 1906 there were paid dividends of \$9964, or 8 per cent., on preferred, and \$950,492, or 4 per cent., on common stock. The working expenses last year were made up as follows: Labor and material, \$8,439,505; repairs and maintenance, \$1,541,218; general expenses, taxes and insurance, \$532,088. The net surplus for the year was \$126,881, after paying dividends.

The production statement for the year is as follows:

	1905.	1906.	Changes.
Coal mined.....	2,231,659	3,007,657	I. 775,998
Coke made.....	890,634	1,186,872	I. 296,238
Iron ore mined.....	1,436,282	1,483,476	I. 47,194
Pig iron made.....	529,036	641,887	I. 112,851
Steel rails, bars, plates and billets..	402,318	401,882	D. 436

The unfilled orders on the company's books, as of Jan. 1, 1907, called for 467,114 tons iron and steel; 201,700 tons of coke and 1,200,000 tons of coal. The number of men employed was 10,414 in 1905, and 11,857 last year.

The total expenditures for additions to property in 1906 were \$1,553,883. These included large expenditures on the iron ore properties at Red Mountain and a new dolomite quarry. New iron ore mines known as the Potter property, heretofore under joint lease to the Tennessee Coal, Iron and Railroad Company, and the Republic Iron and Steel Company, were during the year acquired by joint purchase with the Republic company at a price and on terms exceedingly favorable to the Tennessee company. Valuable acreage was also acquired near the Ketona dolomite property that will approximately double the dolomite or limestone reserves. Large appropriations have been authorized for the construction of seven modern coal washers, and within a few months the entire coal requirements for coking will be properly washed, and the coke produced will then be of a superior quality. In addition to new washers, new mines are being opened and the facilities at old points strengthened. The coking capacity has not been extended, but has been increased by liberal repairs to old equipment, and further increases may be expected from this policy of rigid maintenance.

The labor situation has not been good, and there is much difficulty in securing the needed supply of efficient men in all branches of the work.

## Personal

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

Thomas Cole, of Duluth, was in Calumet, Mich., recently.

Edwin E. Chase has left Denver, Colo., for a trip to Nevada and Arizona.

Hon. Richardt McBride, minister of mines for British Columbia, has gone to England.

J. A. Davis, of Denver, Colo., is traveling through Mexico in search of low-grade zinc ores.

Anthony Blum, president of the Laurentian Gold Mines, Ltd., was at Manitowishkeg, Ont., last week.

Leo Goldsmith, of New York, is in Virginia, examining manganese deposits for a New York company.

R. A. Hadfield, of Sheffield, England, president of the Iron and Steel Institute, is a visitor in New York.

Fred G. Farish sailed from New York, May 6, on his way to Amsterdam, Holland, on professional business.

John McLain has been appointed supervisor of mines of the Westmoreland Coal Company at Irwin, Penn., and other points.

F. E. Schoonmaker, geologist and mining engineer, of Detroit, Mich., has returned home from a trip to Larder Lake, Ontario.

A. B. Cockerill, of Nevada, Mo., president of the Cockerill Zinc Company, has returned home after a trip through northern Mexico.

Woolsey McA. Johnson, metallurgical engineer, of New York, has gone to Kansas, New Mexico and Colorado on professional business.

C. M. Van Law, general manager of the Guanajuato Reduction and Mines Company, is on his way to Europe for a much needed rest.

Prof. Willet G. Miller, Provincial geologist of Ontario, has received the honorary degree of LL.D. from Queens University, Kingston, Ontario.

Prof. Robert H. Richards has returned to Boston from Pennsylvania, where he has been advising in regard to iron and copper concentration.

R. B. Brinsmade is conducting the classes in geology at the University of Kansas, Lawrence, Kan., for a few weeks, during the absence of Professor Haworth.

Bernard MacDonald, of Guanajuato, has opened an office at No. 40 Wall street, New York, as mining engineer. He will make Mexican mines a specialty.

A. A. Hassan, of New York, is going to visit Cobalt, Ont., Larder lake, and the Montreal river country, to examine several mines and explore the territory generally.

James McEvoy, of Fernie, East Kootenay, B. C., geologist and chief engineer for the Crow's Nest Pass Coal Company, is recovering at Victoria from an attack of pneumonia.

M. E. MacDonald has resigned from the active management of the Guanajuato Consolidated Mining and Milling Company, Guanajuato, Mexico, to look after his own private mining interests in Mexico.

Mrs. Harriet Connor Brown, who has prepared the press bulletins issued by the United States Geological Survey for over three years past, has resigned that position and removed from Washington to Chicago.

Walter S. Brown, of Wiard & Brown, Denver, is at present in Mexico on professional business. Upon his return he will remain for some time at the Cleveland-Arizona property, near Red Rock, Arizona.

Thomas R. Williams, for 38 consecutive years foreman of the Susquehanna Coal Company, has retired from the position he had held so long. A dinner was given him in Scranton, Penn., at which there were 147 fellow employees and friends.

George Ames, for several years cashier of the Utah Consolidated Mining Company, with headquarters in Salt Lake City, has resigned to accept a position with the Bamberger mining interests. He will have his headquarters at Park City, Utah.

Capt. Henry Guyer, of Lima, Peru, for many years connected with the Backus & Johnston Smelting Company, of Casapalca, and representative for the Allis-Chalmers Company, has been obliged to give up all further business on account of failing health.

G. A. Richards, general manager of the Mount Morgan Gold Mining Company, of Queensland, Australia, is visiting in New York, where he is making his headquarters during a study of American metallurgical practice. He starts for home this week, by way of Vancouver.

G. D. Delprat, general manager of the Broken Hill Proprietary Company, of Broken Hill, New South Wales, is visiting in Europe, where he is studying the methods of zinc smelting, with reference to the operation of his own company at Port Pirie, South Australia.

Hon. W. Templeman, Canadian Minister of Inland Revenue, has resigned the presidency and directorship of the Airgold Cobalt Company for the reason that, being a minister and responsible for the administration of the mines branch, his name ought not to be used in connection with any mining venture.

Janin, Stebbins & Smith announce the dissolution of the firm. Mr. Stebbins opened an office at 1201 Chronicle building, San Francisco, on May 1, 1907. Mr. Janin and Mr. Smith will continue as associated engineers at 804 Union Savings

Bank building, Oakland, Cal., until suitable offices can be obtained in San Francisco.

W. C. Thomas, for some time past superintendent of the Dominion Copper Company's smelter in the Boundary district in British Columbia has been appointed resident general manager, in succession to T. R. Drummond. George Williams, for several years superintendent of the British Columbia Company's smelter in the same district, is now filling a similar position at the works of the Dominion Copper Company.

T. A. Jaggard, Jr., professor of geology in the Massachusetts Institute of Technology, Boston, is at the head of a party which arranged to leave Seattle, Wash., on May 1, for the Aleutian Islands, Alaska, to study seismic and volcanic conditions. The party was to include Prof. H. V. Summers, of Drexel Institute, Philadelphia; Prof. A. S. Eakle, University of California; Dr. E. C. Van Dyke, and several scientists associated with Professor Jaggard in Boston.

Dr. George F. Kunz has received through the French consul-general the decoration of Chevalier of the Legion of Honor, conferred upon him in recognition of his scientific work. Dr. Kunz, who is head of the diamond department at Tiffany's, is a native of New York and is 50 years old. He has received honorary degrees from Columbia and the University of Marburg, has done special geological research work for the Government, and is president of the New York Mineralogical Club, vice-president of the American Institute of Mining Engineers. In 1889 he received from the French government the decoration of *Officier d'Instruction Publique*, and he is an honorary member of various foreign scientific societies. His book, "Gems and Precious Stones," published by the ENGINEERING AND MINING JOURNAL, is recognized as authoritative, and as a masterpiece in its field.

## Obituary

Georges de La Bouglise, a prominent mining engineer of wide experience, died at his residence in Paris, France, April 15, aged 65 years.

Thomas Phillips, of Scranton, Penn., superintendent of the washery department of the Delaware, Lackawanna & Western, was killed, last week, by being struck by a passenger train, near the Brisbin colliery.

Henry B. Curran, for many years a member of the well known coal firm of Castner, Curran & Bullitt, of Philadelphia, died suddenly, May 4, at Hot Springs, Ark., where he had gone for treatment for certain heart symptoms.

Charles C. Swart, for 14 years in charge of the advertising and catalog business of the Gates Iron Works, Fraser



& Chalmers, and the Allis-Chalmers Company, of Chicago, and later occupying a similar position for over two years with the Union Iron Works and for the past year with the Fulton Iron Works, San Francisco, died in St. Luke's Hospital, in that city, April 9, the result of an operation for appendicitis. He was an acknowledged expert in his work.

Robert S. Mercur, general manager of the Kingston Coal Company, met his death last week, while at No. 4 colliery, Wilkes-Barre, Penn., inspecting some repair work. Mr. Mercur was seen to suddenly fall forward and when some men went to his aid he was dead. For some days he had complained of pains in the region of the heart and death was believed to be due to heart trouble. He was formerly superintendent of the Centralia division of the Lehigh Valley Coal Company, and succeeded the late Gwilym William as superintendent of the Kingston Coal Company, in 1904. He was the son of Frederick Mercur, who was the general superintendent of the Lehigh Valley lines up to the time of his death in 1888. Mr. Mercur was a graduate of Lehigh University and leaves a widow and two children.

Thomas B. Riter, president of the Riter-Conley Manufacturing Company, Pittsburg, died at his home in that city on April 23. He was born at York, Penn., in 1840. He went to Pittsburg when quite young and secured employment with Marshall Brothers, with whom he remained many years. James M. Riter, an elder brother, founded the present company, starting in 1858 a steel construction shop. Thomas Riter began to work for his brother as a blacksmith and learned the details of steel construction. When in the later sixties the oil production in Pennsylvania assumed great proportions the Riters launched into the tank-building business, and soon had a practical monopoly in this class of steel construction. After the death of James M. Riter, in 1873, Thomas B. Riter and W. H. Conley bought the plant from the widow. In 1898 Mr. Conley died and Mr. Riter incorporated the Riter-Conley Manufacturing Company, becoming the president and taking into partnership with him several young employees who had distinguished themselves in their several departments. The firm built practically all the blast furnaces in Allegheny county, and has for years been represented all over the world. Among its important foreign contracts was the erection of three blast furnaces and the open-hearth steel plant for the Dominion Iron and Steel Company, at Sydney. The company has done much work in South African mining camps. All over Mexico and South America may be found work planned and directed by Mr. Riter. At present the company is engaged on the construction of the blast fur-

naces of the United States Steel Corporation at Gary, Ind. It built the great refinery of the Gulf Refining Company, at Port Arthur, Tex., and the Burke refinery at Beaumont, Tex., with tanks that are among the largest in the world. Mr. Riter was a member of the Engineers' Society of Pittsburg. He leaves a widow and a son, Joseph Riter.

## Societies and Technical Schools

*Stevens Institute of Technology*—This school, at Hoboken, N. J., has made a special feature of the section of its library devoted to patent literature. Prof. W. H. Bristol has contributed largely to the support of this section. Miss E. M. Hawkins has recently been placed in charge of the library.

*Colorado Section, Western Association of Technical Chemists and Metallurgists*—This association gives notice that the program for an early meeting of the section shall be a symposium on the cyanide treatment of ores. A number of papers by prominent cyanide men are promised and each phase of the subject will be thoroughly discussed. Every member interested in cyanide work is urged to help this program. If any member wishes to submit a question it will be presented for discussion at this meeting. The next meeting of the section will be held May 14. The subject of the evening is the "Determination of Silica, Iron and Lime."

## Industrial

The Epping Carpenter Company, Pittsburg, Penn., manufacturer of pumping machinery, has opened an office in the West Street building, 90 West street, New York. T. B. Slocum and George B. Ferrer, Jr., are in charge.

The Midvale Steel Company, Philadelphia, on May 1 moved the general sales office for the Pacific coast to the Monadnock building, San Francisco, where it will be permanently located. Jas. C. H. Ferguson is Pacific coast sales agent. This company has also recently occupied the new steel warehouse on Folsom street, San Francisco, Cal.

In a fire at the works of the Indianapolis Switch and Frog Company, at Springfield, Ohio, April 23, the main building of the machine shop was entirely destroyed excepting the walls. This building was 400x225 ft., and will be rebuilt at once as a fireproof structure. There was practically no loss of material or work in course of erection, and temporary arrangements are being made to complete, as far as possible, unfinished orders.

## Trade Catalogs

The W. Gerhardt Works at Lüdenscheid, Westphalia, Germany, are desirous of receiving manufacturers' catalogs of machinery, tools and power-plant equipment for rod, bar, wire and tube rolling mills, and for stamping and drop forging.

Receipt is acknowledged of the following trade catalogs and circulars:

Monarch Road Roller Company, Groton, Tompkins County, New York. Monarch. Pp. 18, illustrated, paper, 6x9 in.

Allis-Chalmers Company, Milwaukee, Wis. Leaflet No. 2002. Valve Gear, Piston Details and Governor of the Reynolds Corliss Engine. Pp. 4, illustrated, paper, 8x10½ in. Bulletin No. 1421. The Overstrom Table for Concentrating Ores. Pp. 20, illustrated, paper, 8x10½ in.; February, 1907.

## Construction News

*Central City, Colorado*—New machinery is to be put in by the Hampton Consolidated Mines Company. N. I. Hughes, Central City, Colo., is manager.

An air compressor is to be installed at the Grand Central mine. D. McMasters, whose address is the Pleasanton, Denver, Colo., is manager for the company.

*Idaho Springs, Colorado*—The Sterling Mines & Tunnel Company is preparing to put in a plant of machinery at its mine. J. Hobson, Idaho Springs, Colo., is manager.

*Holmes, Wyoming*—The Medicine Bow Mines Company proposes to build a 50-ton concentrating mill for copper ores. G. S. Simmons, Holmes, Albany county, Wyoming, is president.

