The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, NOVEMBER 7, 1908. NO. 19.

Advanced Methods of Mining Coal in Silesia

A System Is Used in Which Filling Is Flushed into the Workings and Total Extraction of Unusually Thick Seams Is Accomplished

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Silesia is the second largest populated province in Germany, being second to Rhenish Prussia. It has about 5,000,000 inhabitants. Breslau, having nearly 500,000 inhabitants, is the second city in Prussia and the seat of government of the province of Silesia. One-third of Silesia is governed in turn by Germany, Austria, and Russia.

The area on the east border in the southern extremity of Silesia is known as Ober Schilesen (Upper Silesia). This district is the center of great coal, lead and zinc operations. Important towns included in this territory are Glerwitz, Labrze, Königshütte, Myslowitz, Kattowitz, Tarnowitz, and Beuthen. The district includes about 1,000,000 people.

At Myslowitz, there is what is known as the "Dreikaiserreichsecke," which infers the bordering of three nations, namely, Germany, Russia and Austria. Germany is on the west shore of a small stream called Prozemessa, which is a stone's throw across. Russian soldiers are stationed on the bridge crossing the stream, and which marks the boundary of the nations. Any attempt to cross this line without passport, which, in addition, has to be renewed monthly in Russia, is met with severe challenge. Only Russia makes the challenges to entrance.

A large number of Russian workmen come into the German territory from Poland, to work in the mines, and these are required to recross the bridge at night before the hour of seven; no one is allowed to enter Russia from a foreign country after that hour.

A great part of the surface work about the mines, such as tramming, shoveling, and washery operations, is done by women; these latter, however, are not allowed underground.

FIG. 1. SAND BANK, AND DREDGE SECURING MATERIAL FOR USE IN FILLING

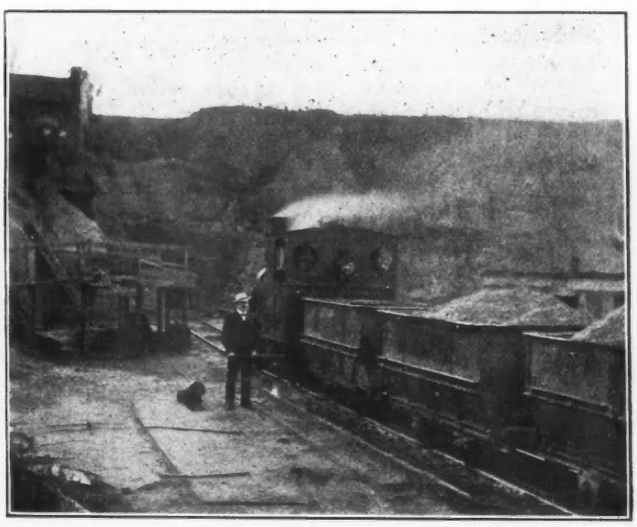

FIG. 2. SHOWS DUMP CARS HAULING FILLING MATERIAL FROM DREDGE TO MINE

The Coal Seams Vary from 14 to 27 Feet Thick

The coal underlying the area from Glerwitz to Myslowitz also extends into Russia, and its approach to the eastward seems to converge. To the west there are four principal seams; the uppermost of these is known as Einsidel, and is 17 ft. thick; other beds are the Schuckmann, 17 ft.; Heinitz, 14 ft., and the bottom seam, known as Raden, which varies from 23 to 27 ft. thick. The latter seam is a coking coal, the others are gas coals. In Russia the seams unite, becoming two seams each about 33 ft. in thickness.

The average dip of the coal is 10 to 12 deg. The formation is called Sattal Flotze (saddle veins) which name indicates the physical nature of the measures. Geologically, the formation is entirely carboniferous, with intervening rocks of sandstone and schist.

Above the four main seams mentioned, and also below them, are several minor seams which have not yet been worked. The present annual output of the district is about thirty million tons. The demand is met readily from the seams mentioned, and development is well in advance, so that there is no immediate promise of working the lower measures.

To the north, where the triasic formation comes in, and where the dolemite appears, lead and zinc are mined to such an extent, that Germany ranks as the foremost zinc producing country in the world. Metal mining in Silesia superseded coal mining.

The mines are owned by 13 different companies, aside from the enormous holdings of the Prussian government. Permission to enter the Kaiser's mines is not available, except when given by the government. An application for same has to be made to the native government of the applicant.

The German spoken in this vicinity is high-class, as compared to the southern country, to the westward, where the dialect is pronounced. English, as in France,

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is rarely heard outside the cities, and in the country, unless one speaks the language, an interpreter is absolutely necessary.

To illustrate the progressiveness of the continental mining industry is cited the following, with a method for testing explosives.

Testing Explosives in Silesia

In a number of the great coal districts of Germany, such as Westphalia, Saarbrüken, and Ober Silesia, the operators are organized, and appropriate support of institutions where experiments of all sorts are carried on which may tend to elevate the industry.

At Beuthen, in Upper Silesia, this idea is well advanced, and experimentation with safety appliances, rescue apparatus in artificially smoke-clouded chambers, and the testing of explosives, are carried on with the utmost care.

For the testing of explosives, a so-called Versuch Stube has been constructed. This is an artificial drift approximately 100 ft. long, built in the shape of an ellipse, with 8 ft. vertical major axis, and 6 ft. minor axis. Three layers of 1x3-in. tongue and groove plank, 4 ft. 6 in. long form the lining; the joints are tarred.

The tube is bound with railroad iron. Only about one-quarter of the drift is in daylight, the same being set in an embankment. At intervals of 3 ft. on the exposed segment are windows 6x12 in., of ½-in. plate glass. These are placed between the hoops of heavy iron, which bind the artificial drift. Each of these parts is numbered, beginning at the end where the explosion is effected. At this end, which is slightly higher than the outlet, a heavy hard-steel mortar is set, having a horizontal boring of 2½ in. diameter by 18 in. long. This hole, into which the explosive is charged, points downward to the floor of the drift. Its prolonged axis would intersect the flow 3 ft. distant from the mouth of the hole. All the conditions are made least favorable to explosive manufacturers.

The walls of the drift about the business end are now spread with fine coal dust, a known amount of powder is charged and fired in the mortar, either by fuse or electricity, according to the custom of the district. Atmospheric conditions are noted at the time of each test. The distance traversed by the flash is also noted, according to the number of the last port which the flame is seen to approach. Five charges are usually made in each experiment, and if the dust does not ignite in these attempts, the explosive is declared safe for the particular quantity tried.

A form of explosive composed of 30 per cent. potassium chlorate, and 20 per cent. rosin, was tried. In the first instance, five charges of 500 grams each were tried successfully, and in no case was there ignition. At 600 grams a voluminous flash set up, which could be clearly seen from the view point; the observation was made from a small house 75 ft. distant, this house having a narrow panel of glass as a window. A charge of 550 grams gave no flash, and the explosive was declared safe to this extent. The same percentage explosive was again tried, only in this second instance, the entire rosin ingredient had been treated with nitric acid, whereas the first was only partly so. Two hundred grams threw a flash to No. 9 port, 65 ft. from the point of discharge. The exhaust of fumes is readily accomplished by the action of a steam jet and the experiments expeditiously effected.

The Deutschland Mine

There are two different methods of mining coal in Upper Silesia: First, the old method of blocking out pillars the entire coal thickness, followed by pillar withdrawal and roof fall; second, a similar preliminary measure, with pillar withdrawal, and replacement.

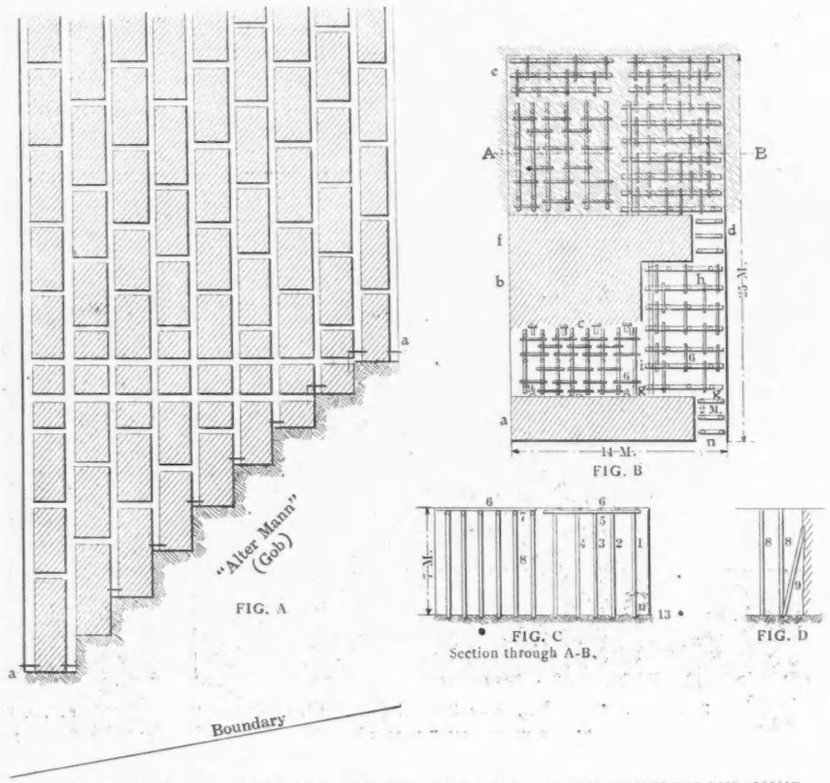

FIG. 3. GENERAL METHOD OF WORKING THE SEAM AT THE DEUTSCHLAND MINE

The work at the Deutschland mine typifies the former method. This mine is located about five miles out of Kattowitz, Upper Silesia, Germany, in a town called Schweintochlowitz. Three thousand tons of coal are mined daily, a good part of which is burned nearby, for domestic purposes and in the local steel works.

The seam here measures about 22 ft., and dips about 13 deg. It is mined in one lift, without replacement of any kind; timber is utilized for temporary support. The timber is eventually withdrawn, marked surface depression ensuing. In the fallen ground, particularly where the pillars have been robbed, (this fallen area is called "alter mann") gas is evolved, containing as much as 8 per cent. Co_2. Certain pillars are necessarily left, in this old Silesian method of mining, to maintain roof in particular areas. In time, these high pillars show signs of crushing, and heat is evolved, which renders the conditions dangerous. This method of mining, however, is generally used where filling material is not available.

The similarity to conditions in South Staffordshire are here noticed. The method of mining is distinctly different, and I am inclined to believe that there is something for the English engineers to study with advantage in this vicinity as regards the safe mining of thick coal seams with high recovery. The roof varies from a strong sandstone to a rock called shiebe, which latter is a hard clay.

The Method of Mining

Hoisting is done from two levels, 900 ft. and 1400 ft. The method of mining is to block out the coal in the pillars 42x75 ft., with a 6-ft. roadway; then starting from the boundary, carry back the pillar robbing. This is carried on in steps, on the retreat, and withdrawing the timbers and allowing the roof to come in, is accomplished in a line approximating 45 deg., to the layout of the roads.

On account of the gaseous condition prevalent, similar precautions to those taken at South Staffordshire must be taken here in order to constantly have a supply of good air in the working places. Fig. A of Fig. 3 shows the dams which set off the "alter mann" (fallen ground) from the coal workings under attack. Approaching the roadway, Fig. B of Fig. 3,

up to the point where a dam had previously been placed, a leg at *e* was left. The dam is now at *d*, the area beyond that being alter mann. The timbers have been removed, as is indicated by the cross-hatch patching.

The condition we will now assume is a dam standing at *d*, and the work being carried back. Working from *n*, the drift sets which maintain the roadway in the lower 6 ft. of the seam between the legs *a* and *f* are removed and the heavier operation commenced. The small timbers are left, as at *d*, next to the legs *a* and *f* until the very last. A six- to seven-meter face is started at *g*, which includes the original roadway.

The hight that posts are required is measured with a pole. The men standing on ladders hold caps, and the posts are set under. A hole about 8 in. deep is cut in the floor to receive the posts, Fig. C of Fig. 3. The posts are all notched to receive the caps, this notch being cut underground.

The axeman first makes a cut about 2½ in. wide, and 3 in. deep, across the top of a cap, and then trims the edges of this incision to make the whole cut elliptical in form. One side of the cut is made deeper than the other, the high side being marked, so that when the timber is set, the miners know precisely in which direction to cut the post. Timber is first set under the cap at an inclination, and finally forced into vertical position in a way that the cap rests on the upper edge of the post, until the timber eventually takes the overlying weight, when the bearing surface becomes even. In Fig. *B* of Fig. 3, the 7-m. face, *g*, is carried on till it reaches *h*, when the work is started at *l*, as a face in the other direction, and the coal similarly removed. Finally the leg *f* is standing in a similar manner to *a*.

The method of getting the coal is by first cutting under, bringing down the overhang by use of powder. At the face, inclined posts 9, 9, 9, are set against the overhang, as shown in Fig. *D* of Fig. 3. Just before a shot is to be fired, certain timbers are withdrawn. Over the caps of the vertical timbers, small sticks 6, 6, 6, are set at frequent intervals. Eventually pillar *f* is removed, and all of the timber is drawn from this area, after which the roof falls, and we have only leg *a* standing. The dam is now placed at *n*, and work is carried on behind, as shown in drawing *A*, of Fig. 3.

Dams are formed by setting up poles close together, driving slivers of wood between them, and finally making the dam tight by looting with clay and lime. The dam, it is remembered, is in the 6-ft. hight of original drift.

There are Few Accidents From Falls of Roof

In spite of the fact that there is about 8 per cent. of CaO_2 in the gob, the working area rarely shows more than one-half per cent. The system requires careful attention, and from all appearances is dangerous, due to the hight at which the work is carried on. However, I was informed that of the thirteen deaths which occurred during the past year, only four were the result of roof falls, the others being gas fatalities, and due to other causes; this record is far in advance of South Staffordshire.

As soon as a shot is fired in the face, the men return to the room, scale ladders, and proceed to bring down loose pieces of coal from the back or side. This they do with a long-handled ax, swinging same with one arm and holding the ladder with the other. In changing the position of a ladder, the men do not necessarily come down to the floor, but hobble the ladder about the room from one timber to the other.

Fig. 4 shows the condition of a room which has been mined in part, with the completely fallen ground close by in the adjacent chamber. The photo was taken

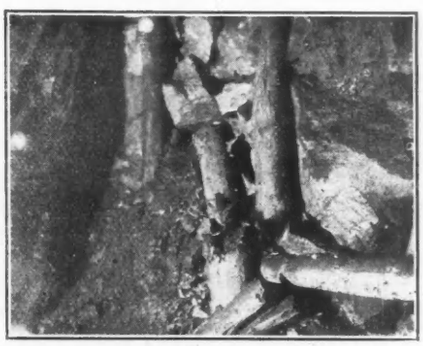

FIG. 4. CONDITION OF CHAMBER WHEN PARTLY MINED

in the room where coal cutting was in progress.

Back Filling by Flushing

There is hardly a mining country where the flushing system for replacement of excavated areas underground has not been taken up. The idea of returning waste material in the mine by means of water originated in Pennsylvania, in the year 1896, at the Dodson colliery, Plymouth. As far as I know, the system is not used elsewhere in the United States than Pennsylvania. Experts from Silesia, Germany, looked into the Pennsylvania field, and have since then elaborated on this system to such an extent that it would hardly be recognized in America.

The northern coalfields in Germany, the Austrian mines, and the French mines, soon took up the idea, and followed suit after the Myslowitz colliery had shown the adaptability of the system, for the replacement of seams where surface subsidence was undesirable.

The system permits of much greater safety to the workmen underground, particularly where the seams are thick, and the testing of roof conditions not so readily accomplished; a marked decrease in mine-timbering cost has resulted, since the introduction of flushing, in various mines. While timbering is generally used in conjunction with the filling, the recovery on withdrawal is greater. Surface damage suits, which formerly were so numerous, have now been practically suppressed. Pillar coal hitherto unminable, on account of permanent pillar requirements, is made available for market by replacement of the areas with filling.

Not alone has flushing been introduced in coal mines, but the iron and lead mines in Germany have taken it up. In England I have found but one instance of its introduction there, and that is at the Greater Moor Iron mine, where filling is introduced with water, with a view to removing pillars.

The English do not readily introduce or accept new ideas which are not the creation of English brain. However, of late, there appears to have been an awakening, and the engineers are entering the German field with a view to profiting by their ingenuity.

The method of filling as taken up in Carmaux, France, is also interesting. Here there is a closer correlation between the introduction of the filling itself with the removal of the coal, than at any of the mines in Germany, where the pillars are formed, as a rule, in the regular way, and the filling is introduced in conjunction with robbing operations.

The different materials used for filling are numerous. In Silesia most any material that can be moved with water and passed through medium sized pipes, is introduced into the workings. It is desirable that the filling shall have some binding qualities.

Filling was formerly introduced into the mine in cars, and in the chambers by manual labor, but this crude method was so expensive, that the flushing system has been generally adopted. An important consideration of cost in regard to the use of water is the necessity of not alone getting rid of the water after it has drained off and served its purposes, but also of clarifying the water before it enters the pumps.

Filling Introduced with Air as a Conductive Force

An experimental plant was built near Kattowitz, Upper Silesia, for the purpose of trying out the idea of introducing filling with air under pressure, as a conductive force. The advantages of such a system are readily seen, in that all the difficulties which arise in using water are done away with. The experiments have not been brought to a conclusion, but it is understood in Kattowitz that encouraging results have been obtained, though it appears that financial backing for the scheme has not been forthcoming. Not alone would the water manipulation difficulties underground be done away with, but

many mines now lacking a water supply could adopt a mechanical filling method.

The material experimented with was a crushed dolomite, the maximum size being about nut. Pipes were 10cm. in diameter, and after long experiment, it was found best to make the pipe line down the shaft in spiral shape, instead of straight in its vertical course. It was inferred that the air pressure used was only slight, and that the pipes could be varied in direction at will after reaching the workings, without interfering with the system, i.e., made to follow the undulations underground, vertically, or change direction horizontally.

Inquiries on the subject, at best, were only vaguely answered, but brought out the point that considerable dust resulted underground as the result of this method, and that the process as it now stands involves greater expense than water flushing. My own opinion of this process is that the dust difficulty could be obviated by spraying the filled material underground from the time it leaves the pipe mouth. I am inclined to believe that there will be a greater shrinkage in the packed area under roof-weight, as the particles could not be in such intimate contact. On this account the spraying would again be of advantage.

Myslowitz Colliery

The Myslowitz mine is situated in the Upper Silesian frontier town of Myslowitz, and is one of the great collieries of the district. A general view of this plant is shown in Fig. 5.

Two 18-ft. circular shafts supply 2600 tons of hard steam coal daily from levels at a depth of 780 and 1100 ft. The thick seam in this mine varies from 28 to 37 ft. There are other seams from 8 to 21 ft. in thickness. Above the coal are stratifications of sandstone and material called schiefer, which is gray in color, and not as strong as the sandstone.

The equipment of this mine is high class. Everywhere the company's consideration for their 2100 employees is noticeable. This attitude of employer toward employee is evident at all mines on the Continent. The change room, for example, is a one-story brick structure, approximately 75x100 ft., standing about 35 ft. high. Within, instead of having lockers, the wearing apparel is hung on hooks, which in turn are attached to chains, and in this way the apparel worn in the mines is raised to a skylight in the roof, and a thorough airing made possible.

At the shafts, hoisting cages are of particularly heavy design, being double-deckers, each deck holding four cars. The teeth of the dogs are a series of sharp, curved steel blades. The hoisting rope was 6 cm. in diameter. On the cages there was suspended a metal bell which, when struck, spread alarm throughout the shaft, and attracted attention at the stations of the shaft, to some disorder on the cage.

For transmission of hoisting signal, there was a complete equipment. The system involves the same principle of interchange of signals as in use at Carmaux, and other mines previously described, whereby there was a thorough understanding between the person giving the signal and the hoisting engineer, previous to commencement of winding.

The system of mining by sand replacement was first introduced in Europe at this colliery. The sand, which is a brown material, of fine texture, is quarried from a bank about 20 ft. high, and 1500 ft. long, and loaded by means of electrically operated bucket dredges. The quarry is located about a half mile from the mine plant.

The Mine Uses 3000 Tons of Filling Material Daily

This filling material is quite free from dirt. Fig. 1 shows a view of the bank, and the dredge operating same. This dredge is equipped with a 30-h.p. motor, 500 volts direct current. The dredge runs on three tracks. The power line is hung on light, steel, lattice-frame poles. These are seen to the right in Fig. 1. The electrical contact to the motor is simply a bar extending from the dredge, which rests on this wire. This can also be seen in the figure. As the face of the bank advances the trolley poles are similarly brought forward.

The upper part of the dredge is equipped with a bin, from which the dump cars, seen in Fig. 2, are loaded. About 3000 tons of this sand is filled into the mine daily (one ton of sand equals 0.77 cu.m.). The dredge can give 3000 cu.m. in 24 hours.

There has been more or less difficulty, due to the freezing of moisture in the sand. This interfered with the unloading operations. Ordinarily, loading required about 10 seconds per car, and unloading eight seconds. In order to obviate the freezing difficulty, the space between the two legs or braces under the body of the car, has been equipped with a grate on which fires are built. In cold weather the bank itself freezes, becoming hard, and a similar difficulty was encountered. This is now ameliorated by spreading hot ashes on the surface of the bank where the dredge is operating. At night arc lamps serve for illumination.

In Fig. 2, the traction equipment is shown. Cars are standing over the grating, through which the sand filling passes into the large hopper; this in turn leads to the main pipe line which supplies sand to the underground workings. There is a considerable storage capacity below the grating. At the mouth of the funnel is an arrangement of water sprays, whereby clogging of sand is prevented as it passes down the mouth of the pipe.

These sprays meet the sand under a pressure of eight atmospheres. The water, in being raised from the mine, after draining off from the sand underground and pumped to the surface, is accumulated in sumps. These are located about 50 ft. off to the left of Fig. 2. At this point, electrically driven pumps are operated, and supply the pressure required to keep the pipe line clear.

There are two bore holes supplying the two levels of the mine. Thus the work may be carried on at both elevations simultaneously. This is an advantage over the system used at the Dodson colliery, Plymouth, Penn., where one line intended for two levels, could supply only one at a time. Communication was maintained by means of telephones, between the chambers being filled, and the man in charge of the sand-unloading operations at the mouth of the bore hole.

A large part of the surface work is done by prisoners; such as track laying, and

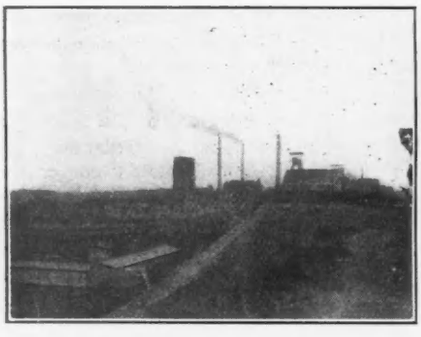

FIG. 5. GENERAL VIEW OF THE MYSLOWITZ COLLIERY

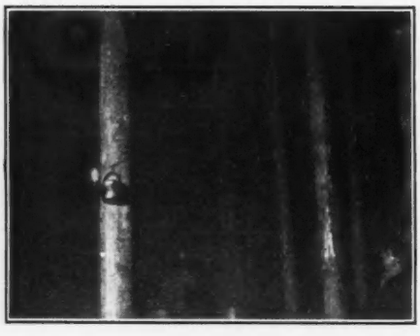

FIG. 6. SHOWING TIMBERS USED TO SUPPORT THE ROOF

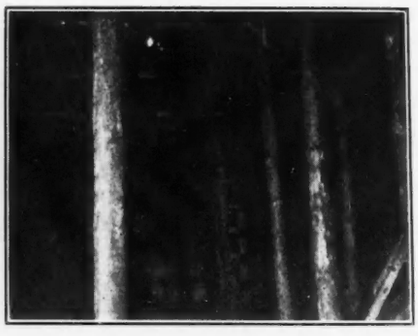

FIG. 7. SHOWING WHERE A PILLAR IS REPLACED BY TIMBERING

work around the dredge and on the banks. Two-thirds of the wage goes to the city, and one-third reverts to the prisoner on his release.

It seems difficult to obtain consistent opinions relative to the amount of water required as compared to the volume of sand. It is claimed at Myslowitz that the proportion is 1 to 1, whereas at other quarters this is questioned, it being claimed that the proportion is nearer 2 to 1. The figure in general depends, to an extent, on the horizontal distances through which the filling material has to pass underground, the head, the artificial pressure which may be supplied at the mouth, and the characteristics of the material being flushed.

It is figured that 1 m. of vertical fall affords transport of material over 10 m. horizontal, and 1 atmosphere of pressure is equal to 1 m. of vertical fall, so that an application of eight to ten atmospheres would mean eighty to one hundred meters transport in addition to the pressure head.

As before mentioned, the thickness of coal taken may be as thick as 12 m., and the method in this instance would be to remove same in slices of 6 m. each. The first slice may be taken at 7 m. The work consists in first blocking out the lower slice, by means of headings 2x2 m. into squares 10 m. to 12 m. in width, and 12 m. to 14 m. in length, the long dimension of the pillars being in the direction of dip, which attains 12 degrees.

The hard formation overlying the seam, and the dip above mentioned, in conjunction with a desirable material for filling, makes this an ideal flushing proposition.

Cost of Pipes Used In Flushing

Sand is conducted to the rooms in pipes of Mannesman steel, which are 178 mm. diameter. The steel is 8 mm. thick, and the pipes are in 6-m. lengths. There is at present in the mine approximately 24,000 ft. of pipe.

Various materials have been used, but the steel above mentioned has met with the greatest favor. The cost of pipe is given at about $3.25 per m. in France. Along the line of the pipe in the mine, turns are made by means of elbows, which usually have a radius of about 1.25 m. to 1.50 m. The elbows are usually made of cast iron, and wear out rapidly. A piece of sheet iron is held against the worn-out portion of the elbow by means of iron straps equipped with nuts and bolts. These branches are controlled by means of gate valves, which, at Myslowitz, are of the plunger type. The tendency is to abandon gate valves, and regulate the inflow by branching off, redirecting the flow when one place is filled.