*Ute Creek, Colorado*—Arrangements are being made to install an air compressor and other machinery at the Humboldt mine. Frank C. Smith, Idaho Springs, Colo., is manager.

*Steamboat Springs, Colorado*—The Hyatt-Verde Mining Company is preparing to install an air compressor and other machinery. D. C. Hazelbacker, Steamboat Springs, Routt county, Colo., is manager.

*Greenville, California*—The Indian Valley Mining Company contemplates the erection of a cyanide plant at the Indian Valley mine, during the present year. E. J. Franz, Greenville, Plumas county, Cal., is superintendent. The company also has an office at 114 Liberty street, New York.

*Rusk, Texas*—The Rusk Iron Company has bought the old Star and Crescent furnace and will make extensive additions to the plant, requiring new machinery. W. H. Oatley, Hartford, Conn., is president; W. F. Knox, Rusk, Texas, is a resident director.



# 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

May 1—It is now apparent that an aggressive fight against the gold-dredging industry is to be waged by the Anti-Débris Association and certain farmers of Sutter and Yuba counties. Funds have been raised, attorneys have been employed and a test suit is to be commenced at once. The dredge owners will thus be placed on the defensive in the steps being taken to force them to protect the farming lands from the encroachment of the débris. Injunction suits are to be brought, as was done in the case of the hydraulic miners in the famous suits against the North Bloomfield Mining Company, in which the farmers were successful. The Dredge Miners' Association, at a meeting in Oroville last week, agreed that the dredger "Pennsylvania" should be secured to throw up a barrier of tailings at Gold Run, a point below the city, upon the left bank of the river. After throwing up the barrier of rock tailings it is the purpose of dredge operators to make a fill of dirt so that a perfect retaining wall will be formed.

There is no change in the condition of affairs in the Mother Lode mines at Angels, in Calaveras county. The mines still remain closed and the men idle. The demand for an 8-hour day was refused by the mine owners, and between 900 and 1000 men are out of work in consequence. Thus far the trouble with the miners on this question has not spread into Tuolumne and other Mother Lode counties, but there are signs of discontent and controversy. The trouble has been mainly brought about by the men from eastern and southern Europe, who have no interest in this country and no sympathy with the local conditions. Numbers of men have left for the prosperous mining camps in Nevada. For fear of a general desertion the officials of the union threaten to blacklist any member who leaves the section where the strike is being enforced. The different properties affected are being protected by armed men for fear of damage by men who have voluntarily quit work. The mines will doubtless remain closed until men can be obtained who will work for \$3 with a 10-hour day.

The independent oil producers of Coal-inga and Kern-river fields in the San Joaquin valley are planning to build a pipe-line from Kern river through Coal-inga to tidewater near San Jose at the southern end of San Francisco bay. The distance is 225 miles and the estimated cost is \$7500 per mile. The expense will,

therefore be heavy, but the independent producers will be freed from the domination of the corporations now controlling the prices of the oil in the valley field. The Santa Maria producers, in Santa Barbara county, are threatening similar steps unless conditions improve and they get a better price for their product.

The Southern Pacific Company has authorized its agent at Reno, Nevada, to make the announcement that in the future all deeds made by the company there will not have a mineral-reservation clause. This clause, which has been inserted in all deeds conveying the lands originally granted the Central Pacific, has been used for the past four years, its effect being to reserve for the company all minerals contained in the lands. The recent action, which originated with Land Agent W. H. Mills, will prove beneficial to prospectors and the mining industry at large, as the reservation clause formerly used was very broad and sweeping in effect. No announcement has been made as yet concerning the future policy of the company in regard to permitting exploration and location of the patented lands of the company by miners. The California Miners' Association has for years been trying to get the railroad company to let prospectors enter the patented lands, with some guarantee that if they found anything they would not be charged exorbitant prices for it. But more to the point have been the efforts of the association to have all the railroad sections examined before patent is issued, so that such portions as were mineral might be reserved for the prospector and miner. In this they have been uniformly unsuccessful, though the laws plainly state that all minerals are reserved for the people.

Capt. J. W. Morrell is trying to make a consolidation of the mining interests around Alleghany, Sierra county, to take in some 1500 acres of mineral ground, both placer and quartz.

The maximum capacity of the new railroad being built to connect the Mammoth smelter, Kennett, Shasta county, with the mine, will be 3600 tons of ore daily. This is determined by the section of the road over which the ore is conveyed in a gravity tram, where an elevation of 1600 ft. is overcome in 4000 ft. distance.

Having completely lost his residence and winery by fire about a year ago, E. Kiegel has come to the conclusion that he had better work his vineyard for all the wealth there is in properly cultivating both sides, and therefore while the grapes

are ripening he will be digging a tunnel on the other side and working a quartz ledge that has already showed assays of from \$40 to \$60 a ton. The property is located on Lost hill, Nevada City, and Kiegel had already pushed his tunnel along under his vineyard quite a distance in the direction of the ledge when the fire came and swept away his possessions. That disaster caused him to cease work for a while, but now he intends to make up for the delay. The tunnel will be run as a crosscut to intersect the ledge, about 700 ft. of which is on his property and which is believed to be an extension of the Reward mine on the other side of Deer creek.

Creditors of the Squaw Valley Mining Company, of Gazelle, Siskiyou county, have filed a petition in the United States District Court in San Francisco asking that the company be declared an involuntary insolvent, the creditors being Boston men. The petition sets forth that at a meeting of the directors held in Boise City, Idaho, the corporation admitted that it was insolvent. The company owns among other mines the famous Dewey group, which at one time paid handsomely. What they really need up there now is a good electrical power plant.

### Salt Lake City

May 4—The Gold Mountain Consolidated Mining Company, of which Albert Carr, of New York, is a controlling factor, has acquired the Annie Laurie mine in the Gold Mountain mining district, in Piute county, and several adjoining properties, which gives it possession of an area approximating 2500 acres. The Annie Laurie mine was formerly a dividend-payer, and is equipped with a mill, which is to be remodeled and enlarged.

The first unit of the Utah Copper Company's new concentrating mill at Garfield is practically ready for operation. The bins are being filled with ore. The ore transportation facilities are not yet of a character entirely satisfactory to the management.

Jesse Knight, of Provo, and associates, have acquired the old Emma mine, at Alta, which was once quite a noted producer. A new company will be formed to operate it.

The Daly Judge Mining Company, at Park City, has issued its annual report to shareholders covering the operations of the company during the year 1906. An indebtedness of \$230,977, consisting of

\$209,000 worth of outstanding bonds and an overdraft at the bank of \$21,978.68, was liquidated and at the beginning of the current year the treasury contained a balance of \$269,038. The total net earnings amounted to \$500,015, or 61.2 per cent. of the gross earnings. A total of 63,322 tons of ore was mined, 13,011 tons of which was of a shipping grade. The mill treated 58,845 tons, the result of which was 9838 tons of lead concentrate, and 8320 tons of iron and zinc middlings, showing one ton of concentrate produced from each 3.2 tons of crude ore. The mill handled an average of 165 tons per day. A recent examination of the mine was made by President John J. Daly, and in a statement accompanying the report he says that there has been an impoverishment of the orebody opened on the 1500-ft. level last year, with a corresponding decrease in earnings. He believes, however, that the vigorous development now in progress will result in the opening of other important ore channels. About 2000 ft. of exploratory work was performed last year. The total production of the mine since the incorporation of the company has amounted to 1,068,346 oz. silver; 3,544.74 gold; 28,961,777 lb. lead; 12,188,260 lb. zinc; 156,110 lb. copper, all of which sold for \$1,279,076.24.

#### Scranton

May 6—Letters have been sent out by the Fulton Coal Company to the minority stockholders stating that the Philadelphia & Reading is willing to take over their holdings at \$2.05 per share. The latter company owns 63,537 shares of the total of 71,129, leaving 7682 in the hands of the public. The Fulton Company owns land in the Shamokin region, and the only colliery on the land is the Enterprise, leased to W. L. Connell, of Scranton, and others.

The commissioners of Luzerne county have finally settled the assessment problem by placing the valuation at \$67 per acre for every foot in thickness of coal. This means that the coal 50 ft. in thickness will be assessed at \$3350 an acre. The average valuation in the county was \$1500.

The Hickory Swamp breaker, one of the pioneer structures in the anthracite region has been abandoned, and the coal from the Swamp mine will be taken to Hickory Ridge breaker, near Shamokin. The latter has been remodeled.

The washery of the old Plymouth Coal Company, at Plymouth, was destroyed by fire last week. The plant was formerly known as Delaware & Hudson breaker No. 5, and was recently bought by Rissinger Brothers.

The Reliance Coal Company, of Pittston, has commenced an action against the Pennsylvania Coal Company, to recover \$20,000 damages for the flooding of the workings with water, due, it is alleged, to the negligent manner in which the Pennsylvania Coal Company conducted

mining operations, permitting a stream of water to flow into the Reliance workings.

The Northeast Coal Company, which operates a new colliery between Carbondale and Forest City, has had a strike on its hands for some time. The company made a proposition to the miners that the matter be submitted to a board of arbitration, the decision to date from May 1. The men refused to accept the offer.

#### Toronto, Ont.

May 4—The Montreal river silver area is being rapidly extended as prospectors take up locations farther inland. The townships of Tudhope and Truax, adjoining James township, are nearly all staked. Native silver has been discovered in Truax.

The Ontario Department of Mines has decided upon an exploration of the Larder Lake district during the summer. Considerable attention will also be devoted to the Lady Evelyn and adjoining areas, the geological conditions of which will be fully investigated. Owing to the continual reports of new discoveries and the enlargement of the known mineral area the season will be a very busy one for the officials.

#### London

April 27—During the last two months or so, a great deal has been heard in London about a new fuel called "coalite," which it is claimed will solve the smoke problem. In London the local laws governing the discharge of smoke into the atmosphere from factories and workshops are very severe, anything like a black smoke being prohibited, under penalty of heavy fines. No regulation has ever been made, however, in connection with the discharge of smoke from houses and other dwelling places, presumably because of the absence of any practicable alternative to bituminous coal. Considerable improvement has taken place in recent years by the substitution of gas fires, but for ordinary heating purposes these are out of the reach of poor people. The promoters of coalite are confident that their fuel will be an effective substitute for bituminous coal, and be within the means of the poorest. They have not yet issued any technical description of their fuel, but an inspection of it leads me to the belief that it is a partially coked bituminous coal. It is probably treated at a temperature just sufficient to make the carbon swell up into a porous mass, but apparently very little of the bituminous matter is actually extracted, for the fuel burns with a pleasant clear flame in the open grate. It is stated also that in the process of manufacture smalls and fines can be employed. If the claims of the promoters are fulfilled, and if the fuel can be prepared and sold at a reasonable price, there will be an opening for coalite. I may say that Thomas Parker, a well known engineer, is the inventor, and that the financial backers of

the scheme include many influential coal owners and coal users.

At the present time the only producer of aluminum in this country is the British Aluminum Company, the progress of which has been noted in the JOURNAL from time to time. The success of this company and the increase in the demand for aluminum and its alloys, especially among motor-car designers, has caused another group of electrical engineers to undertake the manufacture of this metal. The new scheme provides for the construction of works in Carnarvonshire, North Wales. Away up in the hills not far from Snowden, but out of the beaten track of tourists, are a number of lakes admirably adapted for the generation of water power. It is one of these lakes with a Welsh name, unspellable and unpronounceable to the Saxon, that is to be employed for this purpose. The new company is called the Aluminium Corporation Ltd., and though the prospectus has been nominally advertised, the negotiations have all been conducted privately, so that scientific and technical details have not been made public. I am therefore unable at the present time to say what process is to be used or where the raw material is coming from. The company starts with £250,000 cash resources. The first plant, which should start operations by the end of this year, will provide 800 h.p., and the larger plant to produce 6000 h.p. will be in operation in about two years. The whole of the cash above mentioned will be required for the acquisition of the land and the erection of the plant. Later on, additional money will be required for working capital. The names of engineers connected with the venture include Beardmore, Manville, Harpers, Bruce Peebles, and others.

#### Johannesburg

March 25—Lion Hills, one of the favorite "horses" on the stock exchange for a week, has had a big drop. A report came out some time ago, stating that a diamond pipe had been found. This sent the shares of this company "sky high." Much was expected from the trial wash, and the shares mounted to 120 each. Then the results of the trial wash were made known, and it was found that there were no diamonds, the shares came down with a run, and today stand at £4 15s. This venture is only a sample of many others that the Johannesburg public has gone into. There is an inveterate gambling spirit in this place, and promoters are kept busy getting up ventures. It makes little difference whether the proposition be gold, copper, tin, silver, or diamonds; although at the present time diamonds appear to be the most popular gambling counter.

Of course there is a big element of chance in diamond mining, but the mining engineer cannot keep wishing that there was more conscience.



# 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

*Oneida Mining Company*—The property of this company between Jackson and Sutter Creek, has been closed down, the men discharged, and the machinery will be removed. After several years of prospecting the mine is found to be a failure.

*Lucas*—This mine, near Big Bar bridge, has been closed down indefinitely. The recent storms did so much damage that it was decided to cease operations.

#### BUTTE COUNTY

*United States Diamond Mining Company*—This company has been formed to develop the Cooney property above Groveville, with the following directors: M. J. Cooney, C. A. Moore, A. G. L. J. A. Christie and F. M. Ballard.

*Indiana Dredging Company*—This company, which lost two dredges during the floods last month, has decided to build two new ones to replace those lost.

#### DEL NORTE COUNTY

*Low Divide District*—The 300-ft. tunnel in the Zaar mine shows up a 4-ft. ledge of good-grade copper ore, and shipments to a smelter are to be made.

#### ELDORADO COUNTY

*Delwisch*—Men have been set at work on this gravel mine, near Georgetown, and the mill has been started up.