The method of making connections is usually as shown in Fig. *F* of Fig. 8, where the end of the pipe has a flange, and movable rings. At this point on the pipe, reinforcement is often made, as shown. Fig. *G* of the same cut shows a slight angle joint. Flanges are held together by means of bolts, which pass through six to eight holes in the rings.

In making connections from the vertical line to the horizontal, it is found advisable to have an angle of at least 130 deg. between an imaginary line connecting the vertical and horizontal directions and the lines of directions themselves.

The lower six or seven meters of the thick seam being blocked out in an area, the pillars are attacked, much in the same way as at the Deutschland mine, where, however, it is remembered, the withdrawal of the timbers is not done in conjunction with filling, but is accompanied by roof falls.

In setting the timbers, plugs are first driven into the roof, and the caps are hung from these plugs with wire, or light rope. Posts are now brought into the room and set under the caps in regular order. Figs. 6 and 7 show the condition of a portion of an area of a pillar where the coal has been replaced by timbers. These posts are set about 2 m. apart. The comparative hight of the roof above the floor can be estimated by observing the man standing on the floor at the right of Fig. 6.

At the upper end of the pillars, legs of protection are left, as at *a, a,* Fig. *E* of Fig. 8. These legs are finally mined with the main pillar of the next tier above, but not before the sand in the chamber outside it is entirely filled and drained. Before running the flushed sand into the chamber, dams are placed, as seen at *b, b, b,* which confine the sand. These dams are formed of posts and 2-in. plank, which latter are nailed to the posts and are made tight by means of some packing material, such as straw.

Distribution of the Filling

As the mass of filling rises behind the dam, the center boards are set. The chamber being filled, mining is started in the next room, and while there is more or less coal left standing, in approaching the adjacent filled chamber, it is surprising to see how firmly this sand sets after being allowed to thoroughly drain. The coal shell standing is finally scaled off by the miners in the course of the work, until the filling begins to break in from above, which does not generally occur until practically all the coal has been gotten away.

As seen in Fig. 8 there is an opening left in the legs, the filling pipe usually being brought through this opening. In flushing, the pipe is usually brought to about the center of the chamber, and when the area has been filled up to this point, the pipe is brought back until finally it is set close up to the roof at the head of the chamber.

The sand finds its way into the crevices of the coal in the adjacent pillars, and tends to strengthen same. It requires about three or four days for the water to drain off and the sand then sets in a concrete-like manner. At many points in the mine, a cane could be jabbed into the sand by hand for a few inches only.

Removal of a pillar requires about two shifts of six men; it also requires about sixteen hours to fill such a chamber with sand. It is said that 1 cu.m. of sand is filled for every 1.35 cu.m. of coal mined.

The work in the upper slice is carried on quite similarly to that in the lower slice. There is a certain settlement inevitable in the sand, which, it is claimed amounts to five or six per cent. of the hight of the area filled. In virtue of this settlement, a certain bending of the upper coal ensues, and it has been found that on account of this, the coal in the upper slice breaks easier than that in the lower.

The floor on which the men work in the upper slice is the sand filling of the lower slice. The track equipment is laid out in the ordinary manner. While this floor is

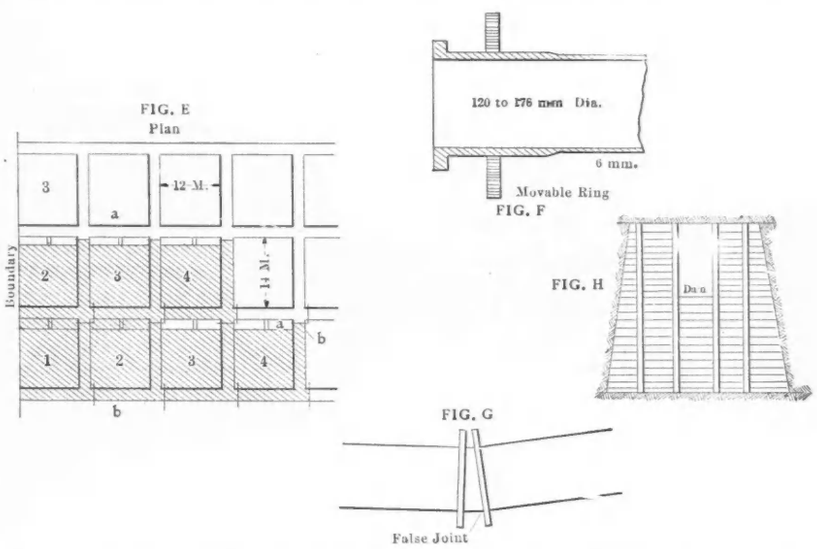

FIG. 8. SHOWING PIPES AND ARRANGEMENT OF DAM USED IN UNDERGROUND FILLING

quite hard, the pack is subject to more or less disintegration. In order to avoid a mixture of coal and sand, iron plates are laid on the floor, onto which the coal from the face is dropped.

The water, in draining off from the sand, has more or less solid matter in it, and is quite muddy in appearance. In order to clear this water of the suspended material, drifts are set apart in the lower part of the mine, and are dammed off with concrete masonry. The walls of these concrete dams are countersunk into the floor and hitched into the roof. The drifts may be set off several hundred feet long.

To permit the clarified water to pass the dam, short lengths of 3-in. pipe are set in this wall in a line, one above the other, about 2 ft. apart. The outer ends of these pipe lengths are fitted with stop cocks. Then the elevation from which water shall be permitted to flow off is regulated according to whether this water is clear or not.

The muddy water coming into the reservoir is allowed to rest, and the suspended material settles at the bottom. The clear water is drawn off by means of these pipes, and passes on to the mine sump. When one of these chambers has been entirely filled with mud, another one is selected, and similarly fitted with a dam.

Flushing at Other Mines in Silesia

Information was obtained relative to operations at various other mines where flushing with water was being carried on, though these mines were not visited. At the Heinitz mine, near Beuthen, cinders, clay, broken bricks, and all kinds of refuse, are flushed down a vertical hole 420 m. deep; the pipe is 182 mm. in diameter.

Before passing into the hole, all the material first goes through a grate having 90-mm. apertures. This material is swept to the hole from a waste heap by means of giants which pass a stream under 30 atmospheres pressure; this pressure is developed by a centrifugal pump.

At the Ferdinand mine, near Kattowitz, where the coal is 2½ m. thick, and dips 25 per cent., city waste is contracted for, for filling purposes. This material is brought to the shaft by 8 h.p. benzine locomotives, which draw dump cars of 1 cu.m. capacity. Sufficient clay and sand are added to make the conglomerate bind. Complete cost of running the above-mentioned locomotive per day is $1.80.

The water supply is pumped from a nearby stream. The dump cars discharge their load into a large hopper-shaped bin, the top of which is equipped with a grating. From this bin the material passes on to a funnel-shaped receptacle, which is connected directly to the main pipe line leading down the shaft; this shaft is 185 ft. in depth. There are two pipe lines, one, a reserve pipe, supported in the shaft at intervals by means of I-beams. Underneath the screen, which is placed in the funnel-shaped receptacle, there is a rising current of water; this screen has 100-mm. apertures.

Underground, a wooden nozzle spout is at the end of the pipe line, which permits of readily changing the direction of the inflowing current about the chamber. It is claimed that the cost of filling is about 13c. per ton. At Myslowitz the cost is said to be somewhat lower than this, figuring closely to 10c. per ton.

Flushing at the Trinity Colliery

At the Trinity colliery in Austrian Silesia, a mixture of sand, clay, and waste mine rock, is effected. The rock is brought to the surface filling plant and crushed. The sand is brought to a separate bin, the dumping being effected with an ordinary cylindrical type of dumper. These hopper units are 4 m. apart. The two materials are now led to the main hopper, which connects with the pipe line. This is 220 mm. long; the pipes are 145 mm. in diameter, and 6½ mm. in thickness. This main hopper is about 790 mm. in diameter at its upper end. At a distance of 450 mm. below the hopper top is a screen, which has square holes of 60 mm. dimensions. This screen is 450 mm. below the top of the funnel. Thirty-five per cent. of the mixture is clay, the other sixty-five per cent. being sand and broken rock.

In order to facilitate the flushing of this material, there are three branch pipe lines 50 mm., which emanate from a main conduit of 145 mm. One branch points directly downward, onto the grating in the funnel, and the other two branches pass below the funnel, enter same from below, and afford a rising current against the bottom of the screen.

At the Tielfau colliery in Moravia, (Austrian Silesia), up to recently, granulated slag only was conducted into the mine workings. The plant is so arranged that the slag comes either from the smelter works and passes directly down the shaft pipe line, or else passes into a storage bin. This bin, or reservoir, serves in case of stoppages at the smelter works.

Recently binding material in the shape of culm from the coal washery has been intermixed with the slag, The culm and slag is led to the main pipe line by separate hoppers.

At the Deutscher Kaiser colliery, Westphalia, the coal is 5 ft. thick, and dips at 33 per cent. Slag and sand is the filling material there also. An innovation is the use of canvas brattices instead of solid wooden dams, to hold back the filling in the chambers underground. Joists of timber are placed about 12 to 15 cm. apart, against the upright posts, and canvas is stretched over the joists. It has been found that by this method, the water which filters through the canvas is clean enough to pass on to the pumps without further settlement. Canvas brattices are also used at Lens Pas de Calais, France.

Nitric Acid from Air

It is just about ten years since we were following with interest the successive disclosures by the Badische Anilin und Soda-Fabrik of its sulphuric-acid contact process, with the development of which the name of Knietsch will be forever linked. In the meantime another great movement has been gaining ground, which seems calculated in time to work radical changes in the manufacture of the second of the staple mineral acids, nitric acid. And in this field also the work of the Badische company figures prominently, as is shown by the recent award of the Liebig gold medal to Dr. Schönherr, the chemist who has taken the leadership in the development of the Badische system of making nitric acid from air, and who has been appointed director of the Norwegian branch (Proceedings of the Annual Meeting of the Verein Deutscher Chemiker, *Chem. Ztg.* 1908 p. 578.)

The Badische nitric acid furnace consists of a long tube traversed from end to end by an electric arc discharge. Air is blown through this tube, being admitted tangentially so as to give it a whirling motion. This is found to raise the efficiency, no doubt by insuring that all portions of the air blown through shall come within the sphere of action of the arc. The entering air is systematically preheated by the outgoing reaction gases*.

Since the autumn of 1907 an experimental plant of 2000 h.p. capacity has been in operation at Christianssand, Norway. This comprises three furnaces of 600 h.p. each. The length of the arc is no less than five meters (16½ ft.). The life of the furnaces is said to be fairly long. The lower electrode is gradually moved up as it wears away. It is claimed as a special advantage of the system, that it gives a concentrated gas with a good yield and high power. Owing to the steady character of the arc, its prejudicial influence upon the power factor, especially marked with intermittent arces, can be reduced to a minimum. As compared with the principal forms of furnace designed by other inventors, the Badische apparatus is distinguished by great simplicity, the absence of moving parts and of electromagnets.

A plant is in course of erection by the Badische company at the Rukwan Falls. This is planned in the first instance on a scale of 120,000 h.p., with the project of enlarging it to double this capacity in the future.

Nearly one-half of the gold in the slime residues on the Rand (H. A. White, *Journ. Chem. Met. and Min. Soc. of South Africa*, August, 1908) is undissolved by aqua regia. Aqua regia breaks up pyrite, so the gold must be inclosed in the slime.

*Frankland, *Journ.* Soc. Chem. Ind., 1907, p. 178.

Metallurgy of Broken Hill, New South Wales

The Ores Carry Lead, Zinc and Silver and Are Similar in Many Respects, but Their Concentration Involves Some Variation in Practice

BY GERARD W. WILLIAMS*

Broken Hill ore consists essentially of an intimate mixture of galena and zinc blende. Silver which varies at the different mines from 7.5 to 12 oz. per ton† occurs in combination with both the lead and the zinc, being usually equally divided between the two minerals. The gangue consists of quartz with varying quantities of calcite, rhodonite and garnet sandstone. The proportion of these minerals varies in the different mines and is responsible for considerable modifications in the treatment as will be seen when the individual mines are considered.

Apart from their hardness the presence of rhodonite and garnet-sandstone add considerably to the difficulty of concentration. Dana gives the hardness of rhodonite as 5.5 to 6.5; three kinds occur in these mines, the hardness of the hardest form being nearer 7 than 6.5. The specific gravity appears to be greater than usually recorded, for as against 3.4 to 3.7 (Dana) local tests on clean mineral rarely fall below 3.9. Especially is this the case in regard to the mineral from the deeper levels. The specific gravity of rhodoniferous tailings (including 5 per cent. galena) varies from 3.8 to 4.5. The great difficulty in regard to the treatment of rhodoniferous ore lies in the fact that owing to its superior hardness, which is reflected in the increased consumption of grinding appliances, the larger particles of the final product are rhodonite. Consequently classification by any form of impulse motion, such as oscillating tables of the Wilfley type is comparatively ineffectual, for, as is well known, size of the particles has an important influence on the concentrate. Although the blende has about the same gravity as the rhodonite, it is eliminated with comparative ease, for being friable the particles are equal in size to those of the galena.

The specific gravity of galena is 7 to 7.7 but the specific gravity of the concentrates varies from 5.9, for ores containing much rhodonite, to 6.5 for clean quartz-calcite ores. On such a clean ore the tailings average 3.5, so that the working difference, in water, is 5.5 to 2.5, or in other words the concentrates are 120 per cent. heavier than the gangue. At the mine which has the most difficult ore to treat, the Junction North, the concentrates average 5.9 to 6.2, as against 4.5 to 4.8 for the tailings; consequently the working margin varies from 1.7 in the best ore to 1.1 in the worst. It will thus be seen that although situated on one lode the individual mines have to adopt different methods of treatment in order to secure the best results.

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†Throughout this article the long ton, 2240 lb., is used.

General Method

Subject to individual modifications which will be described later on, the following is a brief description of the method at present in use: The ore from the mine, after passing the weighing tables is broken in Gates or Blake crushers to 2-in. cube and elevated to the mill bins. From the latter it is fed by means of shaking screens to Cornish rolls which crush it to pass a screen with circular holes 3 mm. in diameter. In most cases the oversize from the trommels is returned to the same rolls, which are run with choke feed, but at the Proprietary mine the ore passes three sets of rolls, the oversize product from each set being elevated up to another, and finer-grinding pair of rolls.

This method which appears to be the most logical manner of crushing, since differential crushing always reduces the percentage of slimes formed, is said to prove economical on the Proprietary; but at smaller mines direct experiment has shown that a choke-feed return gives the best practical results. Rolls are costly in power and unless every pair of rolls is working full the costs must go up. At the Proprietary all the plant is driven by one engine, so that it is impossible to say what difference in power there is between crushing by stages, as in the new mill, and direct crushing as practiced in the old mill. The mine publishes no costs whatever; so the question as to the relative merits of direct and stage crushing rests on the general statement of the management that "stage crushing pays best."

The final product from the rolls, i.e., the product passing a 3-mm. punched screen is fed to jigs. These jigs save about 75 per cent. of the total lead recovered and yield a concentrate assaying 65 per cent. lead. The jig tailings are returned in part to the same jig or to another "fine" jig, and are in part reground in Krupp ball mills or grinding pans. The resultant sands, usually crushed to pass a 0.5-mm. screen, are returned to jigs and to concentrating tables.

The tailings from the jigs and tables are usually collected in trucks and run out to the dump, where they are kept pending the recovery of their zinc contents. The slimes are thickened in settlers and passed over Lhurig or Warren vanners. These slimes after treatment assay somewhat higher in lead, zinc and silver than the original ore. As these slimes represent from 8 to 12 per cent. of the total ore milled this loss is very considerable, for, except at the Proprietary and Central mines, they are not treated, but run out into dams after leaving the vanner tables.

Recoveries

The percentage recovery at the several mines varies within wide limits, as may be seen from the accompanying table.

Both the Proprietary and the Central recover additional lead and silver in their zinc-recovery plants. The plants which I shall describe in some detail are those of the Proprietary, Block 10, Central, South and Junction North mines. Each of these plants embodies some distinct departure from the general treatment method previously epitomized. All data for costs, etc., were supplied by the several managements.

RECOVERY AT MINES OF BROKEN HILL.

Mine.	Lead, Per Cent.	Silver, Per Cent.	Tons Treated per Week.
Proprietary	67.3	41	12,000
Central	72	46	6,000
South	75	55	6,000 (new mill)
North	75	52.7	4,000
British	66	45	3,000 (closed at present)
Block 10	68	36	3,000
Junction North	63.7	45	2,000

Proprietary Mine

There are two mills on the property, but only the most modern one will be described. In this mill grinding is by stages. The ore, after crushing to 2-in. pieces in four Gates No. 5 breakers, is elevated to the mill-bin floor and distributed over the bin. The shells of the crushers are of manganese steel, and the cones have movable covers of toughened steel. The life of the former is 2700 hours, of the latter, 1350 hours. These four crushers handle the tonnage for both mills, about 12,000 tons per week.

The coarse crushing rolls are three in number, 36 in. in diameter, 15 in. wide, and are set 3/8 to 1/2 in. apart. They run at 37 r.p.m. The product from each of these rolls is fed to a shaking screen having holes 3/32 in. in diameter. The over-

size falls upon a belt and is delivered to an elevator which in turn feeds to the second set of three rolls. These rolls are similar to the first set, but are spaced ⅛ to 3/16 in. apart and run at 45 r.p.m. The oversize product from these rolls, after passing shaking tables similar to those at the primary rolls, is returned by belt and elevator to a final set of two fine crushing rolls. These are of the same size as the others, are spaced 1/16 in. apart and run at 78 r.p.m. The oversize product is fed to a No. 5 Krupp mill. In this mill the last and hardest portions of the coarse ore are ground to the required size.

The feed from the several bins to the rolls is by means of a feed roll placed at the head of the chute from the bin. The shaking screens are stated to be much more efficient and more economical that the trommels which were formerly used. According to official tests the latter only passed 58 per cent. of ore fine enough to pass, while the shakers pass 70 per cent. The area of the shaker is 21 sq.ft., and the screen lasts six weeks, as compared with an area of 54 ft. in the trommels taking the same tonnage. The life of the screen in the trommels was only four weeks. The shaking screen requires less water than the trommel, and repairs can be executed in a few minutes.

The product fed to each set of rolls contains less lead than the previous set, the greater friability of the galena rendering it more easily crushed. The first rolls average 15 per cent. lead, which is reduced to 10 per cent. at the last set of rolls. It is certain that this type of crushing diminishes sliming. It is unfortunate that the power required for the several sets of rolls has not been accurately indicated; for it seems likely that the running of large rolls at high speed must be very costly indeed. A roll is a most expensive apparatus, unless kept running with the maximum feed, and the third sets of rolls must consume an amount of power out of all proportion to the work done.

Treatment of Fine Material

The ore that passes through the shaking screens is fed to nine "coarse" jigs of the May type, double five-compartment machines running 165 strokes per minute. On the way to the jigs the pulp passes a series of small spitzluten to remove the slimes which are sent to the settlers. The discharge from the jigs is automatic, through a small pipe in the center of the floor of each compartment. Concentrates assaying 60 per cent. lead are obtained from the first two compartments; the third and fourth compartments yield a product which assays 10 per cent. lead, 19 per cent. zinc and 10 oz. silver.

This product is fed to Krupp No. 4 ball mills with 1/32-in. slotted screens, and the crushed product is elevated to five "fine" jigs. The slimes produced in grinding are removed by a spitzluten. The fine jigs make concentrates assaying 40 per cent. lead. The middlings from the third and fourth compartments are returned to a ball mill having a 1/45-in. slotted screen. The pulp from this mill is fed to the elevator feeding the fine jigs.

The product from the fifth compartment of the fine jigs is run out into trucks, which are returned to the zinc plant for treatment. The coarse-jig tailings are dumped for future grinding and zinc-treatment.

The slimes from the several spitzluten are classified in spitzkasten into coarse and fine slimes. The former go over a set of seven Wilfley tables, the middlings passing to a set of four on a lower level. The tailings are collected and sent to the zinc plant. The fine slimes are classified into four grades and distributed over Luhrig vanners, 28 in number. These vanners are divided into two sets, the lower 14 taking the middlings from the upper 14 which treat the entire product.

Roasting Slime Bricks

The slimes which leave the Luhrig vanners are run out into dams where they are allowed to accumulate in shallow layers. When any dam has a foot of slimes in it a new dam is opened and the full one allowed to dry off. When dry the slimes are cut into blocks, about the size of bricks and allowed to dry in the sun. When dry the blocks are taken by rail to the outside of the town, stacked in rows with adequate air channels and fired. The heaps are about 20 ft. wide, 6 ft. 6 in. high and from 200 to 250 ft. long. Each pile contains about 1250 tons and requires about 1.5 per cent. of wood fuel to start combustion.

After burning for 10 to 14 days the action slowly ceases and as soon as the heaps are cool enough to be handled they are broken up and shipped to the mine smelters at Port Pirie. The bulk of the sulphur and a good percentage of the zinc is driven off; lead losses are considerable. The slimes assay 17 per cent. lead, 16 per cent. zinc and 12.5 per cent. sulphur before burning. After burning the assay is 14.5 per cent. lead, 12.5 per cent. zinc and 7.1 per cent. sulphur, mostly as sulphate. Silver is reduced from 17.5 oz. to 15.8 oz. per ton. The loss of weight is about 5 per cent. The roasted slimes have to be shipped by rail 350 miles to the smelters, so that profits can only be small. The method is somewhat crude but, with the exception of the Central mine the Proprietary is the only mine that recovers anything from its slimes.

The following figures illustrate the chief points in this description of practice at the Proprietary mine:

	Recovery Per Cent. Total Lead.	Tons Handled per hour.
Coarse jigs	47.5	5.75
Fine jigs	13.5	2.75
Wilfley tables	3.15	0.75
Luhrig vanners	3.15	0.17

The lead concentrates, about 18 per cent. of the total weight of the crude ore, average 2200 tons per week; they are sent to the smelters at Port Pirie, South Australia.

Zinc Recovery Plant

The coarse jig tailings, previous to being discharged into trucks for disposal on the dump, are passed over a shaking 40-mesh screen. This removes about 30 per cent. of the total weight of tailings, and this fine product is sent to the zinc plant. The fine jig tailings are run into 8-ton trucks which are sent by rail to the zinc plant. The latter is extremely simple. There are six W-shaped spitzkasten, but the apex of one of the V's is blind, the other one being fitted with a spigot. An iron pipe, shaped like an inverted U with its ends terminating a few inches above the apex of the two V's introduces a hot solution of dilute sulphuric acid and salt cake in rather greater excess than the outlet from the spigot. The acid is maintained at 180 deg. F. The supply vats are heated by superheated steam at 500 deg. F. The tailings are shoveled into these vats, which measure 4 ft. 4 in. in diameter x 4 ft. 8 in. in depth and are lead lined, on the side where the blind pocket is. This blind pocket arrests any coarse material or adventitious substance which might clog up the spigot.

The acid acts on the calcite and the particles of CO_2 liberated attach themselves to the mineral portion of the ore and float upward, aided by the excess upcurrent of hot acid liquor. The overflow from the lip of the vat carries the concentrate which is collected in wooden settlers. All solutions are handled by means of air-pressure pumps on the line of a continuously acting monteju. The discharge from the spigot carries the tailings, which are discharged upon a 3-ft. india-rubber belt, curved like a trough by means of side rollers. This belt, which takes the product from the six vats, runs up hill and so drains the sands settling on the belt. The solution is released to the heating vats. Finally the belt discharges upon another belt which in turn delivers the dried tailings to the waste chutes for use underground in the stopes.

Each vat treats from 10 to 12 tons per hour. The concentrates represent 23.5 per cent. of the total weight and contain 42 per cent. zinc, the recovery of zinc being

PERCENTAGE OF TOTAL AND ASSAY OF PRODUCTS.

	Per Cent. by Weight.	Lead, Per Cent.	Zinc, Per Cent.	Silver, Oz.
Lead concentrates (all sources)	18	55	10	26
Coarse tailings (dump)	29	4	12	5
Fine tailings (zinc plant)	41	5	17	8
Slimes (sinter works)	12	17	16	18

about 66 per cent. The sulphuric acid used in the process is manufactured at the mine.

Costs and Management

Costs for the process, or indeed for any portion of the mining or milling operations are not published. This mine does not publish any costs save a half-yearly statement wherein mining, smelter, custom smelting and any and all expenditures are lumped inextricably together. This is a survival of old-time methods and is not to be commended. Of course, the method may have its advantages from the point of the management, but in regard to this mine there is little to suggest that anything is to be gained by suppressing treatment costs. The large plant and big tonnages treated should make costs compare more than favorably with those at other mines.

Although hardly within the scope of this article reference may here be made to the excellent fire and ambulance service organized at this mine. A fire engine and trained brigade are maintained, together with trained ambulance men. The mine possesses a well equipped ambulance room fiitted with every convenience for rescue work and assistance to injured employees.

Mill at the Central Mine

The present concentrating mill, erected a year ago to take the place of the old mill which was destroyed during the big "creep" is in certain respects the most complete plant in the whole field. This is the only mill in which both lead and zinc are recovered in one series of operations and in which the entire product is treated for zinc. The gangue is chiefly quartz, with some calcite and a good deal of rhodonite and garnet sandstone. The ore is intermediate in character between the quartz-calcite ores of the adjoining South mine and the highly rhodoniferous ores of the British and Junction North.

The ore from the mine is broken in Gates crushers and then sent by means of a Bleichert aërial tram to the mill bins. The mill is divided into four sections or units and as each unit is similar, only one of them will be described.