#### INYO COUNTY

*Greenwater & Death Valley Mines and Smelting Company*—The respective shafts are reported to improve with depth, in the opinion of Malcom MacDonald, manager of the Schwab interests. The smelter will be located at Ash Meadows, where there is plenty of water. The machinery has been ordered and will be delivered when the railroads are finished.

#### MONO COUNTY

*Standard Consolidated Mining Company*—President Westheimer and Secretary Lassen of this company, at Bodie, are arranging for the purchase of machinery to increase the capacity of the power plant and add materially to the reduction works.

#### NEVADA COUNTY

*Conlin*—This mine at Grass Valley has been unwatered and has been started up with a full crew. The new 10-stamp mill be ready for operation in two weeks.

*Sultana Group*—These mines, which

have been filled with water since the recent storms, have been unwatered and work resumed.

#### SHASTA COUNTY

*Shasta King Mine*—The skipway of this mine to the top of the hill to connect with the tramway to the Balaklala tram is virtually completed and will handle 500 tons of ore daily.

*Mammoth Mining Company*—The smelter of this company, at Kennett, now of 1100 tons daily capacity, is installing two new furnaces.

*Great Western Company*—The smelter of this company at Ingot is of 500 tons daily capacity. A railroad is to be built from the plant to the Pitt river to join the Sacramento Valley Eastern Railroad. This will furnish the transportation facilities which are much needed for the smelter, and which are now lacking.

*Corner Group*—This group of mines on Salt creek in Lower Springs district has been sold to the Stauffer Chemical Company, of San Francisco. The ore will be shipped to local smelters.

#### SIERRA COUNTY

*Plumbago*—At this mine the flume conveying power water was carried away by the recent storms, causing a cessation of work.

*Alleghany-Forest District*—Several quartz ledges at American Hill are now to be worked. The Pilgrim is to be operated by an English-American company, T. A. Patterson, manager. The Humboldt is to be reopened by W. H. Wheeler, of Nevada City, and Los Angeles men. The Keller, an extension of the Pilgrim, has been bought by T. Garver and others, of Los Angeles. The Independence, owned by Mrs. B. Latrielle, of Downieville, is to be developed at once. Development work has been commenced on the Olivet.

#### SISKIYOU COUNTY

*Mono*—This mine, formerly the Punch Creek, has been sold to C. C. Broadwater, of Montana, who has made a good payment on the purchase price and is to sink 200 ft. deeper before paying the balance of the \$180,000. The mine has been paying well for some years and formerly belonged to G. W. Grayson, of San Francisco.

*Sheba*—The electric plant established at this mine to furnish power is now working satisfactorily.

#### STANISLAUS COUNTY

*Copper Mountain*—Thomas Donohue and others are opening this mine, 10 miles east of La Grange on the Tuolumne river.

#### TRINITY COUNTY

*Golden Jubilee*—A wide ledge of high-grade ore is reported struck in this mine at Carrville. Wm. Chapman, superintendent.

#### TUOLUMNE COUNTY

*Lumsden Group*—A strike of high-grade ore was made in this mine at Jawbone while assessment work was being done.

*App*—The shoot of ore recently found in this mine in the 1100 level is proving strong in body and of good value.

*Santa Ysabel*—This mine has been unwatered and a force of men set at work.

#### YUBA COUNTY

*Mount Hope*—This property in New York township has passed into the control of an Eastern company, with Paris Bean as superintendent. The mine has not been worked for some years.

## Colorado

#### BOULDER COUNTY

*Marquette*—This company has secured a long-term lease and option on the Richmond property at Salina. W. B. Leveque, Boulder, Colo., is manager.

*Rogers Tungsten Tract*—Philip Bauer & Co., of New York and Hamburg, Germany, have taken a long lease on this property in Boulder Cañon, near Nederland. They have let a contract to the John A. Traylor Machinery Company, Denver, for designing, furnishing all machinery for, and erecting a modern tungsten concentrating plant on the tract. The ore will first be crushed on two No. 4 Traylor fine crushers, to pass ¼-in. opening screen. The product between 20 mesh and ¼-in. will be jigged on Traylor standard all-iron jigs. The tailings from these jigs will be reground on an Elspass triplex roll to pass a 20-mesh screen. This product will be screened on five Imperial ore screens, being successively treated on four Wilfley tables and two Traylor improved frue vanners. The smaller product will first go to a Traylor slimes-settling tank, and be drawn off to the two vanners. This plant will be in operation, the latter part of June.

#### CLEAR CREEK COUNTY

*International*—F. H. Beers and Eastern



associates have become interested in a lease and bond on this group on Soda creek. Mel Crosson, Idaho Springs, has been appointed manager.

#### GILPIN COUNTY

*Eureka*—A strike of free gold ore has been made in the 300 west level, alongside of which is a good body of milling and smelting ores. J. C. Jenkins, Central City, Colo., is owner.

*Gunnell Hill*—Denver people are interested in the recent purchase of the O. B. Joyful mine, on Gunnell hill, for \$10,000, and have formed this company, intend to install machinery and carry on liberal operations.

*Pay Rock Consolidated*—Denver people are interested, having secured a lease and option for two years for \$50,000 on the Frances group, in Eureka district. D. Munday, Central City, is to be manager.

*Perigo*—This group of nine claims, together with the Perigo tunnel, 35 rapid-drop stamp mill and two mill sites, situated in the Independent district, owned by Potter & Lightbourn, of Central City, has been sold to J. K. Richardson, of Denver, associated with Massachusetts capitalists, consideration being \$200,000. Property is credited with production of \$3,000,000. J. K. Seaman, Rollinsville, Colo., is manager.

*Pewabic Consolidated Gold Mines Company*—The last quarterly production of this group of mines, in Russell district, is given as \$32,000, notwithstanding the fact that a large amount of development and sinking work was carried on. Company has made the last payment on the Pewabic group, besides purchasing the New York stamp mill for \$50,000. John C. Fleschhutz, Central City, Colo., is manager.

*Virginia*—Ore running high in gold has been opened up in the 500-ft. workings. George W. Mabee, Central City, Colo., is manager.

#### LAKE COUNTY—LEADVILLE

*Hoffer*—This shaft, in lower Big Evans gulch, and north of Poverty flats, is 304 ft. deep; the formation passed through is 40 ft. of wash, 200 ft. gray porphyry, 25 ft. of contact and mineralized matter, and now the shaft is 35 ft. in the lime. The pitch of the formations is to the southeast and one drift run 45 ft. got into the mineralization. The material that is coming out of the shaft shows small values, not only in silver and lead, but in gold as well. Another interesting feature is the fact that in connection with the oxidized matter is to be found distinctively sulphide ore. Work is being pushed in this material with every prospect of breaking into an orebody. The opening of a mine in this section would mark a new era in the history of the district. The great drawback in the past was the heavy flow of water, but since the Leadville basin has been practically drained by the Coro-

nado and Penrose no water was struck in the Hoffer shaft until after the first contact was passed.

*Little Evelyn*—This company is operating the Boulder claim, South Evans, and during the week succeeded in lowering the water to the bottom of the shaft. A little work has been done showing a body of ore of fair proportions. A station is at present to be cut at the bottom of the shaft, 400 ft., and when this is completed the shaft will be sunk a few feet deeper to determine the extent of the orebody. The shaft is making water at the rate of 500 gallons per minute. The strike is a most important one not only to the company, but to the district, as it opens up virgin territory, and will undoubtedly be the means of starting other properties in the neighborhood. Timothy Kyle is manager of the company, and has owned the ground for 29 years.

*Matchless*—This old producer, Fryer hill, is once more coming to the front as a producer of rich ore. The turn in the affairs of the mine took place when the McNeil lease, in one of the lower levels, broke into a good body of high-grade lead ore a few weeks ago. Development work has seen the ore channel widen out into a substantial orebody.

#### Indiana

W. H. Abbott, a representative of the Southern Indiana Railroad, appeared recently before the State tax board and pleaded for a decreased assessment. He said the earnings of the road had been affected because of difficulty experienced last winter in getting connecting roads at Terre Haute to take its coal for delivery in the Indianapolis and gas-belt markets. Had the connecting roads handled this business, Mr. Abbott said, the road would have hauled 200 cars per day to Terre Haute. The Southern Indiana, he said, now owned the Southern Indiana Coal Company and its 30 mines in Indiana. This coal company owns the Indiana Southern Railroad, so that now the Southern Indiana road owns all this property.

The coal-mine operators are still turning their attention to oil mining. They say they are confident that within two years there will be great oil developments in Vigo, Knox, Greene, Sullivan, Daviess, Clay, Owen, Gibson, Vanderburg, Posey, Clark, Washington, Jennings and other coal-bearing Indiana counties. The Princeton territory is proving good. The land owners are making fortunes and do none of the work. They lease the land at prices varying from \$1 to \$100 an acre and get from one-eighth to one-sixth of all the oil produced.

#### Missouri

##### MORGAN COUNTY

*Ouachita Pottery Company*—This com-

pany is preparing to work coal and fire-clay deposits near Versailles. The company owns about 1800 acres, and will work on a considerable scale. R. E. Bradford, of St. Louis, is president.

#### Montana

##### BUTTE DISTRICT

*Anaconda*—The shaft on the High Ore has reached a depth of 2700 ft. and is going to the 2800, which will make it about 300 ft. deeper than any other in the district. The vein has been crosscut at the 2400 and is yielding ore. It will be crosscut at the 2600 and 2800, but the work has not yet begun at the former. The Little Mina shaft is sinking to the 1000 and is below the 800. Drifting is progressing at the 2400 of the Anaconda mine and openings are going toward the Belmont from some of the lower levels. The company is mining considerable ore on the 800- and 900-ft. levels of the Belmont, but it is low grade and would hardly pay if copper were low in price. The Belmont is only 900 ft. deep and is of two compartments, but in about a week the work of enlarging it to three will begin. It is the intention to equip this property with heavier machinery, sink the shaft to 2000 ft. and make it the main outlet for Anaconda mine ore. It will be used also as an avenue for timbers used in the lower levels of the Anaconda and Neversweat mines.

*North Butte*—The management reports a daily output of about 1400 tons of ore, which is the present capacity of the property with only one shaft through which to operate. For the year ending March 31 the average monthly production of copper by North Butte was 2,738,825 lb., but in the last month nearly 3,000,000 lb. were turned out.

*Trenton*—Sinking in the Gagnon shaft has been suspended for the present, the opening having reached a depth of 2100 ft. This mine, which was supposed about a year ago to be an uncertain quantity as a producer in the future, is yielding more copper ore now than it has in several years. The output of the mine is about 400 tons of ore per day.

*Coalition*—The double-track tunnel from the surface of the Tramway toward the Rarus shaft will tap the Rarus opening at 210 ft. A large station will be cut at the shaft. All timber used in the lower workings of the Rarus will be framed near the entrance to the Tramway end of the tunnel, and hauled through the tunnel by an electric motor. All underground employees in the Rarus will use the tunnel as a means of ingress and egress to the mine. In opening the Tramway the company is receiving assistance from the Boston & Montana. The latter is crosscutting from the 1600 of the West Colusa, with a view of getting directly under the new shaft on the Tramway, now 1000 ft. deep,

and raising 200 ft. This raise will connect with one which Boston & Montana is making from the 1400, and when the work is finished the Tramway shaft will be 1500 ft. deep, there being a difference of 100 ft. in the elevation of the Tramway and West Colusa surface. With the Tramway shaft finished, Coalition will be in shape to increase its ore production greatly. The Snohomish, which adjoins the Tramway, will be worked through this shaft. Coalition owns half of the Snohomish and a third of the Tramway, the Butte & Boston owning the other interests.

## Nevada

### NYE COUNTY—BULLFROG

*Gibraltar*.—The main ledge continues to carry ore of uniform grade and a force of 30 men is engaged in sacking regular shipments to the smelters.

*Great Western Sampler*.—The Great Western Mining, Milling and Reduction Company has commenced the erection of a sampler and experimental cyanide mill at a site on the Tonopah Railroad at a point 10 miles north of Rhyolite. It is the intention of the company to erect a 600-ton mill if the experimental plant proves capable of dealing with the Bullfrog ores. The sampler will largely benefit local miners, particularly those interested in leasing and the development of new claims.

*Lee Bonanza*.—A strike has been made in the main workings at a point 200 ft. from the incline shaft. This shaft has been sunk to a depth of 60 ft. and when the 100-ft. level has been attained, drifts will be run to intersect the new strike at that depth. The vein at the bottom of the incline is 5 ft. in width and carries a little gold and silver. The new strike is most promising and will be developed at once by the sinking of an additional shaft.

*Mayflower*.—The recent strike in this property appears to be of even greater importance than was at first recognized. The vein is 18 ft. in width and carries large quantities of ore of milling grade. The property promises to become one of the greatest on the Bullfrog field.

*Montgomery-Shoshone*.—Shipments averaging between 1000 and 1200 tons per month are being made to the Salt Lake smelters. The ore is coming from the main dump, which was collected during the early development operations. The dump is estimated to contain 15,000 tons of shipping ore. The stoping reserves in the Shoshone and Polaris mines are at present intact and will not be drawn upon until the company's own mill, now in course of construction, is in operation. A new hoisting plant, two 100,000-gal. water tanks and numerous surface buildings are rapidly nearing completion.

*Tramp Consolidated*.—Development operations are being carried on by a force of 40 men under Superintendent Black-

mer. A station in the Denver winze has been prepared for a new hoist and the work of erecting the plant has commenced. This will greatly facilitate mining.

### NYE COUNTY—MANHATTAN

*Hindocraft*.—The main tunnel is in a distance of 100 ft., and its face is in ore of milling grade. It is proposed to continue the tunnel a further distance of 300 ft., with the view of intersecting other orebodies known to traverse the company's claims, and contracts will shortly be let for extending the work.

*Independence*.—Development work continues to result favorably. Several ore-bearing ledges have been opened up and values are increasing as sinking proceeds.

*Manhattan Crater*.—This mine has been purchased by a new company, in which a considerable amount of stock is held by prominent Pittsburg investors. A vigorous development plan has been decided on and a contract has been let for sinking the shaft a further depth of 200 ft. A hoist has been ordered from California and contracts for the surface plant and buildings will be placed shortly.