The crushed ore in 2-in. pieces is fed to the coarse crushing roll and the product passed over a shaking screen provided with punched ⅛-in. holes. The oversize gravitates to another roll, and after passing this roll the entire product is returned to the first roll without elimination of such of the product as may be fine enough to be removed on the shakers. The primary rolls are 30 in. in diameter and have a 15-in. fall. The interspace is approximately ½ in. The flanged roll runs at 15½ r.p.m. and the plain roll at 14 r.p.m. The secondary rolls are of the same size as the primaries but are set face to face for friction drive. The speed is 28 r.p.m. Such procedure must increase the percentage of slimes; but as this mine treats the slimes direct, the consideration need not carry much weight with the management. Nevertheless it seems to be a point deserving of criticism, for this recrushing of already sufficiently crushed material is contrary to good practice in that it must tend to further subdivide the galena and so render it more difficult to obtain a high-grade jig concentrate which has an obvious influence on smelter charges.

Grinders and Shaking Tables

The undersize from the shaker flows to a small spitzkasten, the overflow runs to the sump and the underflow is sent over a four-compartment May jig. The products from the first three hutches are concentrates and go direct to the shipping bins; the tailings from the fourth compartment are distributed over two 7½-ft. grinding pans, central feed. The pulp is fed into the center of the pan and passes down a cylinder surrounding the vertical axis to the muller plate. There is a free discharge at the periphery of the pan; 50 per cent. of the feed is reduced to pass a 0.5-mm. screen.

The product from these two pans is passed over a spitzkasten; the fine sands and slimes overflow and go to the sump and the coarse sands, representing 52 per cent. of the feed to the primary pans, pass to a third pan of similar size. This pan grinds with ordinary feed through a 0.5-mm. mesh, the crushed product flowing down to the sump. The pans are run at 30 r.p.m.

From the sump, which takes the product from two units, the pulp is lifted to the concentrating floor by means of 5-in. centrifugal pumps, and on this floor the pulp is again divided into two portions representing each individual unit. The product from the unit is divided without classification over five Card tables. The concentrates are removed to the bins, the combined middlings from the five tables pass over one Wilfley, and the slimes gravitate to the settlers. The tailings from the Card and the Wilfley tables are delivered upon a drying belt, which in turn delivers to two belts which raise the entire product of the four units to the zinc-recovery plant.

The settled slimes from each unit pass over four double Krupp vanners. These vanners are somewhat similar to the Luhrig vanner. The middlings from these vanners are returned to the same vanners; the tails are delivered upon the big drying belt that receives the sands from the concentrating tables. The belt conveyers are 116 ft. between center of end pulleys and inclined at an angle of 21 deg. to the horizon. The belt itself is 18 in. wide of five-ply rubber. They travel at 130 ft. per minute.

Acid-oil Process

The sands and slimes, which average 18 per cent. moisture, are delivered into mixers in which they are agitated with very dilute sulphuric acid and oil. The consumption of acid is from 10 to 15 lb. per ton and of oil about 1 lb. per ton. Crude mineral oil is used. From the mixers, which are provided with steam pipes to bring the temperature up to 120 deg. F., the pulp runs to a 5x5x5-ft. V-shaped spitzkasten. A baffle is placed across the spitz descending about 18 in. below the surface of the pulp. The underflow is less than the inflow and the excess runs over the front lip.

This overflow carries with it the zinc-lead concentrates which rise to the surface owing to the selective action of the bubbles of carbonic-acid gas generated by the action of the acid on the calcite in the gangue. The gas bubbles attach themselves to the mineral in preference to the gangue and so float the former to the surface. The presence of oil materially accelerates this action. From the first spitz the underflow is delivered to a second similar one, and from that to a third and final spitzkasten.

The concentrates are sent to the zinc bins, and the tailings and slimes to collecting vats fitted with filter bottoms. After leaching out the liquor, which is released to the mixers, the sands are discharged to the dump. This zinc process treats slimes as well as sand; indeed the process works better when a certain percentage of slime is present.

From the collar of the shaft to the settling vats the ore is not handled, nor is the continuity of the process interrupted. Three products only are obtained, lead concentrates, zinc concentrates, and tailings which go to the dump or underground for mine filling.

Power Distribution

In each of the four sections in the lead mill one 75-h.p. motor drives: The primary and secondary rolls; crude and crushed ore elevator and shaking screen; one May jig; three pans for regrinding jig tailings. In the table and vanner department one 15-h.p. motor drives two sections comprising a total of 10 Card tables, five in each section; two Wilfley tables, one in each section; eight double-belt Krupp vanners, four in each section; two slime-pulp elevators, one in each section; one 3-ft. draining belt receiving all sand and slimes tailings from two sections and delivering them to one of the two conveyer belts for elevation to the zinc section.

Tailings Plant

The Minerals Separation Company, which owns the patents for the zinc-recovery process described, also has a plant used for the treatment of the accumulated tailings. These tailings are crushed in 7½ ft. grinding pans, arranged in groups of three as in the mill, to 0.5-mm. mesh and then treated exactly as previously described. A joint plant was erected by the Central mine and the Minerals Separation Company for the treatment of accumu-

lated slimes, the latter company having purchased about 230,000 tons of accumulated slimes at the adjoining Block 10 mine. This slimes plant produces rather a curious concentrate which represents 53 per cent. of the total weight, and assays 24 oz. silver, 24 per cent. lead and 33 per cent. zinc. The plant treats 1000 tons per week. At present it is shut down; the management is waiting to secure favorable smelting terms before disposing of the concentrates.

Work Done in the Central Mill

The combined lead and zinc mill has a capacity of 4000 tons per week. The zinc mill takes the entire product less the lead concentrates, or about 3300 tons per week. The average grade of ore is 12.5 oz. silver, 15.5 per cent. lead, and 19 per cent. zinc. In the lead mill the recovery of silver is 46 per cent., of lead, 72 per cent., the concentrates representing 18 per cent. of the total weight, and assaying 32 oz. silver and 63 per cent. of lead. The zinc flotation process gives a recovery of 68 per cent. of the silver, 80 per cent. of the lead, and 75 per cent. of the zinc in the tailings treated. The concentrate assays 16.5 oz. silver, 14 per cent. lead and 42 per cent. zinc. The total recoveries from the crude ore are, therefore, 85 per cent. of the silver, 96 per cent. lead and 85 per cent. zinc; but the 10 per cent. of zinc in the lead concentrates and part of the lead in the zinc concentrates are not paid for.

In the dump treatment plant the recoveries are slightly different, being 76 per cent. of the silver, 66 per cent. lead and 82 per cent. zinc. It will be noticed that in this plant the lead extraction is decreased and the zinc extraction increased. The weathering of the mineral in the dumps which naturally affects their selective action on the carbonic-acid gas is probably the cause of this difference. The concentrates produced in the retreatment plant assay 15 oz. silver, 10.8 per cent. lead and 45.6 per cent. zinc. The cost of the retreatment plant averages 6s. 6d. a ton. Costs for the combined plant were not available at the time of my visit.

Prior to the introduction of the flotation process the company had experimented with magnetic concentration of the tailings. Treating tailings assaying 6.9 oz. silver, 5.9 per cent. lead and 21 per cent. zinc, a concentrate was obtained assaying 39 per cent. zinc, 9 per cent. lead and 10.5 oz. silver. The concentrate represented 37 per cent. of the total weight treated. Two magnetic plants were erected, but, although running at a profit, the profit was much smaller than that obtained from the flotation process. Owing to the lower grade in zinc the smelter return charges were also higher than with the present grade of concentrate.

Experiments with Zinc-recovery Process

The Sulphide Corporation, which controls the Central mine, has for many years struggled gamely with the zinc-recovery process. This company has incurred a great deal of adverse criticism in the past, criticism at the time perhaps not undeserved, but in the matter of zinc recovery the company deserves unstinted praise. The plant is the only attempt in Broken Hill at a logical, continuous process whereby both lead and zinc are recovered without a break in the treatment. The Proprietary mine, as shown, treats some of the tailings for zinc and treats the slimes by the distinctly uneconomical sintering method; but this mine treats the entire product, sands and slimes. The final product is available for filling as soon as it leaves the tailings collecting vats.

In many respects the plant is unique, certainly as far as Australasian zinc-lead plants go in that the zinc is a very real asset as regards the monthly profits. The Proprietary mine publishes no costs whatever; so the economic value of the zinc and slimes-sintering process is a matter for conjecture, while the Zinc Corporation, which purchased tailings from many companies, has so far proved a dismal failure. Of this company more will be written later on. The zinc plant at the Central places the mine in a sound financial position in face of the threatened drop in the price of metals.

WORK OF BROKEN HILL SOUTH MILL, LAST HALF 1907.

Product.	Net Tons.	Per Cent. Ore.	Lead, Per Cent.	Silver, Oz.	Zinc, Per Cent.	Per Cent. Metal Contents.		
						Lead.	Silver.	Zinc.
Concentrates	17,379	15.7	71.7	19.0	5.8	75.1	54.9	7.5
Tailings	84,445	76.3	3.9	2.7	13.6	20.1	38.5	84.4
Slimes	8,891	8.0	9.0	4.5	12.4	4.8	6.6	8.1
Total	110,715	——	15.0	5.4	12.3			

Broken Hill South Silver Mining Company

The gangue in this mine is essentially quartz-calcite; and although rhodonite does occur in the stopes, it is usually in the form of massive bars which are not rich enough in lead to be worth sending up to the mill. A new mill, with a capacity of 6000 tons per week, will be in operation within a few weeks; the present mill has a capacity of 4000 tons per week. The new mill is built near the main shaft, and the trucks of ore will be dumped directly to the ore breakers from which the crushed ore will be elevated to the mill bins. The procedure in the old mill is as follows:

After passing the grizzlies, manganese-steel bars set with 1½-in. interspaces, the coarse ore is fed to two No. 5 Gates breakers and the product, approximately 1½-in. cubes, elevated to the mill bins. The mill is fitted with three 30x15-in. Cornish rolls. The mills each crush 1800 tons per week from 1½-in. material to 4 mm. sand. Between the bins and the rolls the ore passes over a shaking screen with slotted holes 4 mm. wide and 12.5 mm. long. After passing the rolls the ore is screened through 4-mm. trommels, and the oversize is returned to the same rolls by elevators, a choke feed being maintained. The roll tires, made of Krupp steel, have a life of about 12 weeks. The undersize from the shaking screens and trommels is fed to two Hancock and two May double jigs. The following separation is effected:

	Per Cent. Total Weight.	Lead, Per Cent.	Silver, Oz.	Zinc, Per Cent.
Concentrates	10.6	76.0	19.0	6
Balance	89.4	8.4	4.0	13
Total	100	15.6	5.5	13

The product from the first two compartments of the jigs is concentrates, the third compartment is returned and the balance of the product is divided over 12 grinding pans and one tube mill 13 ft. 6 in. long and 4 ft. 9 in. in diameter. The sands leaving the pans size as follows:

	Per Cent. Total.	Lead, Per Cent.	Lead, Per Cent. Total.
On 40 mesh	10	3.0	2.4
On 160 mesh	70	6.5	50.0
Through 160	20	22.0	47.6
Total	100	9.2	100

This product is distributed over 24 Wilfley tables fitted with a wooden surface of special design. The tailings leaving the tables assay 3.9 per cent. lead, 2 oz. silver and 13 per cent. zinc. The slimes from the tables run to thickeners and from these are fed to six double-belt Luhrig vanners. The vanners separate three products, the concentrate which assays 50 per cent. lead, middlings which are returned to the vanners and slimes which pass to the slimes dam.

The average weekly tonnage was 4178. Milling and concentrating costs average $1.04 per ton of crude ore treated. Mining costs average $2.50 including 35c. refilling charges. Development costs averaged 80c. per ton during 1907. The mill consumes a total of 210 gal. of water per ton of ore treated.

New Mill, Broken Hill South

The new mill is divided into four complete units, but any portion of these units may be placed in circuit with any other unit. The rolls are larger than in the old mill measuring 18 in. across the face by 36 in. in diameter. Running at 19 r.p.m. each set of rolls will have a capacity of 2100 tons per week. The product from the rolls will pass through trommels with 4-mm. screens, the oversize being returned on raff-wheels to the rolls, the undersize gravitating to four double May

jigs. The tailings from the jigs will be ground in 32 Wheeler pans running at 52 r.p.m. and the crushed sands will be divided without classification over 64 Wilfley tables. The pans are arranged in two rows, so that it will be possible to run them in tandem if found desirable. The 64 Wilfleys are arranged in groups of eight. The four units are entirely separate as far as the grinding pans, but from the pans onward the power is distributed into two units instead of four. The slimes from the Wilfleys is thickened and then passed over 24 double-belt Luhrig vanners.

With this mill it is anticipated that the total concentrates will assay up to 75 per cent. lead and that the recovery of that metal will be materially increased. Costs are expected not to exceed 90c. per ton.

North Broken Hill Mill

The ore in the North mine, which is situated on the extreme north of the line of lode, is very similar to that in the South mine. As in that mine the gangue is essentially quartz-calcite. The mineral contents of the two ores and the recoveries from the mills are very similar, as shown in the following comparison of assays:

	Lead, Per Cent.	Silver, Oz.	Zinc, Per Cent.	Lead Recov'd, Per Cent.
South.....	15	5.4	12.3	75.1
North.....	16	6.0	13.3	74.9

The aim of the North mine mill is to produce three products, concentrates of lead and silver, tailings from the jigs which are too low in zinc to repay treatment and which may be sent underground for stope filling, and fine sands carrying zinc for sale to the De Bavay treatment plant. Every effort is made to reduce the proportion of slimes which are not treated by the De Bavay zinc-recovery process. The capacity of the mill is 2500 tons per week.

The ore from the mine is tipped from the landing platform to a No. 5 Gates breaker, and the 2½-in. product is elevated to the mill bins. From the bins the crushed ore is fed by means of a shaking screen to the rolls, which are two in number, each 33 x17 in. Running at 17 r.p.m. these rolls require about 25 h.p. The product from each pair of rolls is distributed over two trommels fitted with screens having 9/64-in. (approximately 4-mm.) punched holes.

The oversize from the trommels is returned by means of raff-wheels to the rolls, and the undersize product together with the undersize from the shaking screens which are provided with the same screen as that used in the trommels, passes to two "coarse" Hancock jigs. A small spitzkasten at the head of the jigs removes the slimes which pass to the settlers. Compartments one and two of the jig deliver concentrates, the product of the third compartment is returned to the same jig by means of an elevator. The product from the fourth compartment of each jig gravitates to five Wheeler pans. The product from the fifth compartment passes to three Wheeler pans and thence over a spitzkasten, to remove slimes which go to the settlers. The product of the spitzkasten is returned to two "fine" May jigs.

The product from the first four compartments of these "fine" jigs runs direct to the five Wheeler pans that treat the product from the fourth compartment of the "coarse" jigs. The product from the fifth compartment of the "fine" jigs is run out to the dumps and is used for filling underground. This product represents 41 per cent. by weight of the ore treated and assays 3.6 per cent. lead, 2.5 oz. silver and 10.9 per cent. zinc.

The five Wheeler pans, which are 4 ft. 6 in. in diameter, crush the ore to pass a 40-mesh screen, this being the present economic limit of fine crushing for the ore. From the pans the ore passes over nine Wilfley tables, the concentrates going to the bins and the tailings to the De Bavay Treatment Company's works. The slimes and fine sands from the spitzkasten and from the floor drainings are settled and then passed over six Wilfley tables; the sands from these tables go to the zinc works, and the slimes are thickened up and sent over four double-belt Luhrig vanners.

DETAIL OF THE VARIOUS RECOVERIES, JUNE TO DECEMBER, 1907.

Product	Net Tons.	Per Ct. Total.	Assay Value.			Per Cent. Metal Contents.		
			Lead, Per Ct.	Silver, Oz.	Zinc, Per Ct.	Lead.	Silver.	Zinc.
Jig concentrates.....	6,944	11.71	73.0	18.3	5.5	52.98	33.55	4.56
Wilfley concentrats.....	2,766	4.66	66.8	19.3	7.4	19.34	14.88	2.59
Vanner concentrates.....	485	0.82	51.0	18.5	14.1	2.59	2.50	0.87
Total concentrates.....	10,195	17.19	70.17	18.57	6.49	74.91	52.75	8.4
Fine jig tailings.....	24,312	40.98	3.6	2.5	10.9	9.04	17.21	33.63
Wilfley tailings.....	19,507	32.88	4.4	3.5	19.7	8.96	18.92	48.7
Slimes.....	5,309	8.95	12.8	7.5	13.8	7.09	11.12	9.27
Totals.....	59.323		16.1	6.05	13.28			

Milling and concentrating costs for the period covered by these figures averaged $1.12 per ton. General mining costs averaged $3.04 with development at 88c. per ton, a total of $5.04 per ton of crude of $28.42 per ton of concentrates.

Of the $3.04 mining costs timbering and maintenance absorbed 36c. and refilling stopes 26c. The miners are paid 84c. per ton of ore, the price including spalling up and placing in the shoots together with all necessary timbering. Trucking averages 15c. per ton and is placed on contract. The average ore broken and delivered to the shoots is 3.7 tons per shift per miner engaged in the stopes, and 1.9 tons per man engaged underground. As the lode varies in width from 30 to 90 ft. and is easy boring, this figure does not reflect much credit upon the miners engaged. The average wages per eight-hour shift at this mine for the half year ending December 1907 were $3.42 for miners and $2.84 for truckers. Considering the poor return for the high wages the mining costs are not surprising.

The Rio Tinto Half-year

A circular from the directors of the Rio Tinto Company, Ltd., dated Oct. 6, says that the deliveries of pyrites to the United Kingdom have again been less than formerly, and on the Continent the chemical trade has not required quite such large supplies as in 1907. Sulphur ore shipments have, however, been well maintained, and are, so far, rather in excess of 1907. Operations at the mines have in no way been hindered by scarcity of water during the summer, and the reservoirs contain a good supply for future use. The subsidences which took place in the South Lode in the early spring have somewhat reduced the mineral production of that department, but during the next two or three months the quantity of ore available from this lode will, it is expected, again have reached the normal; the new and extensive opencast operations having this object in view are already well in hand. Even with a somewhat reduced output of ore, it is estimated that the make of fine copper at the mines will exceed by a few thousand tons the quantity produced in 1907. So far this year the copper market has been exceedingly disappointing. For the whole of 1907 the average public market price of refined copper was £93 14s. 5d. per ton, while for the past nine months the quotations have only averaged about £62 16s. 2d., making a difference in profit of more than £30 per ton of refined copper. Signs of improved commerce over the world generally are not lacking, but until business settles down in the United States after the election, it is not to be expected that there will be a greatly increased demand for copper. There are, however, indications that this may be looked for when more normal conditions in the trading centers have again been reached. Out of the estimated profits for the year, the directors declare a dividend for the six months ending June 30 of 2s. 6d. per share, less income tax, on the 5-per cent. preference shares, and an interim dividend of 27s. 6d. per share, free of income tax, on the ordinary shares, both payable Nov. 2 next.

The rate of burning for fuse used in the mines of West Australia is limited by law to from 80 to 100 seconds per yard

Regenerative Reverberatory Copper Furnace

Description of Furnace at Works of Peyton Chemical Company; Counter-current Heat Recuperation; Oil Used as Fuel

BY FRED A. LEAS*

The first oil-burning reverberatory furnaces installed on the Pacific coast were very similar to those used in Montana about eight or ten years ago. Their outer and inner lines were practically the same, with a pear-shaped type of hearth, and the same flue construction was used leading directly to a brick stack, or, where there was a large amount of fines to be handled, into a down-take, which connected with a dust-settling flue and a steel stack. The roof construction was also similar, pitching from the back or burner end toward the front. The only point in which they differed was that the fire-box construction of the coal-fired furnace was entirely omitted and oil burners were inserted in the back end through openings of sufficient size to admit the air necessary for combustion, which, of course, was taken in at the same temperature as the atmosphere surrounding the furnace. The flame from the burners played directly over the surface of the charge and the maximum temperature of combustion being well toward the burner end of the furnace, the major portion of the actual smelting was done in that section.

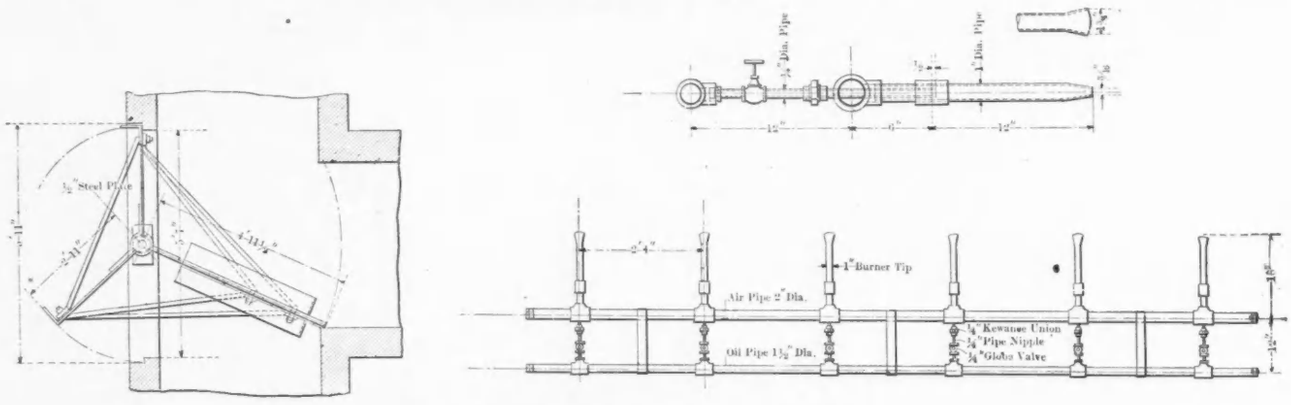
Under these conditions it was difficult to get any speed out of the furnace owing to the localization of the heat, and it was no easy matter to keep the front end sufficiently warm when skimming to get out a thoroughly liquid slag without excessive use of fuel. In some cases it became necessary to skim from the side of the furnace near the zone of maximum heat. The fact that the entire hearth was not utilized and that difficulty was experienced in keeping the entire bath in a thoroughly liquated condition made it essential that for rapid and economical work these features be eliminated.

Regenerative Flues

A regenerative furnace suggested itself as a possible solution, something in the nature of the Siemens-Martin type; but owing to the character of the work many modifications were made necessary. An opportunity presented itself to try the efficiency of the scheme in rebuilding a furnace for the Peyton Chemical Company, in January, 1907. The foundation was already in, and the company did not wish to go to any unnecessary expense; so that some scheme other than conducting the products of combustion to regenerators under the hearth had to be devised. The checkerwork used in the open-hearth process also had to be eliminated on account of the rapidity with which it would fill with accretions of flue dust, impeding the draft, so some other plan had to be adopted to give sufficient area for heating the air necessary for combustion to obtain the regenerative effect. The Whitworth stove was considered, but was not used, owing to the fact that if for any reason the change was not successful it could be put to no further use. At the same time the construction could not be altered to such an extent that it could not be readily brought back to the old condition.

I decided upon the following changes to produce the regenerative effect. The foundation, which would accommodate a furnace 20x40 ft. was straightened out, giving it as nearly as possible an equal width for the entire length, having the shape of a parallelogram. The invert was constructed in the usual way, and the side walls built to an equal hight all around, so that the roof would be on a straight line, not having any pitch toward either end. Welch-flue connections were used at each end, each of which led to a down-take which was connected with parallel flues 150 ft. in length, and separated by the length of the furnace. On the outer end these flues were brought together by turning at right angles and from their point of junction a single flue led to the steel stack. At the junction of the flues a valve was so placed that one flue would discharge the products of combustion into the stack, while the other flue would be open to the atmosphere admitting the air necessary for combustion.

The valve used in the flues consists of a cast hub with three wings of ⅜-in. steel plate bound with 6-in. angle iron and bolted in place. The wings are so placed that in reversing the furnace one flue is opened to the air and the other closed by one movement of the valve.



DETAILS OF FLUE VALVE AND CRUDE OIL BURNER

Burners

An oil-burner manifold was constructed on each end of the furnace and connected with the air and oil mains by means of flexible couplings so that it could be readily inserted and withdrawn from the furnace. The oil is carried in the pipe farthest from the furnace and consists of short pieces of ½-in. pipe and ½-in. tees so spaced that they come directly back of the burner openings. On the side outlet the tees are reduced to ¼-in., a short nipple is inserted, then a ¼-in. valve outside of which is another short nipple, a union coming on next, then a nipple with a long thread which is screwed through the ¼-in. opening in the tee of the air manifold. The air manifold is made in the same way

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with the exception that it is made of 2-in. instead of 1½-in. fittings. On the nipple coming through the 2-in. tee a ¼-in. sleeve with a piece of ¼-in. pipe 6 in. long is attached to carry the oil about half way through the burner, the balance of the distance to the tip being used for atomizing. The side outlet on the 2-in. tee is reduced to one inch and over the ¼-in. pipe a piece of one-inch pipe 18 in. long is placed, which completes the burner. The tip of the one-inch pipe is flattened to a 3/16-in. opening, and is rounded off to give a fish-tail effect to the flame. The two manifolds comprising the complete burners are securely clamped together to make them rigid and to prevent the possibility of leakage in the many joints.

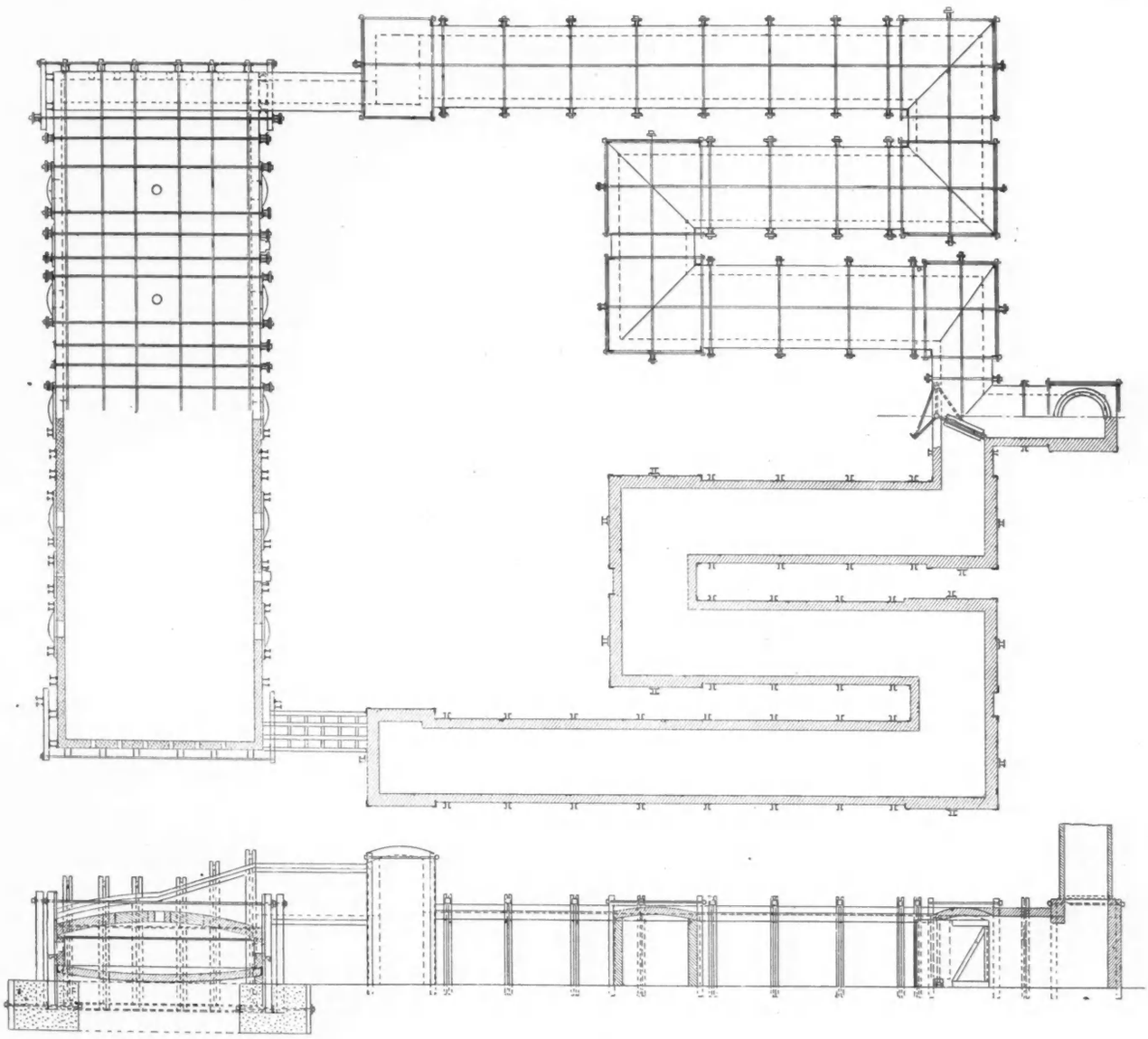
Air for atomizing the oil is supplied by a Connersville high-pressure blower, which delivers the air at a pressure of 7 to 10 lb. and the requirements of each burner is about 50 cu.ft. of free air per minute.

Method of Operation

Upon getting the furnace into operation I found that the stack had ample draft to supply suction to the flue which was left open, this to my mind, being the most doubtful feature of the reconstruction. There was, therefore, no question about the furnace getting all the air it needed. It was found advisable to change fires from one end to the other twice during the period occupied in smelting a charge, usually from two to three hours, and in that way the fires would be on each end from one to one and one-half hours depending on the nature of the charge in the furnace. It was not found advisable to change fires as often as in open-hearth practice, for the reason that the area in the flues was so large that the heat was not taken away as rapidly by radiation to the air traveling back to the furnace, and also to the outside atmosphere as it was taken up in the cold flue. This demonstrates that the regenerative effect could be accomplished in a much shorter flue, which, in this case, was not practicable, owing to the large amount of fine ore which it was necessary to recover.

It is essential to change the valve rapidly so as to keep the fires off the shortest possible time; as the valve is designed this can be done very quickly, for one flue is closed and the other opened by one movement. This type of construction is superior to the butterfly valve used in some regenerative furnaces for the reason that it does not have to be water-cooled and the bearings are all on the outside away from the dust and are cooled by the air.

Working under the regenerative principle proved to be a very decided advantage, increasing the capacity of the furnace fully 50 per cent. Under the old conditions the furnace handled from 60 to 65



PLAN AND ELEVATION, LEAS REGENERATIVE REVERBERATORY FURNACE

tons per day; after the change the tonnage increased to an average of more than 90 tons, and the furnace has smelted as much as 112 tons in 24 hours. The decided increase was due to two reasons, i.e., the entire hearth area was in use at all times and the temperature of combustion was very materially increased owing to the fact that the temperature of the entering air had been raised from that of the atmosphere to a point ranging from 400 to 1000 deg. C., depending on the length of time that had elapsed since changing the fires.

A Modified Plan

As additional capacity was needed, another furnace was built according to the accompanying plans. The inside dimensions of the hearth was 17x60 ft. The same connections were made from the furnace to the regenerative flues as in the construction of the original furnace. The flue construction was changed, however, from the long parallel flues to those shown in the illustration to economize in the space occupied, and also by causing the products of combustion to change directions six times at right angles during their course to the stack in order to settle a larger amount of dust. This furnace, with an available hearth area of 1020 sq.ft., has smelted during a period of 24 hours 176 tons under condition not exceptionally favorable; the charge at that time consisted of 56 per cent. hot calcines, 25 per cent. cold calcines, and 15 per cent. silicious copper ore. The components of the charge were not thoroughly incorporated before entering the hoppers and the cold calcines and silicious copper ore contained about 2 per cent. moisture. The tonnage gives 345 lb. per square foot of hearth area. This is a very decided increase over the old furnace which smelted, before remodeling, about 200 lb., and after being made regenerative about 300 lb. per sq.ft. I feel confident that the second furnace constructed could handle 200 tons per day if it were possible to run it on such a charge as used to prevail in Butte when nothing but hot calcines were handled, producing a matte not less than 15 to 20 per cent. of the total burden.

The furnace as constructed is not only applicable to the use of oil or gas as fuel, but offers possibilities in the use of powdered coal as well. Thus far the experiments with coal-dust firing have not been very successful owing to the fact that the flues clog with accretions of ash. In the regenerative furnace that difficulty could readily be overcome by running sufficiently long on one end to thoroughly clean the flues on the other. The generation of power by the installation of waste-heat boilers can also be accomplished with this type of furnace for the stack gases at the end of the 150-ft. flue have a temperature of about 500 deg. C. As the heat is built up more rapidly than it is taken away, the regenerative effect can be obtained by the use of shorter flues, reversing more frequently with boilers beyond the valve.

Efficiency of the Furnace

Taking the heat-producing constituents of California crude oil as carbon 87 per cent. and hydrogen 10.2 per cent., the tables of "Richards Metallurgical Calculations" give a calorific value of 10,584 cal. Oil of the composition given comes sufficiently close to the formula C_2H_4 to make the following calculations admissible:

According to the equation, $C_2H_4 + 3O_2 = 2\,CO_2 + 2\,H_2O$, two volumes of carbon dioxide and two volumes of water vapor are formed from the combustion of one volume of C_2H_4 and three volumes of oxygen. The nitrogen accompanying the oxygen is 11.42 volumes, making the total volume of air necessary to burn one volume of C_2H_4 14.42 volumes. The maximum temperature of combustion being that temperature to which the heat generated can raise the products of combustion, by the use of Richards' formulas of the specific heat of the products formed, and taking into consideration the calorific value of the fuel, the theoretical temperature of combustion can be obtained, both at atmospheric temperature (30 deg. C.) and in a preheated condition, which we will assume to be 60 deg. C., as follows:

$$N = 11.42\,(0.303\,t) + (0.000027\,t^2)$$
$$H_2O = 2\,(0.34\,t) + (0.00015\,t^2)$$
$$CO_2 = 2\,(0.37\,t) + (0.00027\,t^2)$$
$$Q(o\text{-}t) = 10584 \text{ cal.} = (4.88026\,t) + (0.00114834\,t^2).$$

As the air for combustion is brought in at 30 deg. C. it will add additional heat as follows:

$$Q(o\text{-}30) = 14.42\,[0.303(30) + 0.000027(30)] = 1314 \text{ cal.}$$
$$1314 + 10584 \text{cal.} = 4.88026\,t + 0.00114834\,t^2$$
$$T = 1733 \text{ deg. C.}$$

Making the calculations after preheating the air to 600 deg. C., the following results are obtained:

$$Q(O\text{-}600) = 14.42\,[0.303(600) + 0.000027(600)^2] = 2762 \text{ cal.}$$
$$2762 + 10584 \text{ cal.} = 4.88026\,t + 0.00114834\,t^2$$
$$T = 1893 \text{ deg. C.}$$

The temperature of the air entering the furnace as determined by Le-Chatelier's thermo-electric pyrometer is, just after reversing the furnace, about 1000 deg. C., and drops from that point to about 400 deg. C. in 1½ hours. In the calculations less than the average temperature is taken to balance the unheated air taken in through burner openings, doors, etc.

The calculated heats agree very closely with those determined with the pyrometer, both when the furnace was in operation under the original construction and after it was changed to the regenerative type.

Estimation of High Temperatures in Works Operations

Dr. F. W. Skirrow (*Journ. Soc. Chem., Ind.,* May 15, 1908) has employed the following simple means with entire satisfaction: The temperature in question is compared with the melting point of a known substance of definite melting point, which is contained in a narrow iron tube welded up at one end. A stiff wire passes down the tube and into the solid substance at the bottom in order to indicate when the substance melts. This wire remains fixed as long as the substance is below its melting point, but when the substance melts the wire becomes loose and can be freely moved up and down.

A number of these tubes are prepared, containing a series of substances having melting points covering the range within which it is desired to work. The ends of these tubes are placed in the apparatus under observation, and by noting which of the wires are fixed and which loose, can readily be ascertained the approximate temperature. It is generally sufficient to use two tubes, one containing a substance melting somewhat below the upper temperature limit, and the other containing a substance melting somewhat above the lower temperature limit. The workman is then instructed to regulate his fire so that one of the wires is loose and the other fixed. For materials which would act on iron, other metals might be used, and there seems to be no reason why porcelain tubes should not be employed if account be taken of the greater temperature lag.

Metal and Mineral Production of Ontario

The Ontario Bureau of Mines reports that the output of the metalliferous mines and works of the province for the six months ending June 30, was valued at $8,082,264, the various items being as follows:

Substance.	Quantity.	Value.
Arsenic, tons	256	$ 1,573
Cobalt, tons	365	39,822
Gold, oz.	1,524	27,672
Silver, oz.	7,746,537	3,888,991
Copper, tons	3,887	547,417
Nickel, tons	4,779	932,828
Iron ore, tons	84,440	214,284
Iron pyrites, tons	8,728	27,968
Pig Iron, tons	148,365	2,401,709
Total	.....	$8,082,264

The Kafir running machine drills on the Rand in South Africa must drill, according to T. Lane Carter, 4 holes, 6 ft. deep, in order to get his day's pay.

The death rate per 1000 persons employed in the metal mines of Queensland during 1907 was 0.84.

Notes on Air Agitation

By Mark R. Lamb*

This method of agitation has been perfected by F. C. Brown at the plant of the Waihi Grand Junction Gold Company, Ltd., in Aukland, New Zealand. Mr. Brown has worked along entirely original lines and has developed an agitation tank which is startling at first glance. Air agitation heretofore has not been a success, due largely to cost of power in the small, wide tanks used, but this disadvantage seems to have been entirely overcome by Mr. Brown's tanks of apparently abnormal shape. The first of these to be built in Mexico were erected by A. Grothe at the Hacienda de San Francisco, Pachuca, in the face of considerable adverse comment. These are 15 ft. diameter and 45 ft. high and are giving excellent results. The power required to agitate a charge of thickened battery pulp, varying up to 100 tons dry weight is, according to a recent test, just 1.7 h.p. The entire mill pulp is treated by agitation, and a look at the surface of the charge fully satisfies the skeptic that the agitation is good. The slowly revolving mass in a mechanically agitated tank seems quiescent in comparison. An 8-in. centrifugal pump using 20 h.p., cannot equal this agitation. Repairs and maintenance are very small. Tanks of this type are now being placed in many plants in Mexico, and it is astonishing how much the cost and size of a plant is reduced by planning to agitate all the ore.

*Milling and cyaniding engineer, Apartado 1421, Mexico City.

SHEET IRON READY FOR PACKING ON MULES

Power Required for Agitation

Mr. Brown gives figures of power required which are extremely interesting, a few of which are quoted below. I may say first that he increases the quantity of air until the sides of the cone bottom of the tank are kept clear of settling material. This is determined from the working floor at the top of the tank simply by means of a lead weight attached to a cord. The theory upon which the hight of the tanks has been increased so much is that the indicator of the quality of the agitation is the velocity of the material down the sides of the cone, and that, therefore, higher tanks are more economical of power, since the same power in very tall tanks will produce a greater velocity down the sides of the cone, per ton of material, than in short tanks. The quantity of air necessary for this clearing of the cone varies, of course, with the material; coarse sand, thin pulp or concentrates require more air than fine sand, thick pulp or slime.

Size of Tank. Diam. Ft.	Hight, Ft.	Material.	Charge, Tons.	Free Air, Cu.Ft.	Pressure, Lb. per Sq.In.	Horsepower.
7.5	37	Slime	15	5	22	0.5
7.5	37	Concentrates	40	17	26	2
10	40	Slime	35	9	22	0.75
13	55	Slime	110	16	33	1.75
10	40	Fine Sand	50	25	22	2.25

For agitating concentrates he uses tanks 7 ft. 6 in. diameter by 37 ft. high, and while 10 cu.ft. of free air under 25 lb. pressure will agitate this material, it has been found advisable to use more than this amount in order to guard against accidental stoppages. A volume of 15 to 20 cu.ft. is used, which gives a vigorous agitation and excellent extraction. A screen test of a sample of this finely ground concentrate showed that only 0.2 per cent. remained on a 200-mesh screen. The concentrates assay from £15 to £20 per ton and the extraction is 92 to 94 per cent. with a consumption of cyanide of 4 to 5 lb. per ton of concentrates.

Herewith is the tabulated agitation data:

Basing his judgment upon his experience with other material Mr. Brown expects to treat thickened battery pulp in his plant now building for that purpose with the following quantities of air in tanks of the dimensions given:

Tank Size, Ft.	Free Air, Cu.Ft.	Pressure, Lb. per Sq.In.	Horsepower.
7.5x37	14	22	1.4
10 x40	22	23	2.3
13 x55	38	35	6.0

Such tanks are necessarily built of steel. At many plants it will be necessary to pump from settlers or thickeners into the tall tanks, but even with this disadvantage and under the most unfavorable conditions as to site, the tall tanks will still possess great advantages in low power costs and attendance. Experiments on silver ores seem to show that a more violent agitation, that is, a more liberal use of air, expedites extraction more than enough to pay for the slight increase in the necessary power. Finally, Mr. Brown reports that contrary to expectations, the cyanide consumption during this agitation is actually less than when agitating by means of ordinary mechanical agitators.

SHEET IRON LOADED ON MULE

From experiments extending over a period of six months he finds that the consumption of cyanide treating concentrates in tall tanks is 6d. less per ton, and that the loss in treating slime similarly is 1d. per ton less than when treating by mechanical agitation. Probably the saving is largely due to the great reduction in time necessary for treatment.

The Ruble Boulder and Gravel Elevator

The Ruble gravel elevator and undercurrent is a patented device for separating boulders and coarse gravel from the finer gold-bearing material, and at the same time elevating the coarse waste material to the dump pile. The working parts consist of a coarse grating of timber reinforced with metal above a smooth, inclined floor of planks which conveys the fine material to a sluice and the gold-saving apparatus. There are no moving parts, the gravel being washed and driven up the incline by means of a stream from a hydraulic giant, the spent water transporting the fine material to the sluice. The whole is mounted upon a timber frame which may be provided with trucks for convenience in moving from place to place.

Among the advantages claimed for the Ruble system are the following: It handles boulders as large as one ton quickly and with comparatively little water, the inclination of the grate bars and the metal surface being such that irregular masses of rock slide up the incline with less resistance than on ordinary level ground. Since only the finer material reaches the sluices, the riffles are placed nearer together than in the ordinary sluice, and the sluiceway being wider than usual the entire system may be shortened to 48 ft. The sluice may be cleaned in from one to two hours. The elevator makes its own dump, the material being picked up near the foot of the incline and after a short journey over the grate bars dropped back upon bedrock.

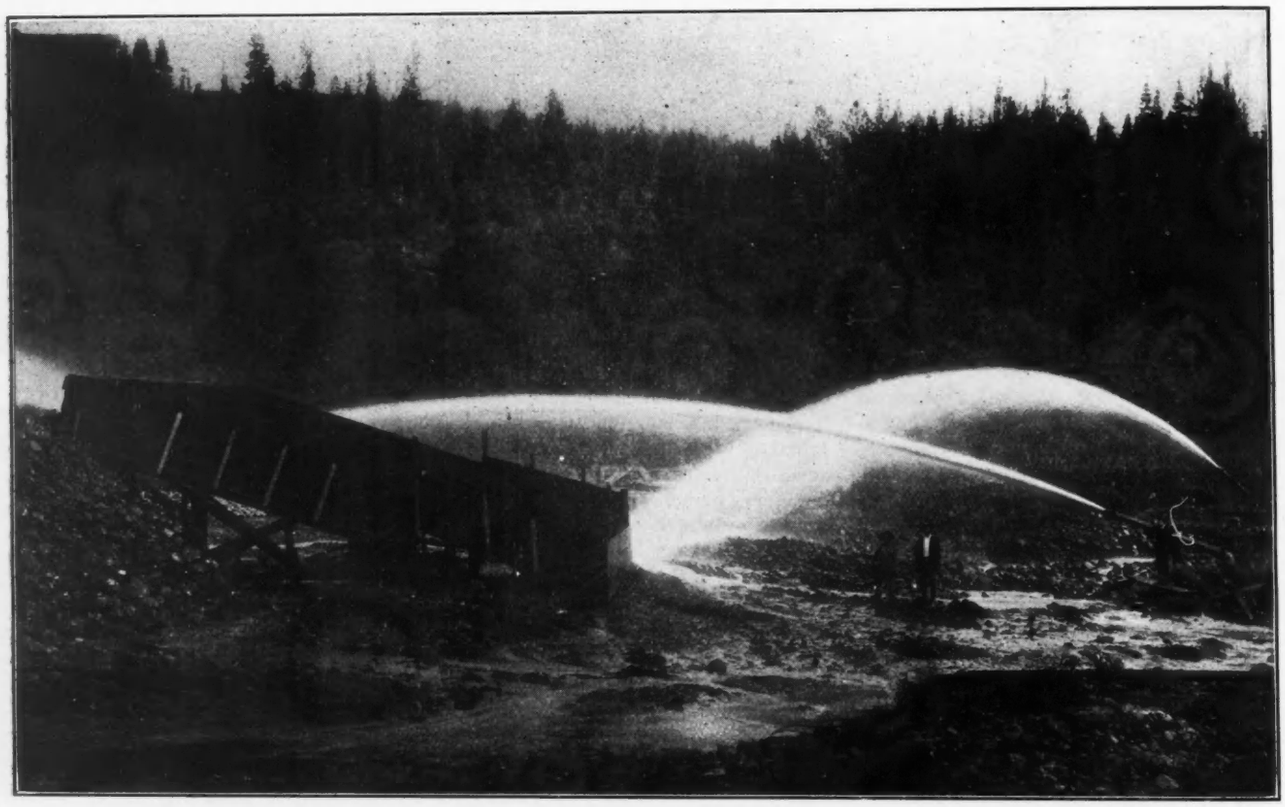
Method of Operation

The giant which forces the material up the elevator incline is placed from 50 to 150 ft. from the foot of the apparatus, leaving space for from 200 to 500 cu.yd. of gravel. The material may be piped from the bank to the machine by means of another giant, which in case the supply of water is limited, may be used alternately, the pressure being shifted to the two nozzles as required. The operator of the elevator first directs his stream upon the pile of material, forcing a suitable quantity upon the lower end of the incline. He then lifts the stream gradually from the foot of the elevator to the dump.

The surfaces of the bars upon which the boulders slide are inclined upward at a slightly greater angle than the bed of the machine proper. This prevents the boulders from sliding back and prevents edges of rock from catching in the spaces between the bars. The inclination is also said to aid in transporting the boulders by directing upward the stream of water which strikes the metal surfaces of the bars, the force of the blow literally lifting masses of rock over the bars.

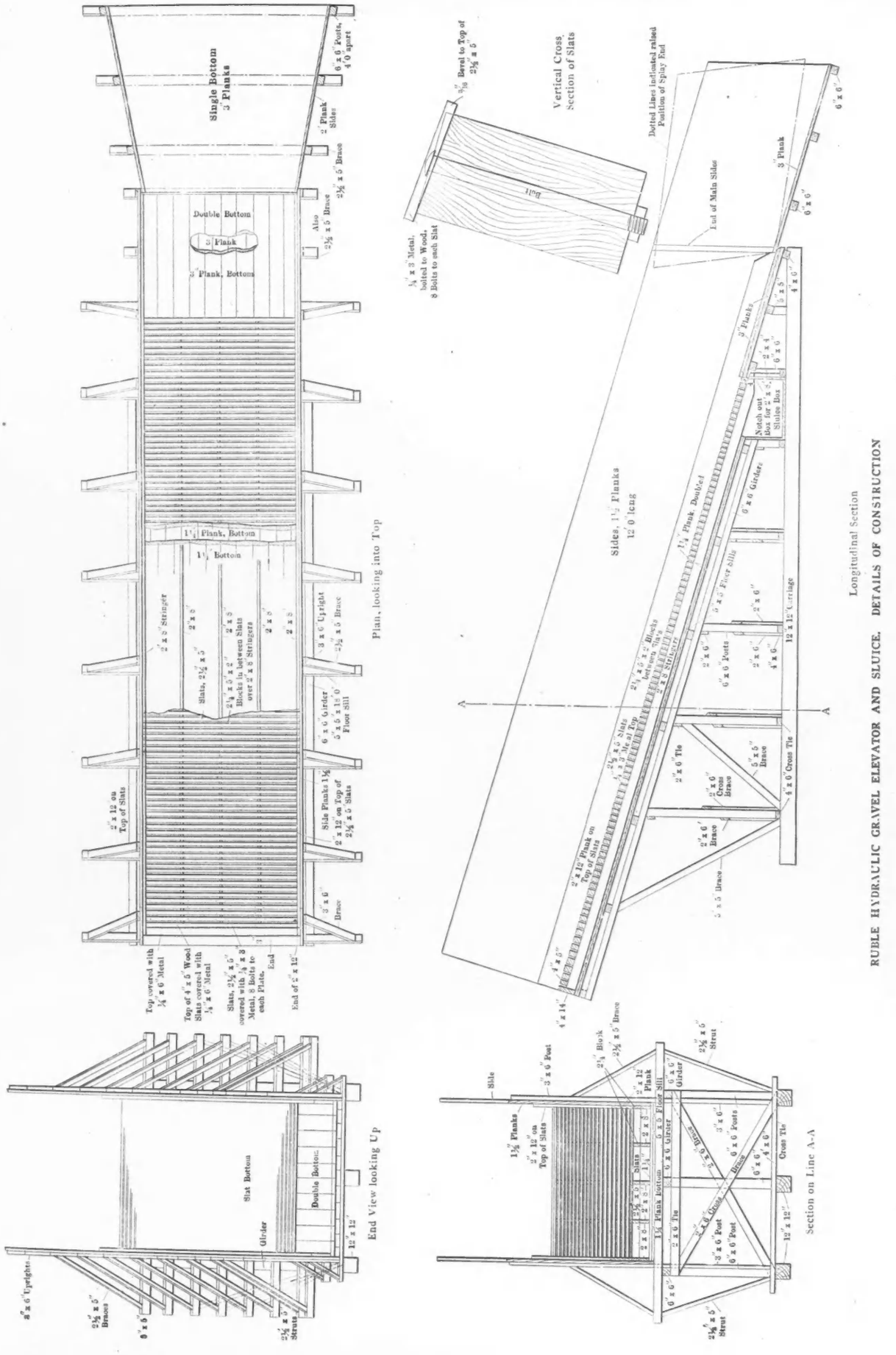
To avoid driving the fine material upon the dump, the gravel is fed upon the foot of the incline in masses of from 3 to 5 cu.yd. There by careful manipulation the fine gravel is washed out into the sluice before the full force is employed to drive the boulders up the elevator incline to the dump. The elevator is said to handle easily boulders, stumps, roots and logs of any size that can be piped to it.

An operator, writing from a mine which has a supply of water for one giant at a time, fed through a 5-in. nozzle under a gravity head of 190 ft., states that about 56 cu.yd. of material passes over the elevator per hour, or 560 cu.yd. in a 10-hour shift. This includes feeding upon the incline as well as the washing proper. The material contains numerous boulders weighing 2000 lb. and upward. Beds of material from 14 to 30 ft. are worked by this method at a profit. One boulder handled measured 4 ft. 8 in. long, 2 ft. 7 in. wide and 18 in. thick. During one season the volume of material treated measured 450 ft. long by 238 ft. wide and 15 ft. thick. To drive this ground over the elevator required 1073 hours.



RUBLE GRAVEL ELEVATOR. ONE GIANT HANDLING BOULDERS, ANOTHER SUPPLYING MATERIAL

Tom Johnson (*Journ.* Chem., Met. and Min. Soc. of South Africa, March, 1908) suggests that the size of a shaft should be regulated not by the amount of ore to be hoisted but by the amount of air required by the number of miners necessary to mine such a tonnage of ore. If the shaft is large enough to furnish the air, it will be ample in size for hoisting the tonnage through it.