*Pine Nut*.—The northeast drift, at a point 320 ft. from the 200-ft. level, has penetrated a large orebody of milling grade. The tunnel lower down the hill has been driven in 420 ft. and is expected to reach the vein system soon.

*Thanksgiving*.—A 9-ft. ledge has been cut in a recently opened prospecting shaft which carries free gold and assays well. The strike was quite unexpected. The find promises to have important results in causing the owners of adjoining claims to enlarge their development operations. The mine is attracting a large amount of attention locally.

*Mustang*.—Drifting has been started from the 255-ft. level with the view of picking up the Thanksgiving ledge, which has every appearance of striking into the Mustang within 30 ft. north of the main shaft. Developments will be watched with interest.

*Otero*.—The shaft has been sunk to a depth of 50 ft., and has opened a wide body of porphyritic ore, which assays well. The manager has completed arrangements for expediting the sinking of the shaft to the 100-ft. level, so that the vein can be properly developed to enable the ore to be broken for shipment.

*Thanksgiving*.—A 9-ft. ledge of ore has been struck in the main shaft. Assays have indicated that the average value is above \$200 per ton, while picked parcels may be obtained for shipping that will assay over \$1000 per ton. The shaft has reached a depth of 230 ft., and levels will be run as rapidly as possible to enable ore being shipped. This strike has caused renewed attention to be given to the field.

*Zanzibar*.—The tunnel has been driven

300 ft., and at the breast it has a depth of 500 ft. from the surface. The tunnel has intersected a number of quartz veins, some of which yield good assay values. The Consolidated vein is 5 ft. in width, and is all of milling grade with rich streaks of shipping ore in places.

### NYE COUNTY—TONOPAH

*Ore Shipments*.—Shipments of ore over the Tonopah Railroad for the week ending April 27 were: Tonopah Company, 1020 tons; Belmont, 515; Montana Tonopah, 135; Midway, 45; miscellaneous, 235; Nevada-Alpine, Lone Mountain, 30; total, 1980 tons. The Tonopah Company also sent 2855 tons to its mill.

## New Mexico

### SANTA FE COUNTY

The lead smelter at Cerrillos and its tributary mines are still closed, in spite of the rumors of early resumption of production. The Tiffany turquoise mines also, 9 miles north of Cerrillos, are idle, but south of the railroad mining is reviving. At the Madrid coal mines, the coal washer and mine are quiet, though some prospecting is going on, and some coal is being extracted for local use.

In the Tuertos range activity prevails. At the New Placers, near Golden, the Gold Bullion Company is the successor of the Monte Cristo Company in the ownership of 480 acres of the best located ground. The dredge owned by the latter concern was brought from Washington gulch, Montana, but was overwhelmed by a cloudburst after a short trial. A new dredge, built by the Marion Steam Shovel Company, has just been started. It is of the dipper type, with 75 cu.yd. per hour capacity and runs on four trucks, set on two tracks. Water, for washing the screened gravel from the dredge, is got from five artesian wells, yielding some 25 gal. per minute, when pumped by rods, actuated by electric motors run from a central power plant.

Down the gulch from the New Placers, on a mesa, are the beds of gold cement which are owned by the Interstate and sister mining companies, of which Capt. Farley is manager. The 30-stamp mill on them is now idle, but it is planned to erect a supplementary cyanide plant soon, and to start milling again. For a water supply, these companies have a spring and three artesian wells.

Across the valley from the New Placers, in the Ortiz mountains, the Old Placers are shut down and even the Mexican hand-fanners have now been stopped by the Galisteo company, which holds the lease of the Ortiz land grant.

The Santa Fé Copper Company is now running both mine and smelter at full capacity, with Mexican labor. The San Pedro mine's daily output is about 100 tons of chalcopryrite-garnet ore, and this



is smelted in a single blast furnace. The fuel is Colorado coke, hauled for 20 miles by wagon from Cerrillos, and the shipment through the same point is copper matte, running 50 to 75 per cent. A new Franklin 15-drill compressor is being installed in the smelter power house, to run rock drills and two hoists in the mine. William Tudor, Jr., is superintendent.

### North Carolina

#### MOORE COUNTY

It is reported that coal has been found on the Bibb property, about 20 miles north of Sanford. It is thought to be an extension of the Deep river coal seam, and is to be prospected thoroughly.

### Oregon

#### LANE COUNTY

*Bohemia Seven*—This property will be developed this spring. It consists of nine claims near Mineral post office and Lewis Hartley, the manager, has sent supplies to the mine, and a force of men will be put at work. The property is owned by Corvallis, Oregon, capital, and is a close corporation, and no stock has ever been offered for sale. Values are principally in gold and silver, and the mine is developed by several tunnels, the main tunnel being a crosscut, which is in 200 ft. and cuts the lead. About 100 ft. of drifting has been done on the ledge.

*Star Consolidated*—A force of men is employed at this mine running a crosscut to tap the several ledges on the property, which is patented and consists of 13 claims. One ledge was struck at 50 ft., and men are now in 190 ft., with over 100 ft. yet to go before they strike the main or Star ledge, which is free milling.

*Comstock*—This property is being developed by the owners, A. F. Peterson and Lewis Hartley. The development consists of a shaft and crosscut to the lead.

*Vesuvius*—F. J. Hard is employing a force of men at this mine, and is getting his 10-stamp mill in shape to run after a winter's shut down.

*Boston Tunnel*—This property is being developed by contract and is owned by Boston capital. Men are under ground about 600 ft., and are drifting on a ledge which is showing up fairly well.

#### DOUGLAS COUNTY

*Oregon Securities*—The Champion mill is running on this property. This company has mined some very rich ore recently. G. B. Hengen is on the property; he, with other New York parties, has a mortgage on the property, and is trying to foreclose, but is having rather strenuous times as some of the stockholders have pooled their interests and are fighting proceedings.

### Pennsylvania

#### ANTHRACITE COAL

##### *Philadelphia & Reading Coal and Iron*

—This company makes the following statement for March and the nine months of the fiscal year from July 1 to March 31:

	March.	Nine Mos.
Earnings.....	\$2,562,234	\$27,889,082
Expenses.....	2,497,925	26,418,729
Net earnings .....	\$ 64,309	\$ 1,470,353

For the nine months there was an increase of \$968,126 in gross earnings; an increase of \$1,337,644 in expenses; and a decrease of \$369,518 in net earnings.

This company contemplates stripping the southern portion of the Mine hill, near St. Clair, for the purpose of taking out the coal from the Mammoth vein, which is a very thick deposit. It is also probable that a similar plan of mining will be placed in operation on the site of the old Milnes colliery, where it is stated there is a seam of coal of great thickness, which lies sufficiently near the surface to be accessible by stripping. The product from the two strippings will be taken to the Wadesville breaker.

*Delaware, Lackawanna & Western*—This company will on May 15 let contracts for the sinking of two shafts, each 1020 ft. deep, near the Truesdale colliery. One will be on the site of the old Dundee shaft, which will be widened out to 14x37 ft. in dimension. The other shaft will be 14x42 ft. Work will be commenced about June 1.

The breaker at the Bliss colliery is being torn down to make place for a more modern structure.

*Lehigh Valley Coal Company*—This company has decided to work a tract of 16 acres located between Dupont and Avoca in Luzerne county. The Marcy vein is so near the surface that it will be less expensive to strip and then mine the coal open-cut. The overburden will average about 15 ft. in depth. The company has awarded the contract for the stripping to Contractor McGowan, of Pittston. Contractor John Pugh, of Kingston, has been given the contract to sink two slopes near the tract in question. These slopes will be sunk through rock a distance of about 200 ft. to the Clark vein. The coal from the open pit and the slopes will be taken to the Heidelberg breaker.

*Mt. Jessup Coal Company*—This company is rebuilding the breaker destroyed by fire at Jessup, in Lackawanna county.

*Mott Haven Coal Company*—This company is building a breaker at its colliery in Mott Haven, Lackawanna county. The coal will be principally sold to local trade and the surplus will be shipped over the Delaware, Lackawanna & Western Railroad.

*Bradley Coal Company*—This company's washery at Peckville, near Scranton, is again in operation, after a stoppage of several weeks, for the purpose of putting in new machinery.

### South Dakota

#### LAWRENCE COUNTY

*Homestake*—The water is flowing into the mine at the rate of 1500 cu. ft. a minute. It is estimated that it will take 48 days to flood the mine, which will complete the work about June 10. The water has now reached the 800-ft. level, one of the largest in the mine, and is rising rapidly with but little loss from seepage. All the works continue idle. Additional filter-presses are being put in at the slime plant, so that its capacity will be increased by the time the mills are running again.

*Globe*—The open-cut work at the mine is showing up an orebody larger than was expected. The ore is porphyritic and the assays continue to increase with depth. In the tunnel, there is almost 400 ft. of ore overhead. Work on the mill is being pushed rapidly.

#### PENNINGTON COUNTY

*Burlington*—At the annual meeting of this company, J. B. Taylor and Chris Miller were re-elected directors. The superintendent's report showed that the shaft had been re-timbered, and the drift on the 100-ft. level extended. Also, shallow shafts have been sunk and trenches dug to locate an expected break in the formation.

*Snowie*—A rich strike was made on the Snowie claims, while doing assessment work. The shaft has now been put down 14 ft. and has encountered a ledge of gold ore. The ground is located a mile west of Keystone, and has timber and an excellent mill site. There is also sufficient water for all purposes.

### Tennessee

#### MAURY COUNTY

*Middle Tennessee Phosphate Company*—This company has leased rights on the Kittrell property near Mount Pleasant, and is putting in mining machinery, washers and dryers, besides a tramway. W. B. Alexander, Mount Pleasant, Tenn., is concerned.

### Utah

#### BOX ELDER COUNTY

*Century*—This company is operating its mill again, and making regular shipments of gold bullion. P. W. Madsen, of Salt Lake, is president and manager of the company.

*Salt Lake Copper*—This company is carrying on a campaign of development and production. Richard McCaffrey, of Salt Lake, is manager.

#### JUAB COUNTY

*Uncle Sam Consolidated*—This company has encountered a large body of shipping ore in a cross-cut off from the bottom of a shaft sunk 250 ft. below the tunnel level. The disclosure is one of the



most important in the history of that mine.

*Tintic Ore Shipments*—The output of the camp last week amounted to 163 car-loads, the mines contributing being: Ajax, 4; Beck Tunnel, 12; Bullion Beck, 6; Carisa, 5; Centennial Eureka, 51; Colorado, 6; Eureka Hill, 2; Eagle & Blue Bell, 5; Gemini, 5; Godiva, 4; Grand Central, 6; Lower Mammoth, 7; Mammoth, 18; May Day, 2; Ridge & Valley, 3; Scranton, 6; Shoebridge Bonanza, 2; Tintic Iron, 4; Uncle Sam Consolidated, 4; Victoria, 3; Yankee Consolidated, 8 cars.

#### IRON COUNTY

*Jennie*—The mill placed in commission by this company recently is taking care of about 40 tons of ore daily. The property is located at Gold Springs.

*Independence*—This company has secured title to some adjoining ground. It is the intention of the management to push development in the future.

#### TOOELE COUNTY

*Cliff*—This company owns the old Buckhorn mine in the camp of Ophir, and is shipping about 50 tons of ore per day. The aerial tramway recently installed is working satisfactorily.

#### Washington

#### FERRY COUNTY

*Iconoclast*—This property, idle for several years, in the Sans Poil district, is soon to be reopened. A vein of silver-lead and antimonial silver ore was opened by a tunnel and some ore was extracted several years ago.

#### STEVENS COUNTY

*Napoleon*—The British Columbia Copper Company owns 46 claims on the Napoleon group, in Pierre Lake district. Plans are afoot for a 500-ton cyaniding plant, to be located near Boyd's station, on the Washington & Great Northern Railway, to cost, with other improvements, about \$200,000. A deposit of iron-oxide ore, said to average about \$9 in gold per ton, about 1000 ft. in length and 500 ft. in width, is to be treated by cyanidation. A steam shovel will be used in mining it. A gravity car tram system will be established for conveying the ore from the steam shovels to ore bunkers, an aerial tramway will be built, for conveying the ore from the bunkers a mile to the mill. The railway company will build a spur from its main line at Boyd's station to the mill. The copper company has a six-drill compressor at the mine, which will be reinforced for a total of 10 drills, to be used in mining the big iron-oxide deposit.

#### West Virginia

#### MINGO COUNTY

*Mason Coal and Coke Company*—This company has been organized to open a

large tract of coal land near Dingess. Z. T. Vinson, of Huntington, W. Va., is at the head of the company.

#### Wyoming

#### ALBANY COUNTY

The Laramie & Hahn's Peak Railroad is completed from Laramie to Centennial and began running trains to that place April 13. This will furnish transportation and give an impetus to mining around Centennial and Holmes.

*Medicine Bow Mines Company*—This company owns the Cuprite mine, comprising 1500 acres, near Holmes. An adit, now in 1000 ft., has gone 200 ft. on an orebody 20 to 30 ft. wide, at a depth of 200 ft. from the surface. This is believed to be the same body which outcrops 500 ft. from the adit, and from which some shipments have been made. Dr. Ralph W. Morse, Lansing, Mich., is president; G. S. Simmons, Holmes, Wyoming, vice-president; S. C. Downey and G. L. Wright, Laramie, Wyoming, directors; Wm. Benton, Centennial, Wyoming, secretary and treasurer.

*Topoka Copper Company*—This company has been for some time at work on a tunnel on its property, near Centennial. About the end of March the adit struck an orebody; it has entered it 35 ft. and is still in the ore, which is a copper sulphide. The company is building orebins at the mine and at Centennial, with the expectation of beginning shipments in June. The company also owns the Lake Creek property, one mile away, on which 600 ft. of tunnels have been driven, opening a vein 8 ft. wide, 30 in. of which has been shown to carry up to \$11 per ton in gold. Wm. Benton, Centennial, Wyoming, is president of the company.