Single Bottom 3 Planks
6" x 6" Posts, 4'0 apart
2" Plank Sides
2½" x 5" Brace
Double Bottom
3" Plank
3" Plank, Bottom
Also 2½" x 5" Brace
1¼" Plank, Bottom
1¼" Bottom
2" x 5" Stringer
2" x 5"
Slats, 2½" x 5"
2½" x 5" x 2" Blocks to between Slats over 2" x 8" Stringers
2" x 5"
2" x 5"
3" x 6" Upright
2½" x 5" Brace
6" x 6" Girder
5" x 5" x 15'0" Floor Sill
2" x 12" on Top of Slats
Side Planks 1½" 2" x 12" on Top of 2½" x 5" Slats
3" x 6" Brace
Top covered with ¼" x 6" Metal
Top of 4" x 5" Wood Slats covered with ¼" x 6" Metal
Slats, 2½" x 5" covered with ¼" x 3" Metal, 8 Bolts to each Plate
End
End of 2" x 12"
Plan, looking into Top
Barrel to Top of 2½" x 5"
Vertical Cross Section of Slats
Dotted Lines indicated raised Position of Splay End
Ball
1¼" x 3" Metal, bolted to Wood, 8 Bolts to each Slat
End of Main Sides
3" Plank
6" x 6"
Sides, 1½" Planks 12'0" long
5" x 5"
4" x 0"
9" Planks
2" x 4" 6" x 6"
Notch out Lost for 2" x 5" Slides Bars
1¼" Plank, Doubled
6" x 6" Girder
2" x 6" Floor Sills
2" x 6"
2" x 6" Posts
6" x 6" Posts
4" x 6"
12" x 12" Carriage
2½" x 4½" x 2" Blocks between Slats
2" x 6" Stringers
2" x 6" Tie
5" x 5" Brace
2" x 6" Cross Brace
4" x 6" Cross Tie
2" x 6" Brace
2" x 12" Plank on Top of Slats
5" x 5" Brace
4" x 14"
Longitudinal Section
RUBLE HYDRAULIC GRAVEL ELEVATOR AND SLUICE. DETAILS OF CONSTRUCTION
Slide
3" x 6" Post
2½" Block
2½" x 5" Brace
2½" x 6" Strut
2" x 12" Plank
6" x 6" Girder
1½" Planks
2" x 12" on Top of Slats
2" x 6" Tie
1½" Plank Bottom
2" x 5" Floor Sill
2" x 5" Slats
6" x 6" Girder
3" x 6" Posts
6" x 6" Post
12" x 12"
Cross Tie
Section on Line A-A
2" x 6" Uprights
2½" x 5" Braces
6" x 6"
2½" x 5" Struts
Slat Bottom
Double Bottom
Girder
12" x 12"
End View looking Up

Experimental Work in Ore Concentration *

By John Allen Davis†

The object of this investigation was to obtain data and to determine the proper adjustment of the quantity of water, the amount of slope, and the size of ore grain to secure the greatest efficiency in concentrating a classified product upon a glass table. A classified product is one in which the grains are of different sizes, depending upon differences in specific gravity, the heavier grains being the smaller. Quartz and galena were chosen as the materials for this work because of their wide divergence in specific gravity; and the pure minerals were employed to obviate the difficulty of occluded or included grains. They were crushed separately and mixed, forming an artificial ore. This was fed to a free-settling, hydraulic classifier, and a series of closely sorted products obtained for treatment on the glass table.

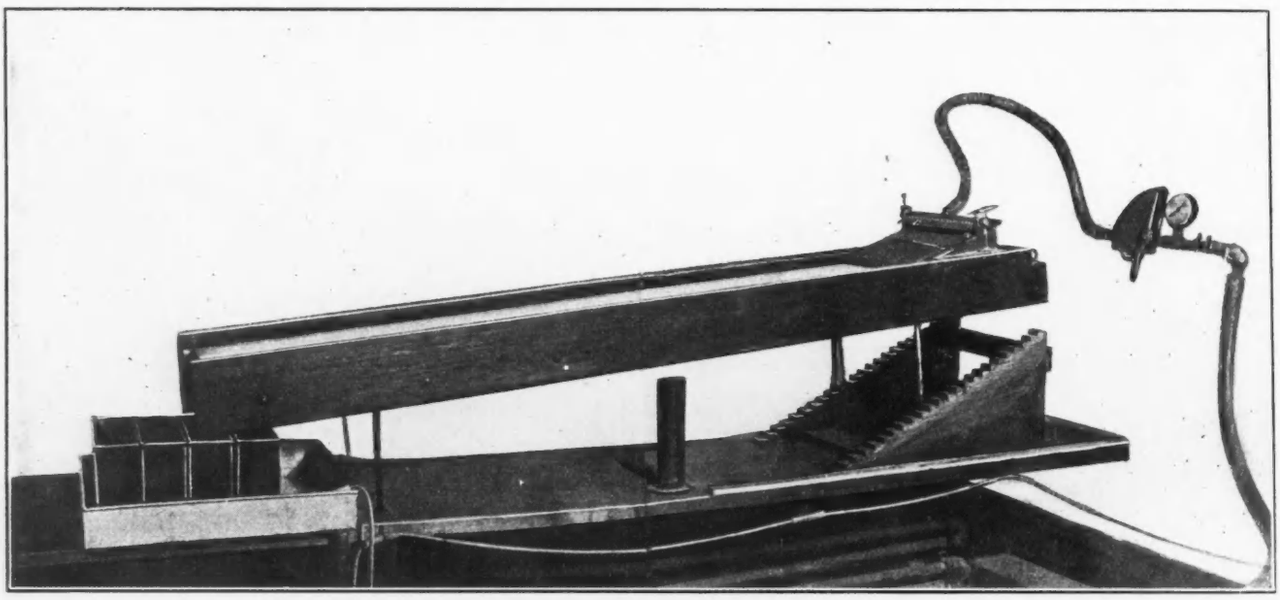
The glass table is an experimental apparatus devised to reproduce as nearly as possible the conditions which exist upon the round table, a familiar slime-concentrating machine. Although both machines utilize the relative transporting power of a film or thin sheet of water, as it flows over a quiet, inclined surface, to separate the minerals of a sorted product, there is one important difference. The film or sheet of water upon the round table gradually diminishes in thickness from the center to the edge of the table, while on the glass table it remains constant. There are two methods of operating such tables, which may be distinguished as the "racing" and the "departure" methods.

In the previous work upon this subject,[1] the departure method was employed. The ore was allowed to settle upon the glass table, and the lighter mineral was rolled off while the heavier remained behind. The explanation of the action of the table under these conditions is as follows: The grains of higher specific gravity move down the slope slowly or not at all, since, being smaller, they are acted upon only by the slow-moving portion of the water in contact with the table; while the larger grains of lower specific gravity move faster since they project upward into the more rapidly moving water of the free surface. By this means concentration is effected. It was further shown that the presence of waves upon the table was of vital importance, since they struck distinct blows upon the larger grains which projected high enough to receive them. The conclusion was reached that the best results were obtainable with a flat slope, and a small quantity of water. But with such an adjustment the quartz rolls away very slowly, and it is necessary to remove the galena, which remains, by means of a secondary operation. If applied to the round table, these conditions would tend to limit the capacity of the machine, and for this reason it was suggested that some study be made of the racing method.

In the racing method, which was, therefore, employed in this investigation, nothing was allowed to come to rest upon the table. Sufficient water and enough slope were furnished to keep the light and the heavy minerals in motion, with the former, however, traveling the faster. The products fed to the glass table were much more closely sorted than is common in practice, and ranged in size well above and below the usual limits of the feed upon a round table. To secure these products a set of classifier velocities was chosen which began with 200 mm. per sec. and descended in the double-Rittinger ratio in 24 spigots to 3.8 mm. per sec. The average diameters of the grains in these products were computed from a table of settling velocities by Robert H. Richards.

Description of Glass Table Used and Mode of Operating It

The glass table (shown in an accompanying illustration) consisted of a frame which carried a sheet of ground plate glass 6 ft. long and 1 ft. wide. There were two pairs of supports 4 ft. apart, and by means of a movable set of 24 steps of ½ in. altitude each, under the head end, the glass table could be set at any desired slope in intervals of ⅛ in. per foot. At the head of the table was a device for distributing the water and ore uniformly. The supply pipe for the feed-water carried a pressure gage and a dial cock. At the lower end of the table were several tin boxes, sliding in an overflow pan, which were used to collect separately the heads, middlings, and tailings as they came over the end.



THE GLASS TABLE USED IN THE EXPERIMENTS

The manner of operating the table and of obtaining the experimental data was as follows: (1) A spigot product was chosen. (2) The dial and gage were adjusted to give the lowest quantity of water which would wet the whole table. (3) The lowest step was taken at which the ore would move. (4) The feed was brought to the table in a spatula made to fit the corrugations in the distributing de-

*Published with the permission of the Massachusetts Institute of Technology. The author was assisted in the experimental work by John M. McMillin.

†Junior Geologist, U. S. Geological Survey, Washington, D. C.

[1]"Sorting Before Sizing," Robert H. Richards, *Trans.* A. I. M. E., Feb., 1897.

vice and thrust under its jets of water. (5) The conduct of the ore was noted and described as below. (6) the slope was varied, repeating 4 and 5. (7) The quantity of water was increased, repeating at each increase, 3, 4, 5, and 6. Owing to lack of time, it was possible to study but 8 of the 24 spigots. These were spigots numbered 5, 8, 10, 12, 14, 20 and 23.

The conduct of the ore was described as follows: If it settled upon the table so that galena was piled upon the quartz, preventing the latter from separating out, the ore was said to be "banked," *B*. If the ore moved down the table irregularly, fingering out into streams, it was described as "streaked," *S*. If the quartz started down the table ahead of the galena, with a comparatively sharp line of separation, and the overlap of the two (the extent of middlings) was less than 2 ft., it was recorded as "fair," *F*. The term "good," *G*, was used for the best conditions of separation; that is, when the quartz moved down ahead of the galena with a sharp line of boundary and an overlap of less than a foot. If the quartz and galena were washed down the table together so rapidly that no separation was effected, the conditions were described as "hustle," *H*.

Method of Plotting the Curves

The data for "good" conditions obtained in this manner were represented graphically by means of points, using the slope in steps as ordinates and the amount of water in pounds per minute per foot of width as abscissas. Upon examination of the points thus plotted for each of the spigots studied, it was found that a smooth regular curve could be drawn approximately through all of the points and that the curve deviated from a straight line in a regular manner. This at once suggested that these curves (Fig. 1) might be rectified by one of the various methods.[2] The reciprocal method was applied successfully in this case, and by plotting steps as ordinates and the reciprocals of the water quantity as abscissas, the straight-line plots were obtained, which are shown in Fig. 2. The equations of these lines were derived by analytical method, using the formula

$$\frac{y-y_1}{y_1-y_2}=\frac{x-x_1}{x_1-x_2},$$

where x_1, y_1 and x_2, y_2 are any two points on the line. The equations were found to be:

Spigot.	Average Diameter of Quartz Grain. Millimeter.	Equation.
8	0.564	$S=206\left(\frac{1}{W}\right)+8.8$
10	0.417	$S=197\left(\frac{1}{W}\right)+8.1$
12	0.248	$S=176\left(\frac{1}{W}\right)+7.1$
14	0.185	$S=160\left(\frac{1}{W}\right)+6.6$
17	0.135	$S=140\left(\frac{1}{W}\right)+6.1$
20	0.113	$S=130\left(\frac{1}{W}\right)+5.8$
23	0.080	$S=109\left(\frac{1}{W}\right)+5.4$

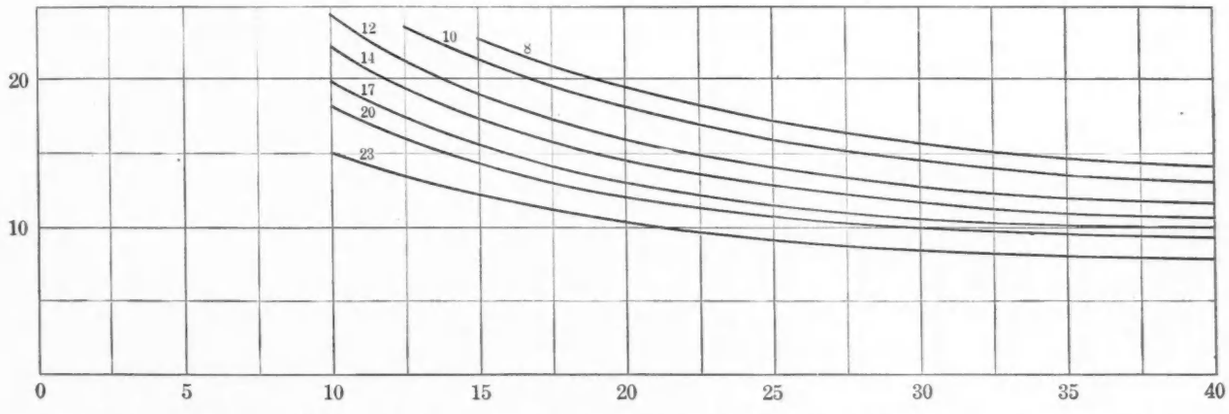


FIG. 1. CURVES SHOWING "G" VALUES; ORDINATES-STEPS OF TABLE USED; ABSCISSAS-WATER USED PER MINUTE IN POUNDS

Derivation of Formulas

It will be observed that these equations are in the form

$$S=k\left(\frac{1}{w}\right)+c,$$

where S is the slope in steps, w the pounds of water per minute, and k and c are two constants. By comparing the various equations it will be seen that both k and c decrease in value directly with the average diameter of the quartz grain in the different spigots, suggesting that some relation exists between them. In order to determine the nature of such a relation, k and c were plotted separately against the average diameters, d, of the quartz grain for the several spigots, and it was found possible to construct a smooth curve through these points in each case. By plotting values of k as ordinates, and the square roots of the reciprocals of the average diameters of the quartz grain as abscissas, the first curve was transformed into a straight line and its equation, computed by the usual method, was found to be

$$k=175-50\sqrt{\frac{1}{d}}.$$

In like manner, by plotting as ordinates the logarithmic values of c, and as abscissas the logarithmic values of the reciprocals of the diameters of the quartz grains, the equation for the other curve was found to be

$$c=\frac{10}{\sqrt[4]{\frac{1}{d}}}.$$

Substituting these values in the general equation noted above, we obtain the equation,

$$S=\frac{275-50\sqrt{\frac{1}{d}}}{w}+\frac{10}{\sqrt[4]{\frac{1}{d}}},$$

in which there are three variables, viz: the slope in steps, the amount of water in pounds per minute, and the average diameter of water in pounds per minute, and the average diameter of the quartz grain in millimeters. We have compared values computed from this equation with the corresponding values in our original data and found that the agreement of the two sets of figures was well within the limits of observation, the average difference being but 0.4 per cent.

It is more convenient to express the slope by some function of its angle, as the sine, for example, for which it is necessary to divide S in the above equation by 96, due to the fact that the steps are each ½ in. high and the distance between the supports 48 in. After making this transformation, the equation becomes:

$$Sin.\ \theta=\tfrac{1}{96}\left(\frac{275-50\sqrt{\frac{1}{d}}}{w}+\frac{10}{\sqrt[4]{\frac{1}{d}}}\right)$$

which shows the proper relations between the variables to obtain the best results in concentrating a classified product of galena in a quartz gangue, under the conditions

[2] "Notes on Graphical Methods," H. M. Goodwin, Ph. D., Boston, 1904, Wm. Libby, printer.

of this investigation. This law is known to hold true between the limits of 0.56 mm. and 0.08 mm. diameter of quartz grain, and between 10 and 40 lb. of water per minute per foot, and between the angles of 4 deg. 15 min. and 14. deg. 30 minutes.

Close sorting was used in deriving this equation; that is to say, there was not a great difference between the sizes of the largest and the smallest particles of quartz or galena in any given spigot product. It was found in the experimental work, however, that for any given spigot there was a zone of several steps both above and below the best or *G* values, where the conditions were fair. By referring to Fig. 1 it will be seen that the various *G* lines are not far apart, and that anyone of the curves is well within such a fair zone for one or even two of the spigots above or below. These facts indicate that the sizing was carried much more closely than was necessary, and that several of our spigot products might have been mixed together with almost equally good results. It is probable that in such a case there might be a larger middling product, and that this factor would determine the scale of sizing to be used in actual practice.

Conclusions

The time required for the tailings to be carried off from the table was recorded throughout the experimental work. This data shows upon analysis: That for any given size of ore, the time required is shorter when the larger quantities of water are employed; and that for any given quantity of water, the time is shorter when the larger sizes are being treated. Since it has been shown possible to obtain good results by the use of the larger water quantities, and since the larger water quantities would result in an economy of time, the application of the racing method to the glass table greatly increases its capacity.

In conclusion, we may state: That there is a definite relation, expressed by the law derived above, between the angle of slope, the diameter of the quartz grain, and the quantity of water to be used in the concentration of galena in a quartz gangue by the racing method; that this law may be used to predict the best conditions for such concentration; that the application of these results to the round table would undoubtedly increase its capacity; and that it is possible to treat ores both larger and smaller than the usual sizes fed to the round table. In applying these results, however, it must be understood: That the thickness of the water film upon the round table is not constant as it is upon the glass table; and that the material treated had the maximum divergence in specific gravity and contained no occluded or included grains.

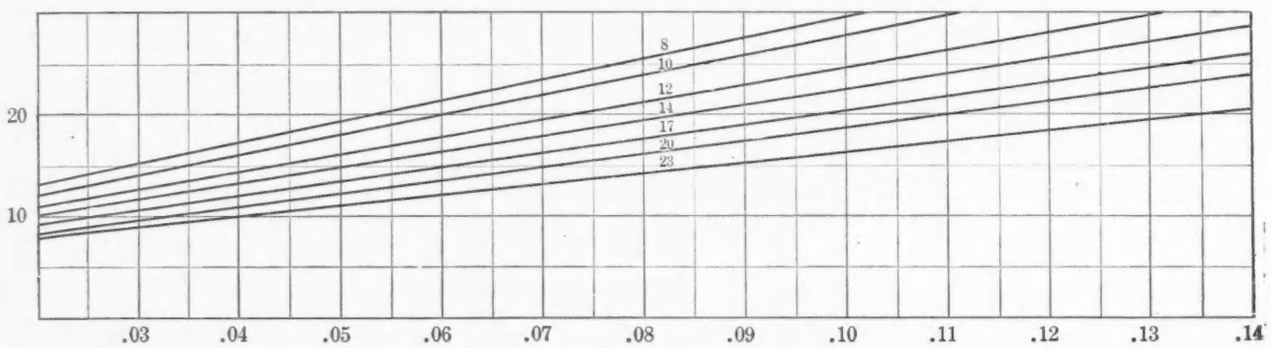


FIG. 2. CURVES SHOWING "G" VALUES. ORDINATES-STEPS; ABSCISSAS-RECIPROCALS OF WATER USED PER MINUTE

Properties of Certain Silicates

G. Stein (*Sprechsaal*, 1908, XLI, 199—201) prepared a number of silicates by heating together silica and the metallic oxide in a carbon tube placed in an electric carbon-tube furnace. The temperatures reached were measured by a Wanner optical pyrometer, or by means of a thermocouple. Quartz heated alone became viscous at 1600 deg. C. and formed a mobile liquid at 1750 deg. Above this temperature it sublimed readily, probably owing to reduction by carbon, and subsequent oxidation of the volatilized silicon. The sublimate consisted partly of small crystals of tridymite, sp. gr. 2.4. In the following table some of the properties of the silicates prepared are given. The zinc silicate was made in a porcelain tube instead of a carbon tube:

	M.p.	Specific Gravity. Crystallized.
Metasilicates.	Deg. C.	
$BeSiO_3$	above 2000	2.35
$MgSiO_3$	1565	3.06
$CaSiO_3$	1512	2.92
$FeSiO_3$	1500 - 1550	3.44
$MnSiO_3$	1470—1500	3.58
$ZnSiO_3$	1479	3.42
$SrSiO_3$	1287	3.91
$BaSiO_3$	1368	3.77
$NiSiO_3$	....	....
Orthosilicates.		
$2BeO + SiO_2$	above 2000	2.46
$2MgO + SiO_2$	above 1900	3.2
$2ZnO + SiO_2$	1484	3.7
$2SrO + SiO_2$	1953	3.84

A few double silicates were also prepared, their specific gravities only being given: Na_2O, Al_2O_3, $2SiO_2$, crystalline, 2.50; K_2O, Al_2O_3, $2SiO_2$, crystalline, 2.60; CaO, Al_2O_3, $2SiO_2$, amorphous, 2.81; Li_2O, Al_2O_3, $4SiO_2$, crystalline, 2.42; Na_2O, Al_2O_3, $4SiO_2$, amorphous, 2.43; K_2O, Al_2O_3, $4SiO_2$, amorphous, 2.44. They all begin to sublime at about 1300 deg., and form mobile liquids at 1600 deg. Silicates containing 1 mol. of alumina to 0.3—0.5 mol. of silica were completely liquid at 1900 deg., and solidified to crystalline masses. The silicate, Al_2O_3, SiO_2, gave only one kind of crystals, sp.gr. 3.03.

Amorphous Carborundum

According to G. Chesneau (*Ann. Chim. anal. appl.*, 1908, XIII, 85-89), in the preparation of crystallized carborundum, some of the amorphous modification is always formed. This is now used, either alone, or mixed with clay, for the manufacture of retorts for zinc distilling, etc. When it is examined under the microscope, black specks of carbon can be seen, but the main portion consists of an opaque green mass of the amorphous carborundum; the presence of crystallized carborundum (sharply defined dark blue crystals) and of a silicate of aluminum, iron, calcium and magnesium, of approximately the same composition as anorthite (colorless, translucent, doubly refracting crystals) can also be detected.

West African Gold

Gold production in West Africa—including the Gold Coast and Ashanti—was 25,123 oz. in September, being 72 oz. less than in August. For the nine months ended Sept. 30 the output was 219,362 oz. bullion in 1907, and 224,524 oz. in 1908; an increase of 5162 oz. The bullion reported this year was equal to $4,350,640, or 210,481 oz. fine gold.

On the Rand the ratio of the total number of white men employed underground at the gold mines to the number of natives is one to from 8 to 11.

The Rare Metals I—Beryllium

By Charles Baskerville*

Beryllium, or glucinum, is a relatively rare metal; its minerals, as a rule, occur in granitic rocks.

BERYLLIUM MINERALS.

	Beryllia Content.
Beryl, beryllium aluminium silicate	11–15%
Chrysoberyl, beryllium aluminate	20%
Phenacite, beryllium orthosilicate	44–46%
Leucophanite, a fluo-silicate of beryllium, sodium, calcium	10–12%
Euclase, a hydrous beryllium aluminium silicate	17%
Helvite, a thio-silicate of beryllium, iron and manganese	10–14%
Gadolinite, a basic orthosilicate of beryllium, yttrium, etc	5–11%
Beryllonite, a phosphate of beryllium and sodium	20%
Herderite, a fluo-phosphate of beryllium and calcium	15%
Hambergite, beryllium borate	53%
Bertrandite, a hydrous beryllium silicate	39–43%
Meliphanite, a fluo-silicate of beryllium, calcium and sodium	10–14%
Trimerite, a manganese, calcium and beryllium silicate	16%
Eudidymite, a hydrous sodium beryllium silicate	11%
Danalite, a thio-silicate of beryllium, iron, zinc, manganese	14%

The important beryllium minerals are beryl, chrysoberyl, phenacite, danalite, herderite and beryllonite. Many of the varieties of beryl, as emerald, chrysoberyl, aquamarine, are valued as gems, when perfectly colored and crystallized, and are in demand in trade. Beryllium salts are used in the manufacture of incandescent mantles, and in scientific investigations, but there is no serious demand for them.

Beryl

Beryl is an accessory mineral in granite veins in all parts of the earth, especially in those of a pegmatitic character. It is associated with quartz, micas, feldspars, garnet, corundum, zircon and occurs in the United States in New Hampshire, Massachusetts, Maine, Connecticut, Pennsylvania, Virginia, North Carolina, Alabama, Colorado, South Dakota and in other parts of the country in sparing amounts. Many beryls contain alkalies, replacing beryllia, and also some combined water. Beryl is found in hexagonal prisms, from mere threads to several feet in length, but sometimes in large masses, coarse columnar or granular. It is usually some shade of green, but may be light blue, yellow, white, or pale rose-red. It is harder than quartz (7.5-8), and has a specific gravity of 2.6-2.8. Its luster is vitreous and the fracture is conchoidal to uneven. The streak is white.

Before the blowpipe, at a high temperature, beryl fuses on the thin edges, and ultimately a vesicular scoria results. If clear specimens are heated, they become white, clouded and translucent. Beryls containing considerable amounts of alkalies are more fusible than true beryls. Beryl dissolves in borax to a clear glass. Emerald colors the borax bead a fine green, owing to the presence of chromium. It is imperfectly decomposed by microcosmic salt; the cold glass is opalescent, and is green if chromium is present. Beryl is dissolved by soda to a clear, colorless glass. It is insoluble in acids.

Beryl is harder than apatite, tourmaline or quartz; it differs from the latter in its terminal planes. It lacks the distinct cleavage of topaz.

Chrysoberyl

This mineral occurs in green or yellowish tabular crystals; in thicker emerald-green crystals, which are raspberry-red by transmitted light; and in rolled pebbles. It is found at Haddam, Conn.; New Hampshire; Greenfield, N. Y.; and Norway, Stoneham, Stowe, Peru and Stanton, Maine. Chrysoberyl has a hardness of 8.5, and a specific gravity of 3.5-3.84. Its luster is vitreous to greasy, and the streak is white. It is brittle, and the fracture is uneven to conchoidal.

Chrysoberyl is unaltered before the blowpipe; with soda, the surface is rendered dull, but it is otherwise not attacked. It dissolves slowly in borax and salt of phosphorus to a clear glass. The pulverized mineral becomes blue with cobalt solution. It is unattacked by acids.

Alexandrite is an emerald-green variety, which is columbine-red by transmitted light. It is supposed to be colored by chromium, and is valued as a gem. Cat's eye, or cymophane, is a yellowish green, opalescent variety from Ceylon.

Phenacite

Phenacite occurs in colorless, wine-yellow, rose-red, or brown rhombohedral crystals, often lens shaped. It is sometimes found in prismatic forms. It occurs with amazon stone, beryl, quartz, emerald and mica, and is found in Colorado, New Hampshire and Virginia.

Phenacite is a brittle mineral with a conchoidal fracture. Its hardness is 7.5-8, and the specific gravity is 3. The luster is vitreous, and the streak is white.

It is infusible before the blowpipe, and is dissolved with great difficulty by borax unless in a very fine powder, when it dissolves to a clear glass. In the highly saturated glass white flocculent particles are produced by flaming. The pulverized mineral dissolves in salt of phosphorus, leaving a silica skeleton. A milk-white bead is produced with a little soda; with more it swells and becomes infusible. It is rendered dull blue by cobalt solution. Unaffected by acids.

Danalite

This mineral occurs in octahedrons of a flesh-red to gray color in Massachusetts and El Paso county, Colorado. Its hardness is 5.5-6, and the specific gravity is 3.4. It is brittle, and the luster is almost resinous. The streak is similar to the color, but is lighter.

Before the blowpipe danalite fuses readily on the edges to a black enamel. It gives a slight coating of zinc oxide when treated with soda on charcoal. It is decomposed by hydrochloric acid, with evolution of hydrogen sulphide and separation of silica in the gelatinous form.

Herderite

Herderite is found at Stoneham, Auburn and Hebron, Maine. Its crystals, which sometimes resemble a low hexagonal pyramid, occur in various shades of yellowish and greenish white. Its hardness is 5, and the specific gravity is 3. The luster is vitreous, and the fracture is subconchoidal.

Herderite phosphoresces before the blowpipe with an orange-yellow light; it fuses with difficulty, becoming white and opaque. It gives acid water in the closed tube when strongly heated, and takes a blue color on treatment with cobalt solutions. It is soluble in acids.

Beryllonite

This mineral is found loose in the disintegrated material of a granitic vein at Stoneham, Maine. It occurs in short prismatic to tabular crystals, which are colorless to pale yellow in color and possess a vitreous luster. The hardness is 5.5-6, and the specific gravity is 2.845. Its fracture is conchoidal.

Beryllonite decrepitates somewhat before the blowpipe, and fuses to a slightly colored glass; it colors the flame deep yellow with a green streak on the lower edge. It dissolves slowly in hot acids.

*Professor of chemistry, College of the City of New York.

Gold Production in India

The mines in the Kolar district, Mysore, India, in September report a total production of 45,155 oz. bullion, which is 381 oz. less than in August, but 571 oz. more than in September, 1907. For the nine months ended Sept. 31 the total was 405,779 oz. in 1907, and 408,404 oz. in 1908, an increase of 2625 oz. The bullion reported this year was equal to $7,597,548, or 367,564 oz. fine gold. The reports this year include two mines—the Hutti-Nizam and the Dharwar Reefs—outside the Kolar district proper.

In the Folsom district in California some people are starting an adjunct to bucket and suction dredges in the form of what they call a river-bed safety mining caisson. A large cylinder is dropped to the bed of the stream, down which men may go and get at the pot-holes and crevices in the bedrock. The matter is in an experimental stage at present.

The chief difficulties in the metallurgy of bismuth are the volatility of the metal and the difficulty of dressing the lower grade ores profitably.

Iron and Zinc in Southwestern Virginia

EDITORIAL CORRESPONDENCE

The following notes regarding the operations of the Virginia Iron, Coal and Coke Company, with offices at Bristol, Va.-Tenn., will furnish an idea of conditions in the iron industry of southwestern Virginia, this company being the chief operator in the district.

The company has two stacks at Roanoke, Va., one of which is now in blast; one stack at Radford, Va., in blast; one stack at Pulaski, Va., not in blast; one stack at Max Meadows, not in blast; one stack at Bristol, in blast; one stack at Graham, Va., not in blast; one charcoal stack at Foster Falls, Va., in blast; one charcoal stack at Reed Island, Va., in blast. Outside of this district the company owns two stacks at Middlesboro, Ky., both of which are now out of blast.

The ore supply for the Roanoke furnace comes from the Dewey, Grubb and Edith mines, at Blue Ridge, Va., all of which are now in operation. From time to time a little ore is shipped to this plant from the mines on the Cripple Creek extension of the Norfolk and Western railroad, this ore making a good furnace mixture with the product of the above-mentioned mines.

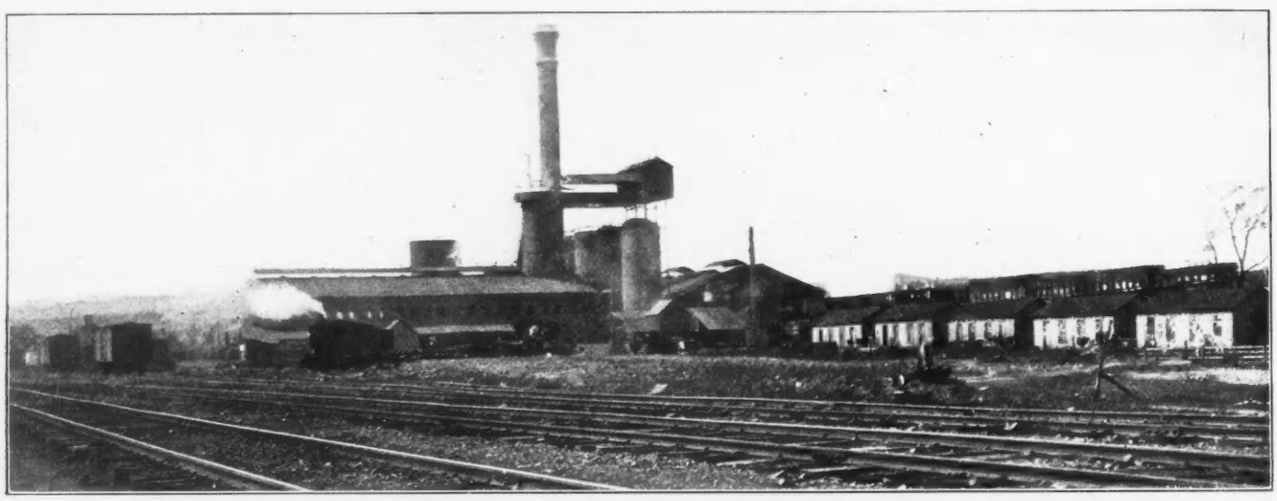
In the Cripple Creek district the Little Wythe and Eagle mines are both in operation. In this same district, at Speedwell, are the Ganaway, Percival, Andis and Porter mines; at Foster Falls, the Cedar Run, Sanders, Lobdell and Foster Falls mines; at Barren Springs, the Barren Springs mine; at Reed Island, the Hurst, Reed Island and Rich Hill mines. These mines supply the furnaces at Pulaski, Radford, Roanoke (and Max Meadows when in operation), as well as the charcoal furnaces at Foster Falls and Reed Island.

The ore for the Bristol furnace comes from the Yellow Hill and Haskell mines, at Shouns, Tenn. The Flint Knob mine is not in operation. The Middlesboro, Ky., plant when in operation, is supplied with ore from the McGuire mine at Cartersville, Ga., Ducktown, Tenn., Boones Pass, Va., and Cumberland Gap.

For its supply of coke, the company depends upon its coal operations in Wise and Lee counties. Limestone is found in abundance throughout the district and usually close to the furnaces.

About five-eighths of the ore used in the company's furnaces is limonite, the balance being "specular" and "mountain" ore. The limonite will show about the following analysis: Iron, 40 to 44 per cent.; insoluble, 20 to 26; phosphorus, 0.3 to 0.5; manganese, 0.3 to 1 per cent. The brown mountain ore will run about the same, with the exception that the phosphorus varies from 0.9 to 1.25 per cent. The Blue Ridge specular ore contains about 36 per cent. iron, 26 to 32 insoluble, 0.11 manganese, and under 0.3 phosphorus. This specular ore is used in order to keep the manganese in the charge down below 1 per cent.

The company mines its ore chiefly from open cuts, the steam shovel being employed in many cases to great advantage. The ore is trammed to log washers, whence it goes to railroad cars for shipment to the different furnaces.



FURNACE OF PULASKI IRON COMPANY, PULASKI, VA.

PULASKI MINING COMPANY

A great deal of interest attaches to the operations of the Pulaski Mining Company, with mines on the Cripple Creek extension of the Norfolk & Western railroad and roasting and sulphuric-acid plant at Pulaski, Va. Here pyrrhotite is being practically dead-roasted, sulphuric acid is being manufactured, and the resulting cinder employed as part of the charge in an iron blast furnace. The details of the process are not known, but the following is an outline of the operations of the company:

The ore is mined from open cuts, steam drills being used, and delivered to the plant at Pulaski at a cost of about 80c. per ton. The ore is first crushed and then conveyed to Herreshoff burners, where it is roasted. The cinder from these burners is taken to a 100-ft. rotary cement kiln and klinkered. Powdered coal is blown into this kiln at the end opposite the feed. The cinder, when fed to the kiln contains from 4 to 7 per cent. sulphur; after going through the klinkering process the sulphur content is reduced to 0.05 per cent.

The raw ore as it comes to the plant has about the following analysis: Sulphur, 27 to 32 per cent.; iron, 45 to 52; calcium and magnesium oxides, 3 per cent.; phosphorus, trace; manganese, trace; moisture, 3 per cent. The product, as it comes from the kiln will analyze about as follows: Iron, 52 to 56 per cent.; sulphur, 0.05 per cent.; phosphorous and manganese, trace.

The gases on leaving the Herreshoff roasters pass through a coke tower, a series of cooling towers made of lead, and finally through a platinum mass, known as a contact mass, into mixing vessels. This part of the process is known only to the operators. The acid is stored in tanks just outside of the plant proper and is loaded into tank cars as required. About 75 tons of sulphuric acid and 100 tons of iron cinder are being produced daily. The cinder is sold to the Pulaski Iron Company, the furnace of which is only a short distance away, where it comprises from 1/16 to 3/8 of the ore mixture. The price paid for the cinder is in the neighborhood of 7c. per unit of metallic iron.

THE BERTHA MINERAL COMPANY

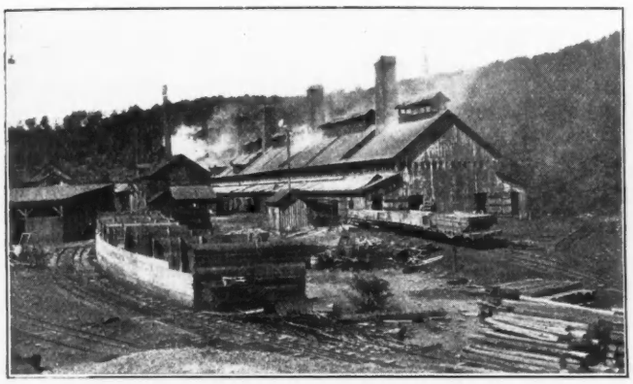
With one or two unimportant exceptions, the zinc industry in southwestern

Virginia centers in the operations of the Bertha Mineral Company, of Pulaski, Va. At present the production of the mines and smelter of this company is far below normal.

The Bertha mine, on the Cripple Creek extension of the Norfolk and Western railroad, ceased production in 1898. Parts of the old tailings dump, however, are now being worked over, and, after concentration, used in the furnaces at Pulaski. The Clark mine, situated a few miles beyond Bertha on the same line of railroad, was closed down in 1903. The old Wythe lead and zinc mine, at Austinville, which was acquired by the Bertha company late in 1902, is producing little ore at present. Here the energies of the company are being directed toward solving the problem of concentrating the "hard ore," a name locally applied to the fine-grained zinc-lead sulphide ore, carried in a limestone gangue. There is quite a little of this ore blocked out in the mine, and it is thought that the mill, with slight modifications, will be able to treat it successfully.

The smelting plant of the Bertha Mineral Company is situated at Pulaski, Va., on the main line of the Norfolk and Western railroad. It consists of 10 furnaces of the Belgian type, slightly modified, in five banks of two furnaces each, refining furnaces, power plant, stock house, a plant for the manufacture of retorts and condensers, blacksmith and repair shops, etc.

Since last December, only three of the 10 furnaces have been in operation; these are now making about 3300 lb. of spelter each per day of 24 hours. The average ore charge for each furnace is about 6500 lb. of local and Tennessee ores. The efficiency of the furnaces is about 86 per cent.



FRONT AND REAR VIEW OF BERTHA MINERAL COMPANY'S SMELTING PLANT, PULASKI, VA.

PLANT OF PULASKI MINING COMPANY, PULASKI, VA.

Three brands of spelter are produced at this plant: Bertha pure spelter, 99.98 per cent. pure; Old Dominion, containing from 0.2 to 0.5 per cent. lead, and Southern, containing about 1 per cent. lead.

The future plans of the Bertha Mineral Company will have a far-reaching effect on the zinc industry in southwestern Virginia.

The production of borax in the United States is confined almost entirely to Inyo, San Bernardino and Ventura counties, California.

Zirconia as a Refractory Material

According to R. Ricke (*Sprechsaal*, 1908, XLI, 214-215), zirconium usually occurs in the form of the silicate, zircon, but recently there has come into commerce, at Hamburg, a mineral, known as "Brazilian zirconia," which consists mainly of the oxide of zirconium, together with ferric oxide, alumina, and small quantities of titanic acid and thoria, and some free and combined silica. It consists generally of nodular aggregates, with a spherulitic structure, like brown iron ore. It is extremely hard, has a specific gravity of 5.5—6.0, and a grayish-green color, and is often striped, in crevices and hollow spaces, with reddish-brown iron oxide. Owing to the high content of zirconia (90 per cent.) the material is very suitable for the production of extraordinarily refractory crucibles.

If detonator caps, in which the explosive is mercury fulminate, become damp or are even exposed to a moist atmosphere the power of the explosive becomes diminished and if the fulminate becomes sufficiently wet it will not explode.

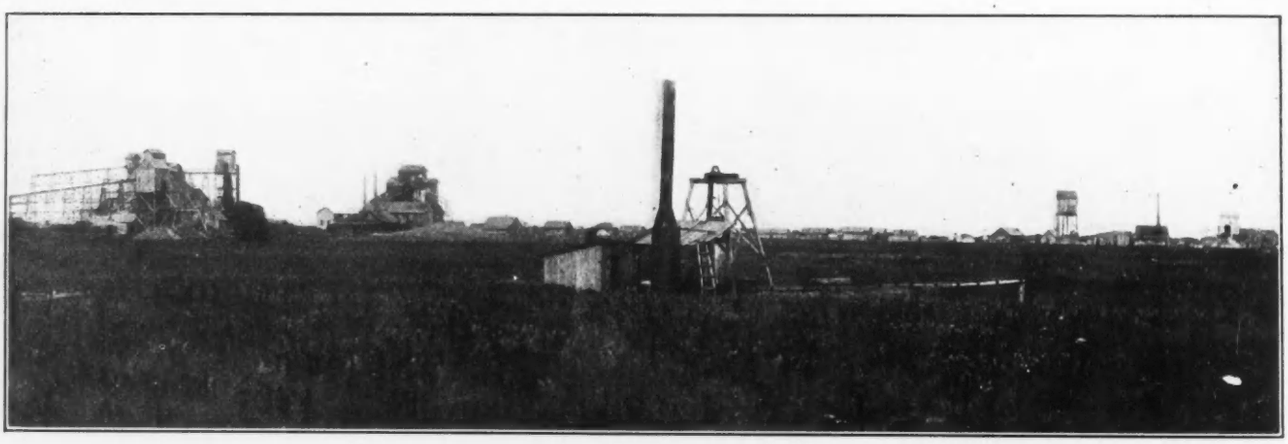
Miami Lead and Zinc District in Oklahoma

The Ore Is Richer Than That of the Joplin District and Much of It Is Heavily Coated and Even Impregnated with Asphaltic Oils

BY OTTO RUHL*

The Miami lead and zinc district in Oklahoma is the most recently developed addition to the Missouri-Kansas zincfield. Although ore was discovered only a little more than a year ago, there are in the district seven concentrating mills already in operation. Considerable development work and prospecting is also being done, for 22 companies other than those operating mills are developing lands or leases, and there are from 10 to 12 drills actively prospecting in the district. Four of the companies doing development work are erecting concentrating mills, and these mills will be running by the time that this article is published.

This new district is in the northeastern corner of Oklahoma, three miles north of Miami, a city having a population of 3000. The camp proper is located on a level stretch of prairie, cut into a few gentle depressions by a small, sluggish stream, which is dry except during the rainy weather. The drainage is toward Tar creek, a stream 1½ miles east of the camp. Near the mines a small town has grown up; this is called Hattonville after one of the most prominent mine operators of the camp. The town consists principally of dwelling houses, bunk houses and boarding houses for the accommodations of the rapidly increasing number of men working at the mines. Supplies are hauled by wagon from Miami.



PANORAMA OF MIAMI LEAD AND ZINC DISTRICT

Emma Gordon Old Chief Miami Yankee Sullivan Tom Lawson

Ore Occurrence

The surface rocks are shales and sandstones of Pennsylvanian age. The first 25 to 35 ft. consists of a yellowish-white clay soil below which comes a layer of well worn, unconsolidated, river gravel, 4 to 6 ft. thick. Beneath the gravel is a soapstone or carbonaceous shale 30 to 35 ft. thick. This shale is impregnated with iron pyrite, and sandstone boulders are found scattered through the beds. Below this shale is a black or dark limestone, which miners term the cap rock. This cap rock is coated and in some cases impregnated with oil and asphalt; in the limestone beds of flint occur. The ore occurs imbedded in this matrix of limestone, shale, flint and asphaltic oil. The oil, however, impregnates most noticeably the ore along the upper layers, close under the cap rock. This cap rock apparently makes a good roof. In the Emma Gordon mine some timbering has been done, and some of the shafts now being opened will have to be timbered when the drifts are widened into stopes, but judging from the present developments little timbering will be required in the mines of the Miami district.

The drilling throughout the field has shown great uniformity in the occurrence of the different formations and their relative thickness. In the mines so far opened the orebodies are in the Pennsylvania formation, and the drilling done indicates that these rocks in considerable part of the district are more than 150 ft. thick. The drilling has not been deep enough throughout the camp as a whole to determine the contact with the underlying Mississippian rocks.

Two ore horizons have been discovered, but only the upper one has been developed and worked. The upper horizon occurs at a depth of from 70 to 110 ft., while the lower horizon, determined only by drilling, occurs at a depth of 160 ft. At present the mines are obtaining their ore from the upper levels. The ore as it is hoisted assays from 15 to 30 per cent. lead and zinc, the lead and zinc being in the ratio of approximately 1 to 5. The ore also carries a heavy percentage of oil and asphalt, together with from 2 to 10 per cent. iron pyrite. The concentrates generally assay from 45 to 56 per cent. zinc, the purity depending entirely upon local conditions in the mine. The concentrates also carry considerable iron, on account of which they are penalized heavily when sold. The operators obtain for the concentrates from $7 to $20 per ton on a basis of $35 to $38 per ton for concentrates containing 60 per cent. zinc.

The lower run, which has been located only by drilling, has been found on at least four leaseholds. In each instance the assays of the cuttings from the drill holes showed a much better grade of ore than that being mined in the upper levels; one sample assayed 62 per cent. zinc. The development of this lower horizon by shafts is awaited with interest by all those operating in the camp.

Little water is found in the mines, and present developments indicate that unless the mines are sunk deeper there will be a scarcity of water for milling purposes. In many of the mines there are no pumps at all, and only a few mines use larger than a 2-in. pump. Several mills in the district store water for milling using the depressions in the old stream beds as reservoirs.

The importance of this new camp may be realized when it is known that the

*Joplin, Missouri.

ore-bearing area has already been proved to amount to almost a square mile. Within this square mile the mills are producing per unit of time as large a tonnage of clean concentrates as any mills in the whole zincfield. The mine ore is rich and runs as high as 20 to 30 per cent. zinc blende and from 5 to 10 per cent. lead. Ore of still greater richness has been found, but only in small amounts. With such a large percentage of lead and zinc in the ore, the concentrating devices are all overloaded, and the tonnage of ore treated is low while the output of concentrates per unit of time is large.

Difficulties in Milling

The mills have been designed after those used in the Joplin district, but the concentrating machines have not as yet been entirely adapted to the concentration of these ores. The jigs in the Joplin district are built to handle a large tonnage of low-grade ore, while in the Miami district a jig adapted to treating a small tonnage of high-grade ore is necessary for good work. The result is that even with the mills making from 15 to 25 tons of clean concentrates per shift the tailings in many instances assay from 5 to 12 per cent. zinc blende, being higher in grade than the average ore in the Joplin mines. The sludge concentrates in a few instances assay as high as 40 per cent. zinc blende.

The losses in concentration are due partly to the peculiar character of the ore, and partly to the fact that the concentrating machinery is not as yet adapted to the ore. The richness of the ore and the fact that much of the ore is coated with asphaltic oils cause a considerable amount of the fine ore to pass over in the overflow, while the chats carry a large portion of the lead and zinc lost. The oil causes loss in concentration not only because, being attached to the ore and lighter than the water, it floats a large portion of the fine ore over into the tailings, but also because, as the asphaltic oils are sticky, it binds the zinc blende and galena to the gangue. The asphalt also causes some trouble in the first cell of the jigs by rolling up into small balls and gumming up the screens. Hot water introduced in the first cell only tends to carry the asphalt over into the second or third cells of the jig and merely transfers the trouble.

The problem of concentration is the one upon which depends the future of this camp. Some provision must be made for the elimination of the oil and asphalt, as well as the iron. Likewise changes must be made in the concentration process so that a higher extraction is made in the mills. The tailings from the mills now running will in every case have to be retreated.

The rich character of the ore combined with the above sources of trouble necessarily limit the capacity of the mills, for in order to obtain a good concentrate the ore has to be passed very slowly through the jigs. Another necessity is a change in the jig's construction making the cells larger and thus allowing a better chance for the settling of the ore upon the screen. A jig differing from the Joplin type has been installed in the district, but extractions obtained while using it are no more satisfactory than with the usual Joplin type.

One company has been experimenting with a roasting process. In this process the oil and asphalt are driven off or burned, and the iron pyrite is partially desulphurized. The ore is then treated in the usual way upon ordinary Cooley jigs. It is thought that by this method the ores will yield concentrates of higher grade and that a better saving can be made. The cost of this process, the increase, if any, in the saving effected, and the increase in the grade of concentrates obtained will determine the applicability of this process to the ore.

MAP OF MIAMI LEAD AND ZINC DISTRICT

1, Emma Gordon; 2, Old Chief; 3, Buckeye; 4, Moosehead; 5, New State; 6, King Jack; 7, Index; 8, Wauhillau; 9, Joplin-Miami; 10, Sullivan; 11, Neil; 12, Miami-Yankee; 13, Golden Hen; 14, Little Naxine; 15, J. W. Coons; 16, Ewing Halsell; 17, Sarah Luckett; 18, Baxter Royalty Co.; 19, Last Chance; 20, Blue Bell; 21, Southern Queen; 22, Frosty Morning; 23, Jennie May; 24, Sixty-Six; 25, Thompson; 26, Nancy; 27, Ben Hur No. 2; 28, J. W. Coons; 29, Robinson; 30, Patton & Gordon; 31, J. F. Patton; 32, E. E. Gordon; 33, Riverside; 34, Spring Putman et al.; 35, Lucky Strike; 36, Ben Hur No. 1; 37, Dan Isley; 38, Sunny Jim; 39, Banner; 40, Arizona; 41, E. E. Gordon; 42, Campbell; 43, Little Joe; 44, Charles Striker.

The grade of the zinc concentrates is much lower than the average for the entire zincfield, but the greater quantity of lead and zinc in the ore as compared with other camps offsets to a certain degree the quality of the concentrates. The lead concentrates are of good grade and amount to a considerable tonnage.

A feature showing the importance of this new camp is the great number of strikes made in the drilling of the leases. Upon one tract of 200 acres 52 holes have been drilled, every one of which showed ore of unusual richness. Upon the other leases the results have been equally as good. The results from mining development have been quite as uniform as the results of the drilling, and the shafts have all found the orebody indicated by the records of the drill holes. A few shafts have been lost through caving ground and improper management, but none have failed to strike good ore. This remarkable record, the richness of the strikes, and the amount of concentrates obtained from the ore seem exaggerated until one has made a visit to the camp.