#### Canada

#### ONTARIO

An amendment to the assessment act has been introduced in the Ontario legislature which, if adopted, will render many mining properties in the older settled parts of the province, that are now exempt, liable to municipal taxation. Many corporations and private individuals, dealing exclusively in land, have sold only surface rights, reserving a title to any minerals which might be discovered. In assessing such property for municipal taxation the holder of surface rights only has been assessed. As a result the surface owners are interested in preventing or concealing mineral discoveries, which would only impair the value of their interests, and the owners of valuable mineral rights of this character are able to hold them indefinitely for speculation, retarding actual development. It is proposed to render these mineral rights subject to assessment. The measure at this stage is only a tentative one and not at

all likely to become law at present, but it has served the purpose of calling attention to the question.

The Ontario Bureau of Mines reports the staking of a number of copper claims in Dunnott township, west of Sturgeon Falls on the main line of the Canadian Pacific, where discoveries of chalcopyrites and bornite have been made. No development work has so far been done.

*North American Cobalt Refining Company*—All doubt as to the intention of the company to proceed with the erection of a smelter at Thorold have been set at rest by the commencement of work by a large force of men. President Leonard states that work will be pushed forward rapidly.

#### ONTARIO—COBALT DISTRICT

*Right-of-Way*—This company is bringing an action for damages against La Rose Mining Company, charging that company with drifting on its property. As the government, under the conditions of the lease, claims a 25 per cent. royalty on the output, it is represented that government interference is clearly called for, in the interests of justice.

*Ore Shipments*—Shipments of ore from Cobalt over the Timiskaming & Northern Ontario road for the week ending April 27 were: Coniagas, 53,500 lb.; Green-Meehan, 67,200; O'Brien, 65,570; total, 186,270 pounds.

*Railway Reserve Mining Company*—Fifty-two veins of varying sizes have been discovered on this property which covers 14 miles of the railway right-of-way. Three shafts have been put down, one at mile 97 to a depth of 20 ft., where calcite carrying native silver has been struck; one at mile 99, where smaltite was found at 15 ft.; and one at mile 100, where niccolite and smaltite were encountered at 30 ft. depth.

*Wabo*—On this mine at Cobalt a 60-h.p. boiler, five-drill compressor and steam hoist have been installed and two shafts are down 90 and 50 ft. respectively, the latter following a vein 6 in. wide.

#### Mexico

#### GUERRERO

*Mitchell Mining Company*—This company informs us that neither the mine nor plant at La Dicha, nor the material yards and terminal and grading of the railroad at Port Marques, 12 miles from Acapulco, were damaged in the recent earthquake. Only 12 persons were killed at Chilpancingo. The only loss the company suffered was in the latter place, where its offices were destroyed. All the records and plans were saved. Grading on the terminal of the railroad at Marques is being pushed rapidly, 850 men being employed on the work. As rapidly as possible this force will be increased to 2500. Ties are already at the Port and advices as to shipping of the rails rolled in Germany are expected almost daily.

# 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, May 8—The coal trade in the West has been helped by the unusually cold weather, which has started up a demand not common at this season; while the call for steam coal is still strong. Railroad conditions are good, and coal is moving freely on most lines. Lake navigation is open at last, and shipments to the Northwest will be pushed, shippers desiring to make the best of a season which may possibly be short.

It is announced that the Dering Coal Company, of Chicago, is arranging to compete for the Mississippi River Trade. Coal will be shipped by barge line from its mines in Illinois, which can furnish a large quantity. A terminal yard will be established at New Orleans, with yards at other river points.

In the East the coal trade is generally quiet and steady, both in anthracite and bituminous. The demand for steam coal continues strong. The coastwise trade is improving, and vessels find plenty to do.

#### COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to April 27 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	1,374,430	1,750,265	I. 375,835
Bituminous.....	10,884,419	11,961,807	I. 1,077,388
Coke.....	4,131,732	4,513,252	I. 381,520
<b>Total.....</b>	<b>16,390,581</b>	<b>18,225,324</b>	<b>I. 1,834,743</b>

The total increase this year was 11.2 per cent.

Coal and coke tonnage of the Chesapeake & Ohio Railroad for the nine months of its fiscal year from July 1 to March 31, is reported as follows, in short tons:

	Coal.	Coke.	Total.
New River.....	4,119,363	161,804	4,281,167
Kanawha.....	2,715,850	73,237	2,789,087
Kentucky.....	133,519	.....	133,519
Connecting lines...	321,460	91,286	412,746
<b>Total.....</b>	<b>7,290,192</b>	<b>326,327</b>	<b>7,616,519</b>
<b>Total, 1906.....</b>	<b>6,774,668</b>	<b>376,116</b>	<b>7,150,784</b>

Deliveries of tonnage originating on the line were: To points west of mines, 3,205,024 tons coal and 176,497 tons coke; points east, 1,369,106 tons coal, and 58,544 tons coke; tidewater, 2,394,602 tons coal. The total increase in tonnage this year was 465,735 tons, or 6.5 per cent.

### New York

#### ANTHRACITE

May 8—The anthracite market showed signs of dullness, except among the small

sizes. The demand was only fair and shipments have been coming along quite regularly. Car supply has improved and shippers are able to transport all the coal necessary to take care of their customers. Water trade is considerably hampered by lack of vessels and this class of business has been necessarily restricted. Prices are as follows: Broken, \$4.35; egg, stove and chestnut, \$4.60; small sizes are quoted nominally: Pea, \$3; buckwheat, \$2.50; rice, \$1.85; barley, \$1.50.

#### BITUMINOUS

The Atlantic seaboard soft-coal trade shows a slight improvement on certain lines, there being a good demand for the better grades of coal, although the market will hardly permit shipments unless there are orders on hand to take care of them. Contracts are calling for fair amounts of coal and the limitation seems to be vessel supply, which is very scarce for both sailing vessels and barges; winter rates are practically maintained at the present time.

Trade in the far East is calling for fair shipments of coal, although the tonnage being discharged at most ports makes berths scarce; this is apt to cause demurrage. Trade along the Sound is inquiring for soft coal and asking for shipments in a moderate way. This business is tied up by lack of barges, which are mostly in the East loaded with coal.

New York harbor trade has not yet straightened itself, and there are large blocks of coal awaiting shipment at tidewater. Prices continue low, \$2.35@2.40 being asked for the lower grades, and \$2.60@2.65 for good grades of steam coal.

All-rail trade is quiet and seems to have sufficient coal for all requirements. Car supply is fairly up to the demand; transportation from mine to tide is up to schedule.

In the coastwise vessel market vessels are extremely scarce and in demand. We quote current rates from Philadelphia to Boston, Salem and Portland, \$1.25 and discharge; to Lynn, Newburyport, Portsmouth, Saco and Gardiner, \$1.25; to Bath, \$1.15; to Bangor, \$1.30; to the Sound, \$1; loading and discharging clause included where usual.

### Birmingham

May 6—The opinion is expressed by prominent coal men in this district that there will be no need for any shut-down or even slack work at the mines during the summer. The demand promises to hold well up through the whole year.

Prices are strong. The Birmingham Iron Company, a subsidiary organization of the Atlanta, Birmingham & Atlantic Railroad, now building to Birmingham, is pushing work on several coal mines, and even before the railroad is completed to the district the company's output will be large. The coal will be used exclusively by the railroad, and its steamship lines out of Brunswick, Ga., and if there is any surplus, after the two furnaces of the company have been supplied, the product will be placed on the market on the coast. Two mines are being opened by this company on Mulga creek, in the southern portion of Jefferson county, while mines at Short Creek and at Blossburg mines, already under operation, will be improved and the output increased.

The railroads are still furnishing good facilities for a prompt handling of almost the full capacity of the mines.

### Chicago

May 6—The wholesale coal market continues unusually strong, and dealers are in hopes that the cool weather of the last month will continue. Anthracite business is especially good, and sales of domestic bituminous have increased in the last week. Throughout the upper Mississippi valley—Chicago territory—this condition exists, and there is a possibility that the domestic supplies of the bituminous operators may be worked off at a good profit.

Through a general feeling of strength in the market, production at the mines has been increased at the mines of Illinois and Indiana in the last month, with the result that the increased output has been taken up satisfactorily. Eastern coals are even, with the demand good and supplies fairly balanced.

Illinois and Indiana lump and egg bring \$2.10@2.75; run-of-mine is \$1.75@2.50 and screenings are firm at \$1.40@1.60. Hocking is quoted at \$3.15 for 1¼-in.; smokeless at \$3.35 for run-of-mine; Youghiogheny, at \$3.15 for ¾-in. gas; Pittsburg No. 8 at \$3.15 for 1¼-in. Contract business is increasing very slowly in the face of the present conditions.

### Cleveland

May 7—Coal rates on the Lakes are steady. Large shipments will be made this week. Coal market continues steady, with increasing supplies.

Coke market is firmer, with spot delivery quoted at \$2.50@2.60 at ovens for



furnace; foundry spot \$3.40. Last half deliveries rule 40c. higher.

The new 600-ft. steamer "Henry Phipps" will be launched in this city May 11. The full carrying capacity will be 12,000 long tons.

**Indianapolis**

May 5—Trade and manufacturing conditions are so favorable that the mining industry is partially stimulated thereby. In spite of the lull in the demand for coal by local dealers usual at this season, the mines have been running regularly and the production for April will average with preceding months. The demand for steam coal of all kinds has been greater than ever before in Indiana. This, coupled with the fact that April proved to be as good as a winter month to the local dealers, who were forced to order a number of carload lots for the unusual domestic consumption, made business quite satisfactory at the mines.

The State Railroad Commission has notified the railroads that section 6, of the new shippers' law would be put into effect June 6. This law requires railroads to furnish cars within 48 hours after they are ordered. The law provides that the railroads shall provide a special book for the ordering of cars, and shippers cannot demand a car or cars except by this order book, to be kept at all stations.

**Pittsburg**

May 7—The mines in this district are being operated to about 80 per cent. of their capacity, owing to a scarcity of railroad cars. It is explained that this is due to the absence of lake vessels at the Cleveland docks and inability to unload the cars. According to reports received at the office of the Pittsburg Coal Company, a number of vessels are bottled up by the ice and may not reach the lower ports for over a week. When navigation is clear, shipments to the lakes, it is believed, will go forward more satisfactorily. The Pittsburg Coal Company has suspended its shipments from independent operators until there is an improvement in the car supply. As a result of the scarcity prices are decidedly firm on a basis of \$1.25 for mine-run coal. All the coal loaded and ready for shipment to down-river ports went out on the rise last week. The rivers are navigable again this week, but there is no coal ready. All the river mines are being operated to capacity.

**Connellsville Coke**—There was a further decline in coke prices owing to the surplus for early delivery. Furnace coke is quoted at \$2.25@2.35, and foundry at \$3.25@3.40. For last half prices are stronger and furnace coke is quoted at \$2.85 and foundry at \$3.50. The *Courier* in its summary for the week, gives the production in both regions at 416,217 tons. The shipments amounted to 14,877 cars distributed as follows: To Pittsburg,

4699 cars; to points west of Connellsville, 9264 cars; to points east of Connellsville, 914 cars.

**Foreign Coal Trade**

May 8—Shipments of coal from Nova Scotia mines for the three months ended March 31 are reported as follows:

Company:	1906.	1907.	Changes.
Dominion.....	535,221	493,882 D.	41,339
N. S. Steel.....	90,118	86,826 D.	3,292
Cumberland.....	125,325	75,786 D.	49,539
Acadia.....	57,823	63,919 I.	6,096
Intercolonial.....	64,307	58,972 D.	5,335
Inverness.....	21,449	38,578 I.	17,129
<b>Total.....</b>	<b>894,243</b>	<b>817,963 D.</b>	<b>76,280</b>

The total decrease shown this year was 8.5 per cent.

**Iron Trade Review**

New York, May 8—In the pig-iron market there has been more activity. Contracting for foundry iron for second-half delivery has been on a scale which shows that consumers believe it policy to be prepared for a heavy business. There has also been a good deal of inquiry for basic pig, supplies of which are not large. Some Southern iron has been taken for the first quarter of 1908, which is remarkable, as the Southern furnaces are not usually willing to contract so far ahead.

Finished material also shows more activity than recently. A good deal of business has been done in bars and plates, and there is also more contracting for structural steel.

The late freeze on the Lakes is over, and the first ore-boats came through the Sault this week. This is a late opening of navigation. There is some delay, owing to the crowd of vessels at the Sault, and matters will hardly be running smoothly for a week. The docks at the lower Lake ports are nearly bare of ore.

The act providing for the continuance of the existing iron and steel bounties and the giving of additional bounties for the manufacture of iron and steel, the details of which have previously been given, has been passed by the Canadian Parliament, in spite of strong opposition on the part of the agricultural interests. The settlement of this question together with that of the tariff is expected to give a considerable stimulus to the iron and steel industry and to insure the establishment of electric smelters.

**Baltimore**

May 7—Included in exports for the week were 2700 tons of rails to Panama and Central America.

Imports of spiegeleisen for the week were 50 tons; of ferromanganese, 453 tons. Arrivals of iron ore were 6200 tons from Cuba; 4250 tons from Spain; 9343 tons from Algeria; a total of 19,793 tons. There were 3232 tons iron pyrites and 200 tons copper pyrites received from Spain.

**Birmingham**

May 6—Even with pig iron selling at \$20 per ton, No. 2 foundry, third quarter, and \$19@19.50 for fourth quarter, there is a strong demand and already intimation is given that the Alabama manufacturers are likely to withdraw from the market altogether, on account of having covered the probable make. One furnace company the past week made a quotation on a 2000-ton lot of iron for delivery during the first quarter of the coming year. The price was under \$18.50 per ton, No. 2 foundry. Other deals for iron to be delivered in 1908 were completed before this. One of the larger concerns of the Birmingham district announces that sales so far this month equal a larger amount than the production.