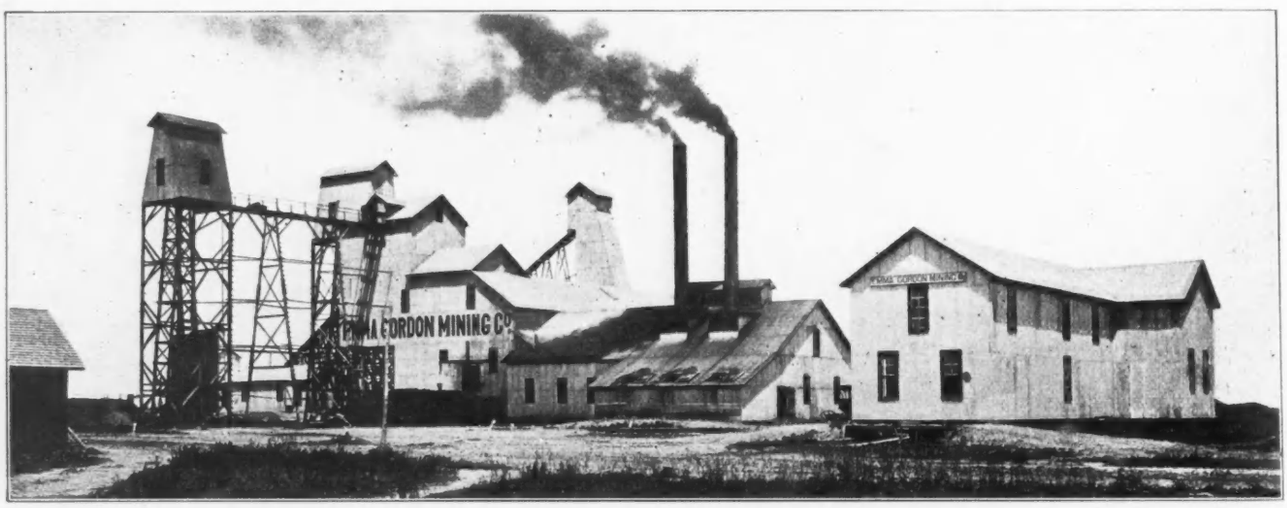
Capacity of Some of the Mills

The New State mine was the first mine to produce ore. It shows what can be done in the camp under the worst possible conditions. The mill is equipped with a mere "coffee-mill" plant, a conglomerated mass of machinery that apparently was designed in the earliest age of mining. But that little plant in six weeks, in May and June, although the mill was not running all the time, produced 190 tons of zinc concentrates and 103½ tons of lead concentrates. During that time the mill is estimated never to have handled more than 50 tons of ore a day. The sludge from this plant assays 50 per cent. zinc blende. The company has recently installed concentrating tables for treating this rich sludge. The Old Chief mine has produced 18 tons of zinc and 4 tons of lead concentrates in a single 10-hour shift. This was done without crowding the mill. Even then the tailings contained considerable lead and zinc.

The Emma Gordon mill rated as a 400-ton plant, while operating at half its capacity, from May 15 to June 11, 1908, produced 440 tons of zinc concentrates and 90 tons of lead concentrates. The other producing mills in the district have similar records. Few of the mines have yet developed their ground sufficiently to insure steady operation at full capacity. It is also true that the mills are all new and unadapted to the separation of this class of ore, yet the record of production is an enviable one.

Most of the land in the new camp is under first lease to the Miami Royalty Company. This company, through the activity of its members soon after the first strike was made, secured leases on about 8000 acres in the very heart of the new district. All the present companies doing development work either lease their properties from this corporation or operate ad joining lands. Leases may be had for a royalty of from 15 to 30 per cent., but the majority of the leases are second leases and pay 30 per cent. Most of the first leases were secured for a royalty of 5 per cent.

The royalties are abnormally high, and there has been considerable dissatisfaction among the developing companies since metal prices have been so low. Were the ores less rich, they could not be mined at a profit and the development would necessarily lag. A few of the developing companies have secured reductions in their royalties, and it is very likely that other companies will also secure reductions. The fact that the mines can pay such high royalties indicates the possibilities of the Miami district.



EMMA GORDON MILL, THE LARGEST IN THE NEW DISTRICT

The most usual wet process for the extraction of bismuth is to dissolve in hydrochloric acid and precipitate either by iron or by diluting with water.

Zinc Smelting at Port Pirie

According to the last semi-annual report of the Broken Hill Proprietary Company, the experimental zinc-distillation furnace at Port Pirie was put in operation May 16, 1908. This furnace has 144 retorts, 72 per side in three rows of 24 each. It is fired with gas from a Schmidt & Desgraz producer. The furnace is of the Rhenish type. The secondary air is supplied by a fan and is preheated to about 800 deg. C. in passing through a flue between those which convey away the hot waste gases. The waste gases pass through a steam boiler which generates sufficient steam to run the fan and producer. The furnace is expected to treat 5½ tons (2240 lb.) of ore per day.

The directors of the company have authorized the building of nine more furnaces, at a further cost of about £81,000, about £19,000 having been already expended in the erection of the first furnace and experimental work. It is expected that the new furnaces will be ready in January, 1910, and will be producing spelter in July, 1910. The production of the 10 furnaces is estimated at 8000 tons of spelter per annum, for all of which a market is available in Australia and the East. With spelter at £20 per ton, it is reckoned that a satisfactory return will be secured. No difficulty is anticipated in securing suitable clay in Australia, but in the recent experimental work clay has been imported from Belgium.

A plant to produce 8000 tons of spelter per annum from this ore corresponds approximately to 25,000 tons of ore per annum. At the estimated cost of £9000 per furnace—which includes the requisite accessories—the estimated cost is a little less than $15.70 per short ton of annual capacity.

The Oriental Consolidated Company, Korea, in 1907 netted $1.58 on gold ore averaging $4.24 per ton.

October Dividends

The accompanying table shows the dividends paid by mining and industrial companies in the United States during the month of October, 1908. The table also includes the dividends paid by some foreign mining companies.

OCTOBER DIVIDENDS.

U. S. Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Alaska Mexican	Alas.	$0.40	$72,000
Alaska Treadwell	Alas.	0.75	150,000
Alaska United	Alas.	0.25	45,050
Arizona, pfd	Ariz.	0.09	114,000
Am. Smg. and Ref. com	U. S.	1.00	500,000
Am. Smg. and Ref. pfd	U. S.	1.75	875,000
Anaconda	Mont.	0.50	600,000
Bunker Hill & Sull	Ida.	0.25	75,000
Continental Zinc	Mo.	0.25	5,500
Copper Range Con	Mich.	1.00	384,185
Elkton Con	Colo.	0.01½	37,499
Hecla	Ida.	0.02	20,000
Homestake	S. Dak.	0.50	109,200
Jamison	Cal.	0.02	7,800
Kendall	Mont.	0.02	10,000
New Idria	Cal.	0.30	30,000
Oroville	Cal.	0.12½	87,500
Portland	Colo.	0.04	120,000
Puritan	Utah	0.01¾	2,500
Silver King Co't'n	Utah	0.15	183,664
Sioux Con	Utah	0.03	22,500
Snowstorm	Ida.	0.03	45,000
Tonopah of Nev.	Nev.	0.25	250,000
Uncle Sam	Utah	0.05	25,000
United States com	Utah	0.50	175,467
United States pfd	Utah	0.87½	425,114
Utah Con	Utah	0.50	150,000
Vindicator	Colo.	0.03	45,000
Wolverine	Mich.	5.00	300,000
Total	....	..	$4,866,979

U. S. Industrials.	Location.	Amt. per Share.	Amt. Paid.
Am. Ag. Chem. pfd	U. S.	$3.00	$544,590
Consolidation Coal	Md.	1.50	153,750
Gen. Chem. pfd.	U. S.	1.50	150,000
National Lead, com	N. Y.	1.25	186,318
Penn. Salt Mfg.	Pa.	3.00	180,000
Pocahontas Coll. com	W. Va.	3.00	135,600
Sloss-Sheff., pfd	Ala.	1.75	117,250
United Metals Selling	U. S.	5.00	250,000
Va. Car. Chem., pfd	U. S.	2.00	360,000
Westmoreland Coal	Pa.	2.50	150,000
Total	....	..	$2,227,508

Foreign Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Buffalo	Ontario	$0.03	$27,000
Costa Rica Esperanza	C. A.	0.62½	62,500
Dom. Coal com	N. S.	1.00	150,000
Dos Estrellas	Mex.	0.75	225,000
Esperanza	Mex.	0.87½	398,125
Guggenheim Expl	U. S.	2.50	2,625,000
Kerr Lake	Ontario	0.15	90,000
La Rose Con	Ontario	0.15	168,750
Mines Co. of Am.	Mex.	0.02	40,000
N. Y. Hond. Rosario	C. A.	0.10	15,000
Nipissing	Ontario	0.15	180,000
N. S. Steel & Coal. pfd	N. S.	2.00	20,600
Pinguico, pfd	Mex.	3.00	60,000
San Carlos	Mex.	0.02	8,000
San Francisco	Mex.	1.00	6,000
Sta. Maria de la Paz	Mex.	2.50	24,000
Temiskaming	Ontario	0.03	75,000
Total	....	..	$4,174,975

Chronology of Mining for October

Oct. 1—The director of the U. S. Mint announced the resumption of the purchase of about $125,000 worth of silver per week.

Oct. 4—Judge Knappen, of the U. S. Court at Grand Rapids, Mich., decides that the Calumet & Hecla company has a right to vote its stock in the Osceola company, a right disputed by A. S. Bigelow.

Oct. 9—The Algoma Steel Company awarded a contract for 150,000 tons of coke to the Pocahontas Coke Company, Limited.

Oct. 10—Flurry in copper abroad due to the Balkan war scare.

Oct. 14—Portion of Bisbee, Ariz., destroyed by fire. Fire in the König coal mine, Königshütte, Siberia, destroyed a number of lives and much property.

Oct. 15—Article 144 of proposed new Mexican mining law, commonly described as the anti-foreign law, is decisively beaten. Amalgamated Copper Company declared a quarterly dividend of 50c. per share.

Oct. 16—Balaklala smelter, Shasta county, California, began operations. Details of the reorganization of the North Butte Extension company announced.

Oct. 19—U. S. Smelting, Mining and Refining Company purchased control of the Bullion Beck & Champion Company.

Oct. 24—Receiver appointed for the Greene Gold-Silver Company found practically no assets.

Oct. 27—The quarterly statement of the U. S. Steel Corporation showed a gain of nearly $7,000,000 in net earnings as compared with that of the last preceding quarter.

Oct. 30—The price of silver dropped to 50c., a new low-record mark for the year.

New Zealand Gold

Gold exports from New Zealand in July are reported by the Mines Department at 42,220 oz. bullion. For the seven months ended July 31 the total was 279,836 oz. bullion in 1907 and 297,037 oz. in 1908; an increase of 17,201 oz. The bullion reported this year was equal to $5,720,880, or 276,772 oz. fine gold.

Silver exports in July were 116,741 oz. in 1907, and 119,492 oz. in 1908; an increase of 2751 oz. The greater portion of the silver was obtained from the gold mines in the Ohinemuri district.

The two deepest shafts on the Rand (*South African Min. Journ.*, Sept. 12, 1908) are the Jupiter, 4232.5 ft. deep, and the Cinderella Deep, 4200 ft. deep.

The Broken Hill Proprietary Company is going to install a baghouse in connection with its smeltery at Port Pirie.

A Curious Conflict of Rights

SPECIAL CORRESPONDENCE

A case has been recently on trial on appeal before the United States Circuit Court in San Francisco between the California Development Company and the New Liverpool Salt Company, which has some odd features. The salt company used to obtain thousands of tons of salt annually from the low point at Salton in the Colorado desert, San Diego county, where they pumped salt water from wells and let it evaporate in that dry region. Then came the overflow of the Salton Sea, which wiped out the salt industry entirely, and left 20 ft. of water or more over the site of the old plant. The Circuit Court for Southern California awarded the salt company $500,000 damages against the Development company and granted a permanent injunction restraining that company from using the water of the Colorado river in such a way that it would add to the water already accumulated in the Salton sea. After this injunction the Development company is alleged to have continued using the water in its irrigating canals and further damaging the Salt company's property, so contempt proceedings were brought. From the original judgment and the contempt proceedings the Development company appealed, and this is now under advisement by the Appeals Court judges.

Tasmanian Production

The Mines Department of Tasmania makes the following report of production for the quarter ended June 30, 1908:

	Quantity.	Value.
Gold won, oz	15,428	£65,534
Silver-lead ore, tons	5,060	38,536
Blister copper, tons	2,190	143,089
Copper ore and copper, tons.	489	2,095
Tin ore produced, tons	1,096	101,626
Iron ore raised, tons	800	400
Coal raised, tons	16,876	14,345
Wolfram ore, tons	1	18
Bismuth, tons	1	60
Total value	.....	£365,703

The gold production came from the following sources: 8581 oz. of gold from quartz; 235 oz. from alluvial; 2343 oz. by means of the cyanide and chlorination processes; 4308 oz. from blister copper from the Mount Lyell Mining and Railway Company; 144 oz. from the silver-lead bullion from the Tasmanian Smelting Company's works, Zeehan.

After many tests the Broken Hill Proprietary Company has concluded that the best results for regrinding are obtained from tube mills.

The Araluen district is the chief gold-dredging center in New South Wales; during 1907, its production was valued at £44,463.

Colliery Notes

In Europe, coal is being mined at a depth of 3773 ft., and operations at 4000 ft. are contemplated.

In deep mines, the services of a geologist are almost indispensable as the very foundation of the theory of deep mining, must begin with geology.

Heavy outbursts of gas are generally preceded by poundings, which warning sounds sometimes continue for several days before the outburst occurs.

The difference in the composition of the various fuels is due more to the extent of the metamorphic action to which they have been subjected than to age.

A good engineer always keeps his outgoing rope just taut, so on coming to a down grade, there will be no danger of the trip overrunning the haulage rope.

A gaseous coal seam is more easily worked than a bed in which no gas is found. Coal containing gas is generally more brittle, and as a consequence more susceptible to the pick.

More than 100,000 tons of cement rock and limestone was loosened by a tremendous blast in a cement quarry at Bath, Pennsylvania. The shock was felt 15 miles away.

The bituminous coal trade of the United States during the year 1907 attained a volume, which, if solid, would cover an area as large as Central Park, New York, and would be 300 ft. high.

The longest wire rope carrier in the world is being installed at Samarkand, in Turkestan, to bring coal from the mines which are located 80 miles from the city. The cable will be 54 miles long.

An ordinary briquet machine, similar to those used in Europe, is capable of turning out from 100 to 250 tons of briquets per day. The briquets vary in size from 2 lb. for domestic purposes, up to 22 lb. for marine purposes.

The sanitary arrangements of Austrian coal mines possess features that ought to recommend themselves to American mine owners. Portable sanitary closets must be provided for every 50 men. Baths are also provided on the surface.

Investigations have shown that gas travels more or less in currents or streams, which result is caused by the incomplete mixing of the gas and air. In making laboratory tests it is sometimes difficult to maintain a uniform mixture of the gas on this account.

The roof of a coal seam is often made heavy and dangerous because of the gases contained in the overlying strata. This trouble can be largely remedied by putting up bore holes in the roof at intervals along the heading and chambers, and in this way draining off the occluded gases.

Tests have shown conclusively that briquetting increases the commercial value of low-grade bituminous and lignite coals far beyond the cost of manufacture; it also increases the efficiency of the higher grades of bituminous coals so that they may be used in locomotives with more efficiency and less smoke.

Starch mixed with lime is found to be a good means of binding, in the manufacture of briquets; this system causes a rather large percentage of ash to remain after burning, but the heat generated is high, the smoke given off is small, and the cost is considerably less than when briquets are formed with pitch.

Normally fresh air contains about 20.9 per cent. of oxygen; when the oxygen falls to 20.5 per cent., the air is very bad. Recent investigations in a number of coal mines have shown the surprising fact, that in many instances, the air at the working faces has contained only from 20.2 per cent. to 20.3 per cent. oxygen.

When blasting coal, the "charge limit" of each explosive used should be carefully determined, and only this maximum charge should be allowed, as experiments have proved that all explosives have a certain fixed maximum weight which usually fails to produce an explosion when fired in an explosive atmosphere.

Many mining men erroneously regard peat as coal "in the making;" true coal owes its origin neither to peat bogs nor to forest trees, but to forests of cryptogamic plants. It has been estimated that some of the peat bogs in Great Britain have increased in vertical thickness by from 3 to 5 ft. in the past 2000 years.

The Rand-Victoria bore-hole which was put down south of the "Jack" gold mine in the Transvaal, reached a total depth of 2500 ft. Another bore-hole put down near the Charlton gold mine in the Transvaal struck a depth of 3500 ft. Two other bore-holes near Johannesburg each reached a total depth of nearly 5000 ft. All these holes were bored by the diamond drill.

All mine gases, with the possible exception of black damp (CO_2), when once absorbed by the air currents, are carried out of the mine; black damp requires a strong air current for its removal, and exhibits a tendency to settle gradually to the lower parts of the mine. Other mine gases are usually found at the point where they are generated, or issue from the strata.

When approaching a fault, it is generally best to anticipate a change in the condition of a mine; at such time, the miner should use extra precautions. Gas usually follows a fault because such a fracture is generally the line of least resistance. The miner may lose the gas after passing through a fault, or it may occur that fresh gas will be found on the other side.

Shrinkage of coal in transit can be easily detected if the tops of the loaded cars are sprayed with whitewash. All cars should be examined by the connecting lines when received and if the spraying is disturbed, the fact should be reported; in this way the place where the shrinkage occurred can be determined. If all handlers report on the condition of the cars it will be an easy matter to locate the leak.

During a squeeze, all standing timber in the waste should be withdrawn and all pillars that can be safely worked should be robbed out in order that a fall of roof may be brought about, and the entry pillars thus relieved. The roof over entry pillars should be broken by shots placed in the mouth of abandoned workings. Reinforce the pillars along the roadway by setting timbers and building cogs wherever possible. If these precautions are taken, it is often possible to control a squeeze. An undue increase of water through leakage from the overlying strata is often a forerunner of a squeeze.

One of the most delicate tests for the determination of carbon monoxide is to add three large drops of blood, drawn by pricking the finger, to a fluid ounce of water, making a yellowish solution. The solution is then placed in a test tube provided with a long and a short glass tube passing through the cork at the top. The air to be tested is drawn through the long tube and bubbles up through the liquid passing out the short tube. If the air contains but 0.01 per cent. of carbon monoxide, the gas will impart a pink hue to the liquid.

Fourteen months were occupied by a Sullivan drill, working 24 hours each day, in putting down a 5560-ft. hole at Doorkloof, Transvaal. For the first 700 ft. a 2-in. core was extracted; the total weight of the rods was between 15 and 16 tons, and they were hoisted in 50-ft. lengths, a 66-ft. tubular steel derrick being used for the purpose. Toward the final depth, from 7 to 10 hours were consumed in raising and lowering the rod. The cost of this drill and its entire equipment, including the boiler, etc., was $8,542.90.

A drill boring a 2-in. diameter hole (core 1⅜ in.) will require, when boring at about 600-ft. depth, 2¾ horsepower.

Any attempt to improve the foreign miner must begin outside the mine and deal directly with his habits of drink and his lack of appreciation of the American standards of truthfulness. He should also be taught the State mining laws and the fact that they are a benefit and a protection to him. Each man should be supplied with a pocket copy of the State mine laws and the rules and regulations of the mine in which he is employed. The law ought to demand of the inexperienced non-English speaking applicant for mine work, a term of apprenticeship under an experienced miner instead of leaving him, as is now done, to the tender mercy of some fellow countryman a degree less ignorant.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.
505 Pearl St., New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for October, 1908, was 52,800 copies.

Nov. 7..... 12,500

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

The Proposed Mining Bureau

We expect that the bill creating a bureau of mines, which we discussed extensively last spring, will pass in the early days of the coming session of Congress, it having been passed by the House before the adjournment. We do not approve the bill as it now stands and hope that the Senate will amend it. We believe that it will be a good thing to take the technologic work away from the Geological Survey and leave the latter more free to attend to geology. We do not conceive it to be a proper function of a government to engage in technologic investigations, particularly when there is an old and well organized profession to do such work, but we admit that there are certain lines of investigation, such as the prevention of mine accidents, which a Government bureau may follow usefully, inasmuch as although it may not discover anything that the profession does not already know and cannot put into effect (outside of the Territories) any regulations that it considers wise, nevertheless there is a prestige connected with a Government report that may lead to action by the States more quickly than private recommendations, especially if the official program is aided by a prodding from the press. Such objections as we have previously raised against this policy are to a large extent removed by what has already been done by the Technologic Branch of the Geological Survey, under the active and enlightened administration of Doctor Holmes, which has availed itself of the services of outside experts, who have brought to it the knowledge of long, practical experience rather than that of the study and college class room.

Our present objection to the proposed mining bureau is the breadth of the bill by which it is to be created. Such a law should be sufficiently broad to enable the organization to grow freely within the limits intended, but what is intended should be specifically laid down and not be left by a lazy or careless Congress to the subsequent determination of the bureau itself. We are quite sure that those who have been active in formulating the pending legislation have nothing but laudable purposes in mind, but it is necessary to think of their successors. Everyone knows how insidious is a bureau at Washington; how ambitious become its members to pick flowers in new fields; how a desk once installed can never be removed and how work must be found for the organization that cannot be dismissed; how appropriations may be wheedled out of a log-rolling and extravagant Congress.

The bill now pending in Congress will permit the mining bureau to do almost anything that it wants to, subject only to existing laws. Its capacity for meddling with the mining industry will be almost unlimited. Some persons seem to be desirous of such meddling right away. Thus we hear from the Pacific coast that the mining bureau is wanted to take a hand in the land troubles of California and Nevada; others hope that it will exterminate fraudulent mining promotions. We are not saying that there are no evils in both those matters, but we fear that the entrance of a bureaucratic regime into such questions would be soon regretted by those who invoked it. The experience of the mining men in the West with the Forest and Reclamation services ought to make them shoo away the agents of another bureaucracy.

We think that the bill ought to be rephrased so as to limit the scope of the mining bureau to the lines of scientific investigation that will aid the mining industry and not allow it at any future time to enter upon activities that may vex and harm legitimate private interests. Also we should like to see something incorporated in the law to the effect that the chief of the bureau is authorized and expected to employ engineers, or commissions of engineers, from private life, exempt from all civil service rules, thus duplicating the efficient policy introduced by Doctor Haanel in the Canadian bureau of mines, which, as we previously remarked, has already been adopted to some extent by Doctor Holmes in this country.

Prospecting on the Government Reserves

We have previously called attention to the complaints in the West respecting the administration of the national forest reserves, and several months ago there was a discussion of this matter by contributors to our pages. The chief grievance is the obstacles raised against prospecting on these lands. It was not intended by Congress in passing these laws that prospecting should be prevented in any way, and we believe the recent statement of Mr. Pinchot, the chief forester, that no such

thing has been contemplated in his administration of the Forest Service, but nevertheless, it appears that mining interests have been injured by the proceedings of his agents in ways that evidently have not heretofore come to his attention, although they have been discussed in our columns and others.

The chief grievance pertains to the location of mining claims. According to the law of the land no location is valid unless a discovery has been made. This is one of the antiquated laws remaining on our statute books, and for many years has been conceded to be so irrational that by common consent it has been disregarded. Twenty-five to thirty years ago there was more or less pretense of making a "discovery"—specimens that will assay traces of gold and silver may be found in many places—but it is long since anyone has taken even that trouble, and the breach of the law has been connived at by the Department of the Interior. Otherwise, how could claims be allowed upon deep leads, for which the prospector must have some unassailable possessory right before spending the large amount of money to open the channel of auriferous gravel that has no surface showing to be discovered?

However, the field agents of the Forest Service seem to have revived this ancient law, which is about as applicable to modern conditions as one of the blue laws of Connecticut, and to have been construing it literally; indeed, in some cases they are said to have put a construction of their own upon it. Thus, one of these young men may find a prospector on the forest reserve. "What are you doing here?" says he. "Prospecting," says the miner. "Where is your discovery?" says the forester. "Here," says the miner. "But that's not pay ore," replies the forester, "and you have no right to stake a claim on this reserve. Get out!" Now we will admit that there is nothing to bring more joy to the prospector's heart than a discovery that will pay from the grass roots down, but where would have been Butte, Ely, Globe, and many of our big mining camps if the adventurers had been given no opportunity to dig through the zone of surface impoverishment? Of course, everyone knows that the Forest Service itself cannot legally eject prospectors from its reserves, and does not claim to exercise that right, but it can so interfere through another bureau of the Department of the Interior that the effect is the same, and this is the complaint rather than the charge of usurpation by the foresters.

The creation of the forest reserves was a wise thing which nowhere meets with warmer approval than in the West, and their administration under Mr. Pinchot has been intelligent and energetic. We are quite sure that since the complaints, which after all are comparatively few, have been forced to his own attention, such impediments to mining as have been developed in connection with mineral locations, the utilization of timber for mining purposes, etc., will be promptly removed, wherefore our Western constituents need not be unduly excited. However, it must be pointed out that the chief of a great organization cannot always guard against misplaced zeal on the part of his subordinates, and cannot select the latter from the ranks of experienced engineers who are able to command much higher salaries in private life. The troubles which the mining industry has had from the Forest and Reclamation services are simply a taste of what is always to be expected from bureaucratic administrations.

The Anthracite "Combination"

The taking of testimony in the Government suit against the alleged anthracite coal combination has been in progress in New York for two weeks past. Little progress has been made so far, and nothing has been brought out which was not already known. The fact is, that while the anthracite trade is more nearly unified and more closely controlled than any other great producing trade in this country, it is so by virtue of common ownership in different companies, and by tacit understanding. There is not—and probably never has been—any formal combination. No agreement exists which the law can prove or touch, because no proof can be obtained which will stand in court. The fact that certain prices are maintained by all the companies may be ground for a suspicion of combination, but is not legal proof.

In all probability the Government case will fail in court. This will not prevent the anthracite companies from acting as a unit, however, when any emergency arises. The practical unification of the trade which began when the Morgan interests obtained control of the Reading, is too strong to be broken.

Panic and Gold Reserves

It is now about a year since the panic of 1907 started. One of the results of such a commercial upheaval, after its first force is spent, is always an accumulation of money in the banks and depositaries; and this has been the case in the present instance. If we take the gold reserves reported by the large banks of Europe on Oct. 25, 1907, and add to them the specie reserve of the associated banks of New York, the total is $2,266,446,855. On Oct. 24, 1908, the total was $2,559,496,960; an increase of $293,050,105, or 12.9 per cent. The accumulation, as might have been expected, was greatest in this country, where the depression has been most severely felt; the New York banks showing an increase in specie during the year of $109,864,200, or 55.9 per cent.; while the increase in gold in European banks was $183,185,905, or 8.9 per cent.

It may be added that most of the European banks carry considerable amounts of silver coin in their reserves, especially the banks of Spain, France and Holland. The total of these reserves increased from $518,430,000 a year ago to $572,034,000 last week; a gain of $53,604,000, or 10.3 per cent. This makes a total increase of $346,654,000 during the year in the metallic reserves of the principal commercial nations.