Furnaces which were reported last week as nearing completion are still being worked on. The fact that the Tennessee Coal, Iron and Railroad Company will do without the skip-hoist on one of the furnaces at Bessemer and make an effort to get it in shape for an early resumption shows how anxious the company is to increase the output. The home consumption of iron is greater now than it has been in months.

**Chicago**

May 6—The local iron market is very strong. Prices are advancing, and there is apparent a tendency toward general contracting for supplies for the last half. Pig-iron sales for the last week have been of large tonnage on contracts and spot sales. For the second and third quarters \$:9.50@20 for No. 2, Birmingham, is asked on Southern; and for quick deliveries \$22@23 Birmingham obtains. Probably the most significant feature of the market is this strong demand for contract iron.

Northern No. 2 iron brings \$24.50@25 for delivery in the second half and deliveries in the second quarter of the year bring \$27 or more. In general, Northern iron is very scarce and seems bound to advance for several months.

Demands for structural steel and other products of the iron and steel industry continue strong. Heavy orders will be placed for the reconstruction of the street railroads in Chicago.

**Cleveland**

May 7—April movement of iron ore to lower lake ports has been 800,000 tons less than in April 1906. The Sault canals are now open and receipts next week will be heavy. A local shipper turned down orders for 100,000 tons, being tied up by contracts. Wild tonnage will be in strong demand this year, with large orders to fill and a short season to do it in.

Pig iron is strong and higher. Ohio furnaces have little tonnage left for sale in 1907. No. 2 foundry at Cleveland was



advanced last week from \$22.50 to \$23, and contracts for first quarter of 1908 are being made.

Last half deliveries on pig are quoted: Bessemer, \$23.85; No. 1 foundry, \$23.50; No. 2, \$23; No. 3 \$22.50; No. 2 Southern \$23.85; gray forge \$22 per ton, Cleveland.

Railroads in the Pittsburg district have advanced freight rates effective July 1. This will affect the local iron market, as rates on all iron and steel finished products are increased 10c. and on pig iron and billets 7½c. per 100 pounds.

### Philadelphia

May 8—Disturbing influences are evident in eastern Pennsylvania territory, more as a reflex action from other territory than from actual local causes. The pig-iron market has developed a good deal of excitement, without resulting in large transactions, or in any decided modification of the situation. The situation is a surprising one to our people, and they are at a loss to account for it on any other grounds than that very heavy requirements have been held back to the very last minute, and then precipitated upon the market. It is difficult to give exact quotations of pig iron today because large transactions have not been closed and both buyers and sellers are higgling over prices. Foundry and forge irons are likely to sell in large blocks within three or four days. Quotations are, therefore, at present writing nominal and may be given at about 50c. above the figures of last week. No. 2 X foundry for third quarter is quoted at \$24.50@25, basic at \$23@24 and for fourth quarter \$23.

**Steel Billets**—The market is unsettled. Business has been done in large lots at \$33 and in two or three instances at 50c. less. Sales of forging steel have been made at \$38. These are regarded as bottom figures.

**Bars**—Refined iron in a general way is quoted strong at 1.83½ for car-lots. Steel bars are selling for early delivery and the demand is good.

**Sheets**—The trade is not affected by the turbulence apparent in other quarters and manufacturers report a steady demand.

**Pipes and Tubes**—Merchant pipe is quoted high and strong and a further advance is in line. The rush for boiler tubes still continues and premium quotations are to be recorded this week.

**Merchant Steel**—Quotations are strong under a moderate demand.

**Plates**—Nothing calling for special comment has occurred. Buyers know that premium quotations will have to be paid when they come into the market, and they are simply biding their time.

**Structural Material**—Considerable material for construction purposes is due in this city within the next 30 days and the projects for additional buildings point to

the placing of orders for these structures at an early date.

**Scrap**—There are no developments in the scrap-iron market excepting that heavy melting scrap continues to be in strong demand, as it has been for some weeks.

### Pittsburg

May 7—About the only event of interest in the steel market during the week was the booking of 46,000 tons of standard steel rails by the Carnegie Steel Company for the Savannah, Augusta & Northern Railroad, 2500 for another road, and 3000 tons of light rails. With these sales the Carnegie company has booked for delivery this year over 900,000 tons of rails, or within 200,000 tons of its capacity, but so far has not taken on any orders for 1908 delivery.

An increasing demand is noted for structural material, and when pending contracts are closed, the mills will be filled up for the rest of the year. In April, it is estimated, the total structural contracts awarded amounted to fully 115,000 tons, and May opened with about 100,000 tons still pending. The McClintick-Marshall Construction Company, the Riter-Conley Manufacturing Company, and the John Eichleay, Jr., Company, large Pittsburg erecting concerns, booked a number of new contracts within the past few days. Plates for delivery within a month easily command premiums of from \$2 to \$3 a ton as the mills in this district are sold up for four or five months ahead. Eastern mills are still able to supply plates for early shipment at 1.80@1.85c.

Agricultural implement makers continue to place orders for steel bars at the established prices of 1.60c., but outside of the Crucible Steel Company of America, mills are not promising deliveries before the last quarter. The Crucible company is able to make early deliveries on steel bars and has no difficulty in obtaining 1.80c., or \$4 a ton over the regular rate.

Crude steel continues scarce, and some independent finishing mills are crippled for a lack of material. One of the largest producers during the past two weeks sold about 75,000 tons of billets, sheet-bars and tin-bars for delivery in the second half, and is out of the market for the rest of the year. A sale of 5000 tons of sheet-bars was made during the week to a Western mill, at \$30.75, f.o.b. Youngstown, for delivery in the last half, which is an advance of 75c. over all previous sales for forward delivery.

**Pig Iron**—There has been another advance in prices for second-half delivery and \$23, Valley furnaces, is now regarded as the minimum price for bessemer and basic iron. Two lots of basic of 7500 tons each, and one lot of 2500 tons of bessemer sold at that price late in the week. Other sales of bessemer and basic previously made aggregate over 30,000 tons and at

prices ranging from \$22.50 to \$22.75, Valley furnaces. These sales practically dispose of all the steel-making pig iron for the year, except odd lots that may come out. A sale of 200 tons of prompt bessemer was made today at \$25, Valley. Foundry iron is well sold up, and it is doubtful if better than \$23 can be done for late shipment for No. 2. For prompt delivery the price is nominally \$25, Valley furnaces. Some sales of gray forge aggregating about 5000 tons for second-half delivery were made at prices ranging from \$22.35 to \$22.85, Pittsburg. According to the official report the sales of bessemer iron in April amounted to 230,000 tons, and the average price was \$21.36, Valley furnaces. This would indicate that some heavy sales for second half were made at \$21 and less, and also, as intimated in last week's report, that some large transactions were not made public. Who the purchasers were is merely a matter of conjecture, but they are supposed to be large steel interests.

**Steel**—Sales of bessemer billets have been made at \$31.50, Pittsburg, for prompt shipment, but the tonnages were not large. Open-hearth billets cannot be had at any price. Steel bars remain firm at 1.60c., and plates at 1.70c.

**Sheets**—There is no change in the market. Mills are still months behind in deliveries, and prices remain the same, black sheets being quoted at 2.60c., and galvanized at 3.75c. for No. 28 gage.

**Ferro-Manganese**—For prompt delivery prices remain about the same as named a week ago, \$70@71 per ton.

### Cartagena, Spain

April 20—Messrs. Barrington & Holt report shipments of iron ore for the week: Great Britain, 6550 tons; Rotterdam, 9350; total, 15,900 tons. Freight are easier.

Quotations for iron ores are: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; low phosphorus, 10s. 9d.; specular ore, 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganese ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 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.

### Stockholm

The agitation in Sweden over Government limitation of exports of iron ore has resulted in the presentation by the crown to the Swedish Parliament of a proposition that the State acquire an interest in three of the largest iron-ore deposits in the kingdom, situated in Lapland and now controlled by private companies. The cablegrams do not name the mines, but presumably they are the Gellivaara, the Kiirunavaara and the Luossavaara, in

Swedish Lapland. The plan provides for the acquisition of a one-third interest by the State in these mines for 25 years, with the option to acquire another third after 30 years. In return the Government permits the mines to export ore without any restrictions as to quantity. Heretofore the quantity to be exported each year has been fixed by the Government, and no excess permitted.

**London**

One of the interesting developments now taking place at the Broken Hill Proprietary, in New South Wales, is the exploitation of the iron ores of Knob hill. Hitherto these ores have been used only as flux in the smelting operations, but more recently they have been developed, with the object of using them for the production of iron. Experiments are now being carried on with the idea of erecting a blast furnace on the spot, and, in addition, shipments of ore have been made to other countries. The largest shipment thus made was a cargo of 2000 tons to Bairds, the Scotch ironmaster.

Readers of the JOURNAL may possibly remember the Darien Gold Mining Company, which has been trying for 20 years, by means of French and Manchester capital, to make money out of the Espiritu Santo and adjoining mines, at Cana, Darien, Colombia. Sometimes the mine has been well managed, and sometimes the reverse, but no money has ever been made out of it. The third reconstruction has just been carried out successfully, and it speaks volumes of the courage and hopefulness of the directors and their supporters. Arthur Coventry, the chairman, has been on the board from the start. He is a partner in a Manchester firm of machine tool makers, Smith & Coventry. At one time Lord Charles Beresford was on the board, and inspired shareholders with his breezy optimism. By means of the new reconstruction, the company will come into possession of over £120,000 working capital, half of which is being subscribed by the old shareholders, and the other half by a new group of people. The company has a 40-stamp mill, which was put up in 1900, and another 20 stamps, which were reconstructed out of the old mill used in earlier days. All that is wanted now is a visit from Dame Fortune.

**Perth, Western Australia**

Lead mining at Northampton is looking very hopeful, and should the metal maintain a fair price this district must become a big producer. Numbers of the old abandoned mines are re-opened and many new leases have been applied for. The lodes are usually of good size and of high grade but contain no silver. The Smelting Company has started sinking a new shaft and is erecting necessary machinery.

Copper will undoubtedly be one of our big productions in the near future. The Phillips river field is opening up well; good returns are being made by the old mine on the North Coolgardie fields, at Murrin Murrin. New finds are being worked at many other points, but it will be some months before any great increase can be made.

**Metal Market**

NEW YORK, May 8

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

Metal.	Exports.	Imports.	Excess.
<b>Gold:</b>			
Mar. 1907..	\$2,126,173	\$ 5,007,319	Imp. \$2,881,146
" 1906..	5,918,627	5,630,695	Exp. 287,932
Year 1907..	5,703,304	11,607,691	Imp. 5,904,387
" 1906..	20,146,622	10,316,087	Exp. 9,830,535
<b>Silver:</b>			
Mar. 1907..	5,058,461	3,936,139	Exp. 1,122,322
" 1906..	5,213,811	3,509,898	" 1,703,913
Year 1907..	14,669,396	11,315,168	" 3,354,228
" 1906..	19,165,608	12,676,998	" 6,488,610

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 May 4 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 5,000	\$ 44,055	\$ 766,142	\$ 10,081
1907.....	1,796,536	5,352,432	13,215,628	668,474
1906.....	4,300,036	21,051,103	23,217,624	701,808
1905.....	32,881,125	4,950,256	11,137,981	1,212,281

Exports of gold for the week were to the West Indies; of silver to London and Paris. Imports, both gold and silver were from Central and South America.

The joint statement of all the banks in the New York Clearing House for the week ending May 4 shows loans \$1,140,320,300, an increase of \$16,902,700; deposits, \$1,120,599,900, an increase of \$14,416,600, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	\$183,146,600	\$212,884,500
Legal tenders.....	79,571,300	74,090,100
Total cash.....	\$262,717,900	\$286,974,600
Surplus.....	\$ 5,899,525	\$ 6,824,625

The surplus over legal requirements shows a decrease of \$5,522,150, as compared with the previous week this year.

Specie holdings of the leading banks of the world, May 4, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York.....	.....	.....	\$212,584,500
England.....	\$178,789,870	.....	178,789,870
France.....	510,173,900	\$196,042,760	714,216,660
Germany.....	168,460,000	56,155,000	224,615,000
Spain.....	77,345,000	126,940,000	204,285,000
Netherlands.....	25,923,000	28,335,000	54,258,000
Belgium.....	16,016,665	8,008,335	24,025,000
Italy.....	161,685,000	24,915,500	186,600,500
Russia.....	586,955,000	30,625,000	617,580,000
Aust.-Hungary.....	227,975,000	62,615,000	290,590,000
Sweden.....	20,740,000	.....	20,740,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to April 25:

	1906.	1907.	Changes.
India.....	£ 6,152,678	£4,409,784	D. £ 1,742,894
China.....	.....	.....	.....
Straits.....	.....	265,500	I. 265,500
Total.....	£ 6,152,678	£4,675,284	D. £ 1,477,394

Receipts for the week were £170,000 in bars and £46,000 in Mexican dollars from New York; £216,000 in all. Shipments were £22,826 to India and £61,250 coin to the Straits; £84,076 in all.

Indian exchange continues steady, the Council bills offered in London being taken at an average of 16.09d. per rupee. The tone of the market is weaker, however, and the amount of bills offered has been reduced from 70 to 50 lakhs of rupees. Shipments of silver to India have been light.

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

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury).....	\$ 254,075,403	\$ 691,481,469
Gold certificates.....	41,965,030	630,371,839
Silver dollars.....	3,391,226	82,528,304
Silver certificates.....	6,320,837	469,829,163
Subsidiary silver.....	8,419,788	121,349,701
Treasury notes of 1890.....	13,242	6,168,758
U. S. notes.....	4,701,774	341,979,242
Nat. Bank notes.....	11,516,291	588,397,549
Total.....	\$330,403,591	\$2,932,106,025

Population of the United States, April 1, 1907, estimated at 85,838,000; circulation per capita, \$34.16. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the treasury as assets of the Government does not include deposits of public money in national-bank depositaries to the credit of the treasurer of the United States, amounting to \$167,445,244. The total in circulation showed increases of \$25,706,157 over April 1, and \$211,855,722 over May 1 last year.

**Prices of Foreign Coins**

	Bid.	Asked.
Mexican dollars.....	\$0.50	\$0.52
Peruvian soles and Chilean.....	0.45	0.48
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.85	3.89
Spanish 25 pesetas.....	4.78½	4.80

**SILVER AND STERLING EXCHANGE.**

May.	Sterling Exchange.	Silver.		May.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
2	4.8620	65½	30 3/8	6	4.8650	65½	30 3/8
3	4.8640	65½	30 3/8	7	4.8640	65½	30 3/8
4	4.8650	65½	30 3/8	8	4.8620	64½	29 7/8

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



## Other Metals

May.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
2	25 @25½	24½ @24½	105¼	42½	6 00	6.55 @6.60	6.40 @6.45
3	25 @25½	24½ @24½	105½	42½	6 00	6.55 @6.60	6.40 @6.45
4	25 @25½	24½ @24½	.....	42½	6.00	6.55 @6.60	6.40 @6.45
6	25 @25½	24½ @24½	104½	42	6.00	6.55	6.40
7	25 @25½	24½ @24½	102½	42	6.00	6.55	6.40
8	25 @25½	24½ @24½	103	42	6.00	6.55	6.40

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

**Copper**—The market has relapsed this week into nearly complete stagnation, such small buying as there has been having been chiefly from abroad. The unsettled conditions are still reflected in the great disparity between the prices for casting and for Lake. The close is nominal at 25@25½ for Lake copper; 24½@24¾c. for electrolytic in ingots, cakes and wirebars; 23c. for casting copper.

After the bears had covered their commitments in the London standard market, the buying ceased to be aggressive, in consequence of which a gradual decline in quotations set in. The close is cabled as steady at £103 for spot, £101 17s. 6d. for three months'.

Refined and manufactured sorts we quote: English tough, £110@111; best selected, £114@115; strong sheets, £122@123.

Exports of copper from New York for the week were 531 long tons. Our special correspondent reports no exports for the week from Baltimore.

The Electrolytic Refining and Smelting Company of Australia, Ltd., has been formed with a capital of £150,000, privately subscribed, for the purpose of erecting an electrolytic copper refinery in Australia. The Mt. Morgan Gold Mining Company of Queensland is a prominent factor in the new company, it having relinquished the intention of erecting its own electrolytic refinery at Mt. Morgan. Associated with the Mt. Morgan Company is the firm of Aron Hirsch & Sohn, of Halberstadt, Germany. The new works will be erected at Port Kembla, about 40 miles from Sydney, which is a central location (near the coalfields of New South Wales), chosen with a view to handling the blister copper product of a large part of Australia.

**Copper Sheets**—The base price of copper sheets is 32c. per pound.

**Copper Wire**—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

**Tin**—The feature of the market is an almost total absence of spot supplies, and buyers were forced to pay a heavy premium for such quantities as were needed promptly. Although there are some consignments in port, the strikes prevalent among the longshoremen have delayed the unloading of the same, so that the scarcity of near-by metal still continues. At the close from 42@42¼c. is being paid. No interest whatever is shown among consumers in purchases for forward delivery.

The London market has not shown any special features, but moved within narrow limits, closing steady at £192 5s. for spot, £188 for three months'.

Statistics of tin on May 1 show the following visible supplies, in long tons:

	In Store.	Afloat.	Total.
Great Britain.....	3,026	2,800	5,826
Holland.....	470	183	653
United States.....	1,398	2,062	3,460
Total.....	4,894	5,035	9,929

The stocks in the United States do not include those at Pacific ports.

Exports of tin from the Straits for the two months ending Feb. 28 were as follows, in long tons:

	1906.	1907.	Changes.
United States.....	3,244	2,772	D. 472
Great Britain.....	5,776	5,458	D. 318
Other Europe.....	1,375	1,065	D. 310
China and India.....	237	300	I. 63
Total.....	10,632	9,595	D. 1,037

The decrease in the total this year was 9.6 per cent.

**Lead**—The price for desilverized remains unchanged at 6c. per lb., New York; 5.92½c., St. Louis. In each market corroding brands sell for 10c. per 100 lb. higher.

The urgent demand which was apparent in the European market has evidently been filled, in consequence of which prices declined and close at £19 12s. 6d. for Spanish lead, £19 15s. for English lead.

**St. Louis Lead Market**—The John Wahl Commission Company reports as follows: Lead is dull, but firm. Quotations are 5.92½c. for both prompt and forward delivery.

**Spanish Lead Market**—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 20, that the price of pig lead has been 92.75 reales per quintal; silver 13.50 reales per ounce; exchange, 28 pesetas to £1. The price of lead, on current exchange, was equal to £18 10s. 10d. per long ton, f.o.b. Cartagena. Shipments for the week were 409 tons argenteriferous and 300 tons desilverized lead to London; 56 tons desilverized to Marseilles; 775 tons in all.

**Spelter**—The continuous decline in prices has developed a somewhat larger business, but sellers appear to be still

more eager than buyers. The close is easy at 6.55, New York; 6.40, St. Louis.

London reports a very quiet market, quotations being £25 17s. 6d. for good ordinaries, £26 2s. 6d. for specials.

**Spanish Zinc Ore Market**—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 20, that the market remains quiet. Shipments for the week were 600 tons blende to Swansea.

**Zinc Sheets**—The base price is now \$8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

**Antimony**—The market is again lower, with Cookson's at 23c., Hallett's at 20½c., and ordinary brands at 20c.

**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.

**Platinum**—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is \$32 per ounce for ordinary metal and \$35 for hard. Scrap is quoted at \$24 per ounce.

**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 plan to establish a metal exchange in Germany seems to have fallen through, the great metal houses of Frankfurt and Halberstadt, together with the leading zinc producers of Silesia having been unwilling to enter the scheme. Inasmuch as those concerns do the bulk of the business in copper, spelter and lead, a metal exchange conducted by the small brokers of Berlin and Hamburg would have been distinctly non-representative. Probably nothing further will be heard of the proposal to establish a German metal exchange in opposition to that of London.

## Missouri Ore Market

**Joplin, Mo., May 4**—The highest price paid for zinc ore was \$51 per ton, the assay-base price ranging from \$46 to \$48 per ton of 60 per cent. zinc; the average price was \$46.70. The highest price paid for lead concentrate was \$82 per ton, medium grades selling at \$77 to \$80 per ton; the average price was \$80 per ton.

The Underwriters' Land Company has taken off the night shifts at the Yellow

Dog mine, reducing the output 150 tons per week, owing to the threatened demand of ground men for higher wages. The inequality between 25c. per hour for machine-drill men and \$1 per hour to \$15 per eight-hour day for shovelers, is causing a growing unrest among the machine men and hookers. Mine owners are beginning to realize that they are likely to have the first trouble this district ever knew, as labor agitators are here from unionized sections inciting the men to demand higher wages.

Following the shipments of zinc and lead from the various camps of the district for the week ending May 4:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	3,901,130	1,015,550	\$134,249
Joplin.....	2,161,830	410,440	69,381
Galena-Empire.....	1,670,440	187,170	46,741
Alba-Neck City.....	792,650	85,560	23,238
Duenweg.....	599,960	189,000	21,959
Prosperity.....	331,260	207,150	16,236
Badger.....	399,040	4,580	10,159
Aurora.....	468,240	6,650	9,095
Granby.....	435,000	56,000	8,200
Oronogo.....	273,180	870	6,101
Spurgeon.....	236,950	23,320	5,430
Baxter Springs.....	62,400	57,590	3,738
Carl Junction.....	139,060	7,870	3,641
Zincite.....	116,960	.....	2,807
Carthage.....	61,920	.....	1,548
Wentworth.....	54,920	.....	1,525
Sarcozie.....	52,420	.....	1,232
Sherwood.....	50,330	.....	1,207
<b>Totals.....</b>	<b>11,817,690</b>	<b>2,261,750</b>	<b>\$366,487</b>

18 weeks.....216,761,470 34,107,030 \$6,533,835  
 Zinc value, the week, \$275,994; 18 weeks, \$5,129,038  
 Lead value, the week, 90,493; 18 weeks, 1,404,797

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.....	42.68	48.66	March.....	73.73	82.75
April.....	44.63	48.24	April.....	75.13	79.76
May.....	40.51	.....	May.....	78.40	.....
June.....	43.83	.....	June.....	80.96	.....
July.....	43.26	.....	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	.....
<b>Year.....</b>	<b>43.24</b>	<b>.....</b>	<b>Year.....</b>	<b>77.40</b>	<b>.....</b>

**Wisconsin Ore Market**

Platteville, Wis., May 8—The past week was satisfactory to producers and buyers alike. The price paid for 60 per cent. ore was as high as could be expected and the buyers got all the ore they wanted. Some of the producers suffered in consequence of a shortage of labor.

The shipment of the district, by camps, for the week ending May 4 is as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	225,640	56,800	.....
Highland.....	460,550	50,500	.....
Benton.....	261,252	.....	.....
Buncombe-Hazel Green..	187,000	.....	.....
Linden.....	161,250	.....	.....
Livingston.....	102,000	.....	.....
Mineral Point.....	89,800	.....	.....
Galena.....	85,000	.....	.....
Cuba City.....	64,800	.....	.....
Rewey.....	64,000	.....	.....
<b>Total for week.....</b>	<b>1,701,302</b>	<b>107,300</b>	<b>.....</b>
<b>Year to May 4.....</b>	<b>31,028,099</b>	<b>1,417,670</b>	<b>143,100</b>

The production continues at about the same average tonnage monthly, notwithstanding the number of plants that are handicapped through lack of competent help.

**Chemicals**

New York, May 8—The chemical markets generally are showing a good degree of activity, and in most lines demand is fully up to supply.

Copper Sulphate—The market continues strong, with a good demand and moderate supplies. Quotations are unchanged at \$7.50 per 100 lb. for carload and larger lots; \$7.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Messrs. Mortimer & Wisner, of New York, give the statistics of nitrate in the United States on May 1 as follows, in long tons:

	1906.	1907.	Changes.
Stocks, Jan. 1.....	13,100	13,050	D. 50
Imports, 4 mos.....	82,900	68,334	D. 14,566
<b>Total supplies.....</b>	<b>96,000</b>	<b>81,384</b>	<b>D. 14,616</b>
Deliveries, 4 mos.....	91,260	81,384	D. 9,876
Stocks, May 1.....	4,740	.....	D. 4,740
Afloat for U. S.....	88,300	130,000	I. 41,700

The quantity reported afloat includes all cargoes due to arrive by Aug. 15 next. There were no visible stocks on hand at the opening of May.

Heavy Chemicals — Imports of heavy chemicals into the United States for the three months ended March 31 are reported as follows, in pounds:

	1906.	1907.	Changes.
Bleaching powder	31,961,872	31,078,668	D. 883,204
Potash salts.....	39,480,335	66,510,772	I. 27,030,437
Soda salts.....	5,698,366	6,385,185	I. 686,819

Exports of acetate of lime were 17,851,473 lb. in 1906, and 24,886,284 lb. in 1907; an increase of 7,034,811 lb. this year.

Sulphur—Imports of sulphur and pyrites into the United States for the three months ended March 31 were, in long tons:

	1906.	1907.	Changes.
Sulphur.....	25,500	12,640	D. 12,860
Pyrites.....	132,467	142,166	I. 9,699

Estimating sulphur contents of pyrites, the total sulphur imported was 78,487 tons in 1906, and 69,506 tons in 1907; a decrease of 8981 tons.

**Mining Stocks**

New York, May 8—The general stock markets continue uncertain and rather dull, showing strong evidence of professional trading. Money has been rather easy, but this does not seem to have helped speculation. Apparently no general movement for an advance is yet in sight.

The curb market, where most of the dealings in mining stocks still are, has

been quiet and rather dull, but prices have been fairly well sustained. They have been variable, with small fluctuations, but no decisive movement. The copper stocks have been more active than any others.

On the exchange there was one sale during the week of Homestake, of South Dakota, at \$55.50 per share for a 100-share lot. This is the lowest price yet recorded.

**Boston**

May 7—Notwithstanding the general lack of interest in the market, prices have hardened for mining stocks in this market, although they were not at their best tonight. The continued firmness of the metal market has had to do with this fact. The high-grade copper stocks have been in the best demand, which acted as a support to the entire list. Quincy was the leader in this line. On Wednesday it spurted from \$126 to \$132 and subsequently sold at \$136, closing above \$130 tonight. There was some expectation that the quarterly rate would be increased, but no deviation was made from the \$4.50 rate. On the same day Tamarack spurted from \$111 to \$122.50, subsequently touching \$127 and closing tonight at \$120. Osceola, on slight transactions, rose \$10 to \$150. Calumet & Hecla is up \$30 to \$870, and Calumet & Arizona rose \$7 to \$180, reacting \$4. Wolverine rose \$10 to \$170, closing within \$4 of it.

Amalgamated Copper touched \$98.12½ during the week, closing about the same as a week back at \$94.62½. American Zinc, on concentrated buying, is up \$3.25 to \$43. Boston Consolidated spurted \$2.62½ to \$31.50, although the final today was \$29.87½. This company plans to retire its debenture bonds at the rate of £105 per £100. About one-half this issue has already been converted into stock.

The Stock Exchange list has been enlarged by taking in Arizona Commercial, heretofore traded in on the curb. The price holds just above \$27 per share. Balaklala, lately listed, has been heavy around \$10. Copper Range spurted \$1.75 to \$83.75, losing \$1 of it, and Franklin moved up \$1.62½ to \$18.50, losing most of it. Isle Royale rose \$2.25 to \$21, but did not maintain the advance, and Mohawk spurted \$4 to \$90, with a \$2 reaction.

North Butte has been to the fore, advancing \$6.50 to \$93.25, although the close tonight was \$91.75. Old Dominion moved up \$1.75 to \$56.50, reacting to below \$55. Utah Consolidated advanced \$2.62½ to \$65.62½, reacting to \$63.50, and Victoria became active, touching \$9.62½, against \$8 a week back. United States Smelting sold up \$2 to \$56.50, losing \$1 of it. This company has issued a very comprehensive report.

The Osceola annual meeting has been



further adjourned to July 1. The Tamarack at its annual meeting voted to sell 5906 acres of timber land, by which the company profits about \$35,000.

**Colorado Springs**

May 3—Trading has been light during the past week, but steady prices have prevailed. A big "boosters' excursion" from Denver, Colorado Springs and other points to Cripple Creek will take place on May 11 to celebrate the formal opening of work on the drainage tunnel. The brokers are predicting a rapidly rising market in the near future, but the outsider wonders what can produce it. The output of the Cripple Creek mines was \$1,177,575 for April.

**STOCK QUOTATIONS**

NEW YORK May 7		BOSTON May 7	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	3/4	Adventure.....	4*
Am. Nev. M. & P. Co.....	100 1/2	Allouez.....	52
Amalgamated.....	94 3/4	Am. Zinc.....	43
Anacosta.....	63 3/4	Arcadian.....	7 1/2
Balakiala.....	9 3/4	Atlantic.....	14
British Col. Cop.....	8	Bingham.....	18 1/2
Buffalo Cobalt.....	3	Boston Con.....	29 1/2
Butte & London.....	1 1/2	Calumet & Ariz.*.....	176
Butte Coalition*.....	27 1/2	Calumet & Hecla*.....	865
Butte Cop. & Zinc.....	3	Centennial.....	33 1/2
Cobalt Contact.....	53	Con. Mercur.....	38
Colonial Silver.....	3	Copper Range.....	82 1/2
Cum. Ely Mining.....	10	Daly-West.....	16 1/2
Davis Daly.....	15 1/2	Franklin.....	17
Dominion Cop.....	7 1/2	Greene—Can. cfts.....	16
El Rayo.....	6	Isle Royal.....	19
Foster Cobalt.....	1 1/2	La Salle.....	17
Furnace Creek.....	1 1/2	Mass.....	7
Giroux Mine.....	8 1/2	Michigan.....	14 1/2
Gold Hill.....	2 1/2	Mohawk.....	88
Granby, New.....	15	Mont. C. & C. (new).....	3 1/2
Greene Gold.....	1 1/2	Nevada.....	16
Greene G. & S.....	1 1/2	North Butte.....	91 1/2
Greenw'r & D. Val.....	80	Old Colony.....	1 1/2
Guanajuato.....	4 1/2	Old Dominion.....	55
Guggen. Exp.....	230	Osecola.....	145
Hanapah.....	3/4	Parrot.....	23 1/2
McKinley Dar.....	1 1/2	Phoenix.....	1 1/2
Micmac.....	5 1/2	Quincy*.....	130 1/2
Mines Co. of Am.....	1 1/2	Rhode Island.....	6
Mitchell Mining.....	4 1/2	Santa Fe.....	3 1/2
Mont. Sho. C. (New).....	9 1/2	Shannon.....	18
Nev. Utah M. & S.....	5 1/2	Tamarack*.....	120
Newhouse M. & S.....	20	Trinity.....	22 1/2
Nipissing Mines.....	13	United Cop., com.....	61 1/2
Old Hundred.....	3 1/2	U. S. Oil.....	55 1/2
Silver Queen.....	1 1/2	U. S. Smg. & Ref.....	45 1/2
Stewart.....	2 1/2	U. S. Sm. & Re., pd.*.....	64 1/2
Tennessee Copper.....	4 1/2	Utah Copper.....	9 1/2
Union Copper.....	4 1/2	Victoria.....	9 1/2
Utah Apex.....	6	Washington.....	1 1/2
West Columbus.....	12	Winona.....	9
		Wolverine.....	166
		Wyandotte.....	1 1/2

N. Y. INDUSTRIAL	
Name of Comp.	Clg.
Am. Agri. Chem.....	20
Am. Smelt. & Ref.....	131 1/2
Am. Sm. & Ref., pf.....	108 3/4
Bethlehem Steel.....	12
Colo. Fuel & Iron.....	35 1/2
Federal M. & S., pf.....	87
Inter. Salt.....	87
National Lead.....	65 3/4
National Lead, pf.....	99 3/4
Pittsburg Coal.....	12 1/2
Republic I. & S.....	27 1/2
Republic I. & S., pf.....	84 1/2
Sloss-Sheffield.....	56 1/2
Standard Oil.....	525
Tenn. C. & I.....	147 1/2
U. S. Red. & Ref.....	18 1/2
U. S. Steel.....	37 1/2
U. S. Steel, pf.....	102 1/2
Va. Car. Chem.....	28
Va. I. Coal & Coke.....	71

ST. LOUIS	
Name of Com.	High. Low.
Adams.....	40 30
Am. Nettie.....	05 03
Center Cr'k.....	2.25 2.10
Cent. C. & C.....	66.00 65.00
C. C. & C. pd.....	78.50 77.50
Cent. Oil.....	125.00 115.00
Columbia.....	5.00 4.50
Con. Coal.....	25.00 20.00
Doe Run.....	165.00 150.00
Gar. Bimet.....	30 23
St. Joe.....	18.00 15.00

S. FRANCISCO May 1		NEVADA May 1	
Name of Comp.	Clg.	(Weir Bros. & Co., New York)	Clg.
<b>COMSTOCK STOCKS</b>			
Belcher.....	.50	Tonopah Stocks.....	
Best & Belcher.....	1.10	Tono'h Mine of N.....	17.37 1/2
Caledonia.....	.35	Tonopah Exten.....	2.87 1/2
Chollar.....	.10	Montana Tonop'h.....	3.35
Con. Cal. & Va.....	.92	Belmont.....	4.37 1/2
Crown Point.....	.28	Tonopah Midway.....	1.45
Exchequer.....	.45	West End Con.....	1.20
Gould & Curry.....	.28	Jim Butler.....	.94
Hale & Norcross.....	.65	<b>GOLDFIELD STOCKS</b>	
Mexican.....	.72	Sandstorm.....	.62
Ophir.....	2.40	Kendall.....	.38
Overman.....	.12	Red Top.....	4.00
Potosi.....	.07	Jumbo.....	4.00
Savage.....	.82	Goldfield Mining.....	1.45
Sierra Nevada.....	.46	Dia'field B. B. C.....	.31
Union.....	.45	Atlanta.....	.65
Utah.....	.04	Mohawk.....	16.00
Yellow Jacket.....	.90	Silver Pick.....	.86
		Laguna.....	1.45
<b>TONOPAH STOCKS</b>			
Golden Anchor.....	.31	<b>BULLFROG STOCKS</b>	
McNamara.....	.45	Mont. Shoshone C.....	9.62 1/2
Montana-Pitts.ex.....	.15	Tramps Con.....	.75
North Star.....	.36	Gold Bar.....	.86
Rescue.....	.18	Bullfrog Mining.....	.17
<b>GOLDFIELD STOCKS</b>			
Black Ants.....	.10	Bullfrog Nat. B.....	.24
Blue Bull.....	.47	Homestake Con.....	1.15
Columbia Mt.....	.87	<b>MANHAT'N STOCKS</b>	
Comb. Frac.....	4.50	Manhattan Con.....	.68
Conquerer.....	.20	Manhat'n Dexter.....	.16
Daisy.....	2.05	Jumping Jack.....	.15
Florence.....	6.25	Stray Dog.....	.19
Frances-Mohawk.....	1.40	Indian Camp.....	.13
Goldfield Con.....	7.87	<b>COLO. SPRINGS May 4</b>	
Grandma.....	.22	Name of Comp.	Clg.
Great Bend.....	1.00	Acacia.....	9 1/2
Red Hills.....	.59	Black Bell.....	5
St. Ives.....	1.45	C. C. Con.....	5
<b>BULLFROG STOCKS</b>			
Amethyst.....	.41	Dante.....	5
Bonnie Claire.....	.41	Doctor Jack Pot.....	8
Mayflower Con.....	.50	Elkton.....	55
Montgomery Mt.....	.21	El Paso.....	46
Original.....	.15	Findlay.....	65
<b>MANHAT'N STOCKS</b>			
Gold Wedge.....	.10	Gold Dollar.....	7 1/2
Manhattan Mg.....	.12	Gold Sovereign.....	6 1/2
Pine Nut.....	.15	Isabella.....	25
Ruby Wonder.....	.30	Index.....	.....
Stray Dog.....	.20	Jennie Sample.....	6 1/2
Yellow Horse.....	.06	Jerry Johnson.....	6 1/2
		Mary McKinney.....	60
		Pharmacist.....	6 1/2
		Portland.....	1.17
		Un. Gold Mines.....	8 1/2
		Vindicator.....	87
		Work.....	19 1/2

**New Dividends**

Company.	Pay-able.	Rate.	Amt.
Amalgamated Copper.....	May 27	\$2.00	\$3,661,758
Am. Smelters Sec., pf., B.....	June 1	1.25	375,000
Bunker Hill & Sullivan.....	May 4	0.60	180,000
Doe Run Lead.....	May 15	0.50	29,531
Lehigh Coal & Nav.....	May 27	2.00	395,110
New Central Coal, Md.....	May 1	0.40	20,000
Penna. Steel, pfd.....	May 1	3.50	588,749
Philadelphia Co.....	May 1	0.75	434,296
Pocahontas Collieries, pfd.....	May 1	1.50	22,500
Quincy, Mich.....	June 10	4.50	495,000
Tenn. Coal, Iron & R.R.....	May 1	1.00	225,536
Tenn. C. I. & R.R., pfd.....	May 1	2.00	4,960
Tonopah Co., Nev.....	Apr. 22	0.35	350,000
United Copper.....	Apr. 29	1.75	787,500
United Copper, pfd.....	May 15	3.00	150,000
U. S. Cast Iron Pipe & Fdy.....	June 1	1.00	150,000
U. S. C. I. Pipe & Fdy, pfd.....	June 1	1.75	262,500
U. S. Steel Corp.....	July 1	0.50	2,541,513
U. S. Steel Corp., pf.....	May 31	1.75	6,384,919
U. S. Cast Iron Pipe & Fdy.....	June 1	1.00	125,000
U. S. C. I. Pipe & Fdy, pfd.....	June 1	1.75	218,375
United Verde.....	May 1	0.75	1,500,000
Vindicator Con., Colo.....	Apr. 25	0.03	45,000
Yellow Aster, Cal.....	May 4	0.10	10,000

**Assessments**

Company.	Delinq.	Sale.	Amt.
Andes, Nev.....	Apr. 30	May 21	\$0.10
Benson, Cal.....	June 9	June 29	0.10
Chollar, Nev.....	Apr. 22	May 16	0.10
Con. Imperial, Nev.....	May 7	May 29	0.01
Con. St. Gothard, Cal.....	Apr. 24	May 14	0.10
Daly, Utah.....	May 4	May 24	0.25
Little Chief, Utah.....	May 14	May 30	0.01
Lyon, Utah.....	May 13	June 3	0.02
Lost Packer, Idaho.....	May 6	May 27	1.00
Lucky Dutch'n, Nev.....	May 4	May 25	0.01
N. Y. Bonanza, Utah.....	May 11	May 31	0.03
Overman, Nev.....	May 17	June 7	0.10
Potosi, Nev.....	May 13	June 5	0.10
Union Con., Nev.....	May 8	May 29	0.10
Utah & N. Y., Utah.....	Apr. 27	May 16	0.01
Wabash, Utah.....	May 11	June 3	0.05
Yellow Jacket, Nev.....	Apr. 13	May 22	0.10

**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	66.976	30.968	.....
June.....	65.394	65.394	30.185	.....
July.....	65.105	65.105	30.113	.....
August.....	65.949	65.949	30.529	.....
September.....	67.927	67.927	31.483	.....
October.....	69.523	69.523	32.144	.....
November.....	70.813	70.813	32.671	.....
December.....	69.060	69.060	32.003	.....
Year.....	66.791	66.791	30.868	.....

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

**AVERAGE PRICES OF COPPER**

Month.	NEW YORK.				LONDON.	
	Electrolytic		Lake.		1906.	1907.
	1906.	1907.	1906.	1907.		
January.....	18.310	24.404	18.419	24.825	78.869	106.739
February.....	17.869	24.869	18.116	25.236	78.147	107.356
March.....	18.361	25.065	18.641	25.560	81.111	106.594
April.....	18.375	24.224	18.688	25.260	84.793	98.625
May.....	18.475	18.475	18.724	18.724	84.867	.....
June.....	18.442	18.442	18.719	18.719	83.994	.....
July.....	18.190	18.190	18.585	18.585	81.167	.....
August.....	18.380	18.380	18.706	18.706	83.864	.....
September.....	19.033	19.033	19.328	19.328	87.831	.....
October.....	21.203	21.203	21.722	21.722	97.269	.....
November.....	21.833	21.833	22.398	22.398	100.270	.....
December.....	22.885	22.885	23.350	23.350	105.226	.....
Year.....	19.278	19.278	19.616	19.616	87.282	.....

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

**AVERAGE PRICE OF TIN AT NEW YORK**

Month.	1906.	1907.	Month.	1906.	1907.
January.....	36.390	41.548	July.....	37.275	.....
February.....	36.403	42.102	August.....	40.606	.....
March.....	36.662	41.313	September.....	40.516	.....
April.....	38.900	40.938	October.....	42.852	.....
May.....	43.313	43.313	November.....	42.906	.....
June.....	39.260	39.260	December.....	42.750	.....
			Average.....	39.819	.....

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	16.031	19.531
March.....	5.350	6.000	15.922	19.703
April.....	5.404	6.000	15.959	19.975
May.....	5.685	6.175	16.725	.....
June.....	5.750	6.175		