A SUBJECT OF GREAT interest to prospectors and miners is the utilization of the rare minerals and metals, for which during recent years an important market has developed. This has led to the production in the United States of a large quantity of tungsten ore, while the minerals containing molybdenum, vanadium, uranium, tantalum, and other rare elements find a regular market. We receive from prospectors many inquiries as to the identification of these rare minerals, their uses, market value, etc. We are gratified, therefore, to be able to present a series of articles on this subject by Prof. Charles Baskerville, of the College of the City of New York, who is a recognized expert in this field and is famous as the discoverer of the elements carolinium and berzelium. In the present issue, Professor Baskerville treats of beryllium. His series of articles will continue in subsequent issues, each one taking up a special element.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Sampling by Machine

I have read with interest the various articles in the recent issues of the JOURNAL following John. A. Church's description and criticism of the sampling department of the Great Cobar mill. If not too late I should like to join in the discussion and help to counteract the impression given by some of his statements that mechanical sampling is in a chaotic state and is operated on a fundamentally wrong basis.

If I have correctly understood these statements and the arguments in support of them Mr. Church has not sustained the charge of inaccuracy of modern sampling methods, and, as suggested by Mr. Mathewson, I think he would not have taken this position if he had had access to the results of tests which every uptodate sampling company is constantly making. The public sampling works, having to maintain a standard different from that of mills directly connected with a smelter or reduction plant, make a business of hunting down causes for differences which may appear through the daily comparisons of their work which they are constantly receiving, and I know of at least one instance where the matters brought up in the articles referred to were considered and in part acted upon several years ago.

RETARDATION OF COARSE ORE

Mr. Church lays great stress on the possible unreliability and inaccuracy of mechanical systems of sampling due to the retardation of the coarse ore at one stage of the process, and to the retardation of the fines at later stages. I believe this danger is wholly imaginary, and contrary to sampling experience. I will grant that in the days of hand sampling (not entirely gone, unfortunately), the separation of the coarse and fines was a serious matter; and to those who still put faith in those systems as the final arbiters, the realization of how well this troublesome question has been eliminated by the correctly built mechanical sampler is most difficult; but with these present systems I cannot see why fine and coarse particles of ore which reach the crusher at the same time have any brotherhood, nor why they should continue on their tumultuous course together. As a matter of fact the best practice in mechanical sampling exaggerates this separation or retardation at the start by passing the ore on its way to the crusher over a perforated shaking tray or grizzly, taking the finer portion directly to the elevator or sampling machine far ahead of the coarse portion which halts awhile on its way through the crusher.

In Cripple Creek the Taylor & Brunton Company did not crush the ore as fine as was the general sampler custom before taking out the first sample cut, and I believe the Metallic Extraction Company, under Mr. Argall's management was the only large reduction mill which had adopted this plan. It is not necessary now to go into the proof of the accuracy of this system, but in order to convince some of our skeptical shippers that the first cut on a large lot could be accurately taken on ore crushed to 1½ or 2 in., it was our custom, when so requested, to sample an ore first in our ordinary coarse-crushing method, and immediately thereafter resample the entire lot after crushing to ½ in. In the different samplings the retardation was entirely different, yet it was a most rare occurrence that the two samples did not agree well within the accepted assaying limits, a condition which could not exist except accidentally had this retardation been a factor affecting the accuracy of the work.

INDIVIDUAL LOTS AS ORIGINALLY SAMPLED.

Gross Weight, Lb.	Dry Weight, Lb.	Assay and Analysis. Gold, Oz.	Silver, Oz.	Lead, Per Cent.	Insol., Per Cent.	Iron, Per Cent.	Sulphur Per Cent.	Zinc, Per Cent.	Copper, Per Cent.
3,095	3,079	0.00	3.8	53.0	28.0	1.0	9.0	0.0	0.0
1,387	1,345	0.89	88.7	26.0	32.0	11.0	0.0	0.0	0.0
1,410	1,400	1.44	312.0	4.0	22.0	34.0	21.0	2.0	0.0
31,420	30,634	0.01	8.0	14.0	48.0	6.0	2.0	10.0	0.0
20,460	19,928	0.01	7.8	13.0	49.0	7.0	2.0	10 0	0.0
8,550	8,414	0.15	7.3	37.0	15.0	6.0	4.0	2.0	0.0
1,310	1,294	1.39	19.0	19.0	43.0	6.0	2.0	2.0	1.25
1,800	1,778	0.04	28.3	6.0	79.0	4.0	2.0	0.0	1.35
12,580	12,378	1.37	21.0	48.0	27.0	4.0	9.0	0.0	1.67
82,012	80,250	0.295	17.0	22.8	40.8	6.3	3.8	6.5	0.31
		As Sampled Together.							
First Assayer.....		0.34	16.8	22.4	41.0	5.6	3.0	6.4	
Second Assayer.....		0.31	16.9	23.0	41.3	6.6	3.3	6.7	
81,540	80,154	0.325	16.85	22.7	41.15	6.1	3.15	6.55	

SHAKING-TRAY FEED

Speaking of the application of shaking-tray feed in sampling mills Mr. Church says: "This has been done in a few mills, but they are too few to afford many samples of their work." Assuredly he could not have investigated this matter or he would not have made this assertion. In the 90's, while I was managing the Taylor & Brunton mill in the Cripple Creek district, Colorado, shaking-tray feeds were put ahead of every set of rolls, and were, therefore, ahead of every following sampling machine. All subsequent Taylor & Brunton mills were constructed in this manner and I have seen others which used them. This plan was adopted to change the intermittent discharge from the sampling machines into a continuous feed over the rolls immediately beneath them, and at the same time to feed this ore to the rolls in a perfectly even stream the full width of the rolls. Incidentally this eliminated the danger of error from a possible synchronism of motion between consecutive samplers; that is, it interrupted and retarded the direct drop of the ore and prevented the portion which had passed through one sampler from falling *en masse* into a single pocket or division of the machine immediately following.

As our samplers all had different speeds of oscillation this danger was remote, but this arrangement prevented any criticism on this score. Retardation has appealed so little to me as a source of error that I have considered the advisability of perforating all these feed trays in order to pass the fines directly to the following sampler and thus to increase the capacity of the rolls as well as to prevent the rolling of the sometimes damp fines into the troublesome "pancakes." But the increased cost and difficulty of cleaning the machinery between lots under such conditions has made this change seem inadvisable.

DIFFICULTIES OF SAMPLING

To overcome the imaginary results of this retardation there is suggested the possibility and the desirability of so constructing a sampling machine that each revolution or oscillation will take a sample which will correctly represent in value per ton the whole amount of ore which happened to be presented to the sampler during this period of one revolution or oscil-

lation. Unless I have misunderstood the suggestion such a condition seems impossible of fulfilment, except in the case of an ore of absolute uniformity in value, such as a chemically pure compound of lead carbonate or sulphide barren of gold or silver, when any small portion taken anywhere from the pile of ore would as correctly represent it as one taken by the most scientific methods.

Ore as received at a sampling works is not an homogeneous mass, but usually consists of an imperfect mixture of pieces of all sizes, and of all values from barren rock to pure gold. And from the time the rock was mineralized in past ages, and through the mining and shipping, is not the tendency toward a concentration and a separation of the precious metals from the barren rock? Therefore, I cannot see just where a beginning should be made in lessening "the separation of particles which ought to be associated."

It would seem axiomatic that an accurate sample of any 60.6 lb. of coarse ore cannot be taken by any device, mechanical or otherwise, which takes in one oscillation, revolution or grab, any 9.9 lb. Nor would the probability of correctness be satisfactorily increased were the proportion taken one-half, or 30.3 lb. It is conceivable that such a 60.6-lb. mass might be presented to the crusher as a single chunk, and also that it might consist of quartz with a seam of gold running through it; but it is improbable that a single sample could be so taken as to correctly represent the whole chunk in value.

Averages and Size of Particles

Sampling by any means is bound to be a matter of averages, but this need not militate against correct results, if in the lot to be sampled, the relation between the size of the largest particle and the weight of the sample to be taken is within certain limits. This subject was considered thoroughly by D. W. Brunton in an article published in the *Trans.* A. I. M. E., Vol. XXV, p. 826, describing experiments made under his direction while I was with the Taylor & Brunton Company in Aspen, Colorado, in 1893, and all Taylor & Brunton practice follows the conclusions arrived at through these experiments. For instance, in the case of the chunk mentioned, the proper procedure would be to crush and roll it several times, and not present it to the sampler until the proper fineness had been reached, and then to reduce its volume by several small cuts rather than by one large cut.

The back numbers of the Journal are not available to me at this time, and, therefore, I cannot refer to Mr. Jones' article from which extracts are taken, and so cannot discuss them. Any conclusions, however, arrived at from a few selected experiments are always of doubtful value in determining the value of any process. In my experience I have found that the largest part of sampling differences has been caused by general carelessness, or improper handling of the ore *after* it has passed the mechanical samplers and has reached the bucking room; and I have examined mills where differences of 30 per cent. and more have often occurred in cutting duplicate samples from the few hundred pounds finally delivered to the sample room by the mechanical samplers. In such a mill it would have been unfair and misleading to ascribe any differences to the mechanical department unless all conditions governing the sampling had been investigated and contributing errors of the quartering and bucking rooms eliminated.

A Severe Test

While in charge of our Cripple Creek works it was our custom to sample and buy from leasers considerable ore in small lots which we stored in separate bins, and which we afterward united and sampled together as soon as sufficient tonnage had accumulated to make one or more carloads for shipment to the smelter or mill. I regret that I have not the results of a few years of this work to offer as an exhibit, but, as I remember, these figures were not kept longer than a year or two. I am safe in saying, however, that in over 95 per cent. of these mixes the resulting assays were well within the accepted assaying limits, although it was not unusual to have in the same mixture small lots assaying from 0.50 to 100 or more oz. gold per ton. In the resampling of these ores as a mix the ores were not previously bedded, but were wheeled directly to the crusher floor from which they were shoveled into the crusher. As these mixes frequently contained larger lots with 1-in. pieces, and of low gold value, and sometimes smaller lots of fine ore or slimes of very high value, they were excellent examples of variation in retardation. Not at all as an argument, but as a single instance of what can be done with proper care, I give in the accompanying table the details of a mixture made recently at our Murray, Utah, plant. Three months elapsed between the purchase of the first and last lot of the mixture, and different men had a hand in the sampling and bucking of the individual lots, but as the proper relation between the size of the largest particle and the size of the sample was maintained in the original sampling, and proper care was exercised in cleaning the mill, etc., close checking followed as a natural result.

Assaying Limits

On the ground that assaying in a large plant should be at its highest efficiency Mr. Church criticizes Mr. Mathewson's reference to the "assaying limits." I think there is a misunderstanding here as to what is meant by this term. It does not refer to careless work or incorrect methods in the laboratory, but to the mechanical condition of the pulp and to the limits of the delicacy of the pulp balances and to the personal equation of the man who weighs up the charges. For the details of this subject I will again refer to Mr. Brunton's article; the summary is that in weighing up two or more charges for separate assay the assayer may get one or more pieces of metal in one charge than in another and yet not be subject to criticism for carelessness. Such differences may amount to several hundredths or even tenths of an ounce in gold, and half an ounce or more in silver on even low-grade ores, and are recognized differences wherever ore is bought and sold, as is readily proved by the large numbers of repeat and umpire assays required before arriving at a settling basis. My understanding is that in a properly constructed and operated plant, average assays, both of the original and of the duplicate samplings will check more closely and more often than the check assays on the individual pulps.

T. R. Woodbridge.

Salt Lake City, Utah, Oct. 11, 1908.

Loading Blast Holes

Permit me to take issue with the editorial criticism of the method of loading holes as described in Mr. Adkinson's article in the Journal of Oct. 17. The following is the statement to which I refer:

"Experiments have shown that, provided there are no intervening air spaces, no difference in the effect of the explosion is noticeable whether the primer is near the bottom, near the top, or in the middle of the charge. Therefore, the primer should be placed near the top of the charge, as then there is less danger of the dynamite's burning instead of exploding."

Granted! There is certainly less danger of the dynamite's burning instead of exploding. But there is also the great certainty that, in the round of holes as described, with the primer placed near the top, there will be missed holes. Whether these missed holes will be caused by the explosion of one breaking the collar of the hole adjoining and carrying away the primer, or by the fact that placing the primer near the top leaves much the greater part of the fuse on the face of the drift where, even if neatly coiled, it is easily torn away, is not important.

Experience has taught most miners the necessity of putting the primer near the bottom, at the expense of considerable extra trouble in loading, at the risk of the holes burning, and if the drift be wet, at the increased danger of dampening the cap. It was this experience, probably, which caused Mr. Knowles in his masterly works to put the primer in the position to which exception is taken. Tom.

Pioche, Nev., Oct., 22, 1908.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by profressional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

Manganese Ore in Texas

I own a deposit of manganese ore near Marfa, Texas, which assays 30 per cent. manganese, 12 per cent. iron and 3 oz. silver per ton, which can be concentrated so as to bring the manganese up to about 40 to 50 per cent. What market can I find for this ore?

W. T. E.

Address the American Smelting and Refining Company, El Paso, Texas.

Zinc Smelters in Canada

How many zinc smelting works are there in Canada? E. B.

There are no zinc smelteries in operation in Canada. The Canadian Metal Company erected at Frank, Alberta, a zinc smeltery a few years ago, but it made only an experimental run and is not now in operation. A small plant is being built at Nelson, B. C., for the trial of an electrothermic process of smelting, but so far as we are aware this is not yet in operation.

Making Coke from Peat

I have heard about coke being made from peat. Can you advise me if this is being done successfully?

W. P. H.

We have had occasion recently to examine a number of samples of coke made from peat. The coke was exceedingly heavy and still showed its woody texture. The porosity of the sample was not pronounced, and the cellular structure was very poor. It is not probable that coke made from peat will be a commercial success. The manufacture of briquets from peat is a profitable industry on the Continent.

Iron Ores

Please name the three greatest iron-ore fields of the United States in the order of their importance as producers.

H. A. K.

The most important iron-ore producing district in the United States is the Lake Superior region, in Michigan, Minnesota and Wisconsin, which furnishes the raw material from which 75 per cent. of the pig iron is made. Its production last year, in round figures, was 42,000,000 tons of ore. The second is the Alabama region with a production last year of 4,100,000 tons. For the third place there are several competitors: the Lake Champlain district—Port Henry and Chateaugay—in New York mined 785,000 tons in 1907; the Cornwall district in Pennsylvania, 705,000; New Jersey—Morris, Sussex and Warren counties—585,000 tons.

Blasting Powder

What is the annual consumption of blasting power for blasting purposes in the United States? What are the best technical treatises on this subject?

X. Y. Z.

We do not know of any statistics available as to the consumption of black powder in the United States. Probably the annual consumption is somewhat in excess of 125,000 tons.

There is no technical treatise on the subject that is thoroughly uptodate. However, the following works will be found useful: "The Manufacture of Explosives," two volumes, by Arthur Guttmann, price $9; "Explosives and Their Power," by C. Napier Hake and William Macnabb, price $9.75; this work is a translation and condensation from the French of M. Berthelot; "Manufacture of Explosives," by Courtenay DeKalb, price $1.

Specific Heat of Gases at High Temperatures

Is the specific heat of the gases common in metallurgical work the same at high temperatures as at low?

W. E. S.

In general, perhaps in all cases, the specific heat rises with the temperature. The latest measurements that we know (by L. Holbarn and L. Austin, Beiblätter, *Annalen der Physik*, 1905, vol. V, p. 621; Berliner *Berichte*, 1905, p. 175) are the following:

Temp., ° C.	Nitrogen.	Oxygen.	Air.	CO_2
10–200	0.2438	0.2175	0.2375	0.2168
20–440	0.2419	0.2240	0.2366	0.2306
20–630	0.2464	0.2300	0.2429	0.2423
20–800	0.2497	..	0.2430	0.2486

The large increase in the case of carbon dioxide is particularly noteworthy.

Silver in Lake Superior Copper Mines

Do any of the copper mines in the Lake Superior district contain silver, and, if so, is it recovered?

A. G. M.

A number of the mines in the Lake Superior district contain a little pure native silver, but except in two instances the silver is not recovered in commercial quantities. Some of the mines in Ontongan county, such as the Mass Consolidated, Michigan and Adventure have, in the past, found silver, but, except that recovered by hand picking, none was saved. Some of the Calumet & Hecla copper contains an appreciable amount of silver and this is refined electrolytically at the company's plant in Buffalo, N. Y. Quincy copper also carries silver and a portion of the output is refined by the Calumet & Hecla company at Buffalo. Aside from these two, no other companies recover their silver.

Silver occurs native and in some instances in beautiful crystalline form. It is also found intimately joined to copper, but no alloying has occurred. This form is known locally as "half-breed," and the combination of native copper and silver is said to be unique and peculiar to this district.

A Safe Mine Atmosphere

There is much discussion at present concerning what is known as a "Safe Atmosphere in a Coal Mine." Will you kindly explain what is meant by a safe atmosphere, and state whether there is a dividing line or general rule by which the air in a mine may be considered safe or dangerous?

C. A. W.

The question is one in dispute, and in a number of instances has been the cause of litigation. Recently the mine inspector of a southern coal State decided that the air in a certain mine was dangerous, and ordered the officials in control of the property to provide safety lamps for all miners working underground. The mine officials refused to comply with the order, claiming that the mine was safe, and that the use of safety lamps would enforce unnecessary trouble and expense on the company. The case was carried to the court, and after hearing considerable testimony from various experts, the decision was rendered in favor of the coal company. The atmosphere in a mine may be safe under normal conditions and permit the use of naked lights; however, the same atmosphere will be rendered highly explosive when subjected to the flame of a blown-out shot, or other intense heat. Mr. Haas, of West Virginia, whose paper, read before the recent meeting of the West Virginia Mining Association, was published in the Journal of Oct. 24, discussed this question in an admirable manner. Mr. Haas claimed that dust-laden air could not be exploded by the flame of an ordinary lamp nor by the flame from the short-circuiting of an electric cable. Other causes, such as the distant discharge of explosive mixtures by pressure, and the combustion of coal by friction were cast aside as unworthy of consideration. There are a great many practical coal engineers who staunchly support such theories, and as a consequence, the problem remains unsolved. Mr. Galloway, the eminent English engineer, claims that an atmosphere containing fine coal dust is explosive when it contains but 0.892 per cent. of marsh gas. Marsh gas (methane) first becomes explosive when one volume of gas is mixed with five volumes of air; the higher explosive limit of marsh gas occurs when one volume of gas is mixed with 13 volumes of air. The mixture of marsh gas and air is most dangerous when the ratio is about 1 to 9.

New Publications

ELEMENTS OF RAILROAD TRACK AND CONSTRUCTION. By Winter L. Wilson. Pp. 320; illustrated. 5x7½ in.; cloth, $2. New York, 1908: John Wiley & Sons; London, Chapman & Hall, Ltd.

HYDRAULICS. VOL. II. THE RESISTANCE AND PROPULSION OF SHIPS. By S. Dunkerley. Pp. 253, illustrated. 5½x9 in.; cloth, $3. New York, Bombay and Calcutta, 1908: Longmans, Green & Company.

INTERCORPORATE RELATIONSHIPS OF RAILWAYS IN THE UNITED STATES AS OF JUNE 30, 1906. Interstate Commerce Commission, Special Report No. 1. Prepared by the Division of Statistics and Accounts. Pp. 516, 6x9 in., cloth. Washington, 1908: Government Printing Office.

SOUTH AFRICAN COMPANIES ANALYZED. Second Series. Pp. 76, 3½x6 in., boards. Price, in London, 1 shilling. London, England; *South Africa*.

This is a convenient reprint of a number of the analyses of reports of Transvaal mining companies, which have appeared from time to time in the London journal known as *South Africa*. It furnishes in condensed and convenient form many facts of interest to investors and dealers, which they might have some difficulty in digging out for themselves.

SCIENTIFIC BOOKS. CATALOG. Pp. 176, 6x 9-in., paper. New York and London; Hill Publishing Company.

This is one of the most extensive catalogs ever issued of books relating to mining, metallurgy, mechanical engineering, electrical engineering, chemistry, the construction and operation of power plants and kindred topics. It contains a large number of titles, carefully classified by subjects, with many notes as to the character and contents of the books, and particulars as to size, prices, etc. A full index of authors' names adds to the value and convenience of the catalog.

REPORT ON THE FOSSIL IRON ORES OF GEORGIA. By S. W. McCallie. Geological Survey of Georgia. Bulletin No. 17. Pp. 199; illustrated. 7x10 in.; cloth. Atlanta, Ga., 1908: The Franklin-Turner Company.

This very creditable and highly valuable monograph, of which Doctor McCallie himself is the author, discusses at much length the origin of the fossil iron ores (Clinton ore) and data upon which to estimate the iron-ore reserves of the South. It is a contribution which will be highly appreciated by those interested in the iron foundry of the South.

MAP OF WEST VIRGINIA, SHOWING COAL, OIL, GAS AND LIMESTONE AREAS. I. C. White, State Geologist. 39x45 in.; paper, 50c. Morgantown, W. Va., 1908: West Virginia Geological Survey.

This map, which is on a scale of seven miles to the inch, has been carefully and fully brought uptodate. The topography is based on the topographic sheets of the United States Geological Survey. The coal and limestone areas are clearly shown; the principal anticlinal lines, as well as the developed oilfields and gasfields, are plainly indicated. A useful addition is the location, name and address of every shipping coal company in the State arranged by counties.

THE LIME AND CEMENT RESOURCES OF MISSOURI. By H. A. Buehler, Assistant State Geologist. Vol. VI, Second Series, Missouri Bureau of Geology and Mines. Pp. 256, illustrated, 6½x 10 in., cloth. Jefferson City, Mo.; Hugh Stephens Printing Company, State Printers.

This volume is the result of field-work extending over a considerable period, and involving visits to nearly all the counties of the State. A large number of samples of limestone and shale were also analyzed. In view of the large and growing use of and demand for cement, the report is timely and interesting. The conclusion reached is that Missouri possesses great resources in lime and other materials for the manufacture of cement. The manufacture is growing rapidly; in 1900 portland cement was not made in the State; in 1907 there were factories in operation with a capacity of 6,000,000 bbl. yearly. The report includes a brief general description of the raw materials used in the manufacture of lime and cement; the uses and properties of those materials and the methods of manufacturing. Following this general section are descriptions by counties of the deposits of lime and cement materials, their geological position, occurrence and probable extent. In conclusion a table of analyses is given. The book is illustrated by maps, geological sections and many reproductions of photographs.

THE OFFICIAL MINING DIRECTORY OF MEXICO. Pp. 244, illustrated. 9½x12½ in., cloth, $6. Compiled and published under authority of the Government by John R. Southworth and Percy G. Holms; Calle del Eliseo, Mexico, D. F., Mexico.

This is an amalgamation of two separate publications, "The Mines of Mexico" and "Mining Directory of Mexico." The subtitle is "History, Geology, Ancient Mining and General Description of the Mining Properties of the Republic of Mexico." The general section is necessarily brief, being confined to an introduction of 30 pages, three of which are given up to a summary of the mining law. The rest of the book is devoted to descriptions of mines and accounts of the companies owning them, classified by States. These descriptions vary in length from a condensed paragraph to a page or more in the case of some important mines. The descriptions in all cases are condensed, only essential facts being given, without going into details. In view of the large investments in Mexican mines made from the United States, this book will be very useful, and there ought to be a good demand for it in the United States. It is well and clearly printed and is illustrated by maps and many reproductions of photographs. The introduction is given in Spanish and English, in parallel columns. The descriptions bear the marks of careful compilation and editing.

SUPPLEMENTARY COAL REPORT, WEST VIRGINIA GEOLOGICAL SURVEY.. Vol. II(A). By I. C. White, State Geologist. Pp. 720, illustrated. 6x9 in.; cloth, $2. Morgantown, W. Va., 1908: West Virginia Geological Survey.

This is a companion volume to Volume II, published some time ago. The former work was devoted chiefly to the coals in the northern end of the State; much of the space in the present one is given to the Great Kanawha and New River regions, and the coalfields between those districts and the Kentucky line. It is accompanied by a map showing the location of bore holes mentioned in the text; also by elaborate tables of analyses of coal. The revised correlation of the coals of the Kanawha series is given in full, together with corrections of some errors made in the correlation in former volumes.

A SKETCH OF THE GEOGRAPHY AND GEOLOGY OF THE HIMALAYA MOUNTAINS AND TIBET. By S. G. Burrard and H. H. Hayden. Part I The High Peaks of Asia; Part II, The Principal Mountain Ranges of Asia; Part III, The Rivers of the Himalaya and Tibet. Pp. 230, illustrated. 9x12 in.; paper, 6 rupees. Calcutta, India, 1908: Superintendent Government Printing.

These volumes are a condensation of the information secured in explorations extending over 100 years, the first survey detachment having been sent out by the Surveyor-General of Bengal in 1807; this was the first expedition to the Himalayas undertaken for purely geographical purposes. The parts have been made each as far as possible complete in itself, but they are essentially interdependent; they will be completed by a fourth part, to be issued soon, on the "Geology of the Himalayas." The first three parts, now under review, are largely geographical, while this fourth part will be entirely geological. They are accompanied by a number of maps. While the compilers have included all the information obtainable uptodate, they admit the incompleteness of the existing surveys over large areas. Full references to various publications on the subject are included. The authors were assisted in their work by W. J. Eccles, J. H. Nichol, Lenox Conyngham, Shiv Nath Saba and Ishan Chaadra Dee, acknowledgement of whose work is made in the preface. The work is an interesting study on a subject of importance.

Personal

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

C. H. Thompson has returned to Los Angeles, Cal., from Durango, Mexico.

H. Oren Cummins has opened an office at Redding, Cal., as consulting engineer.

L. C. Todd, Rollinsville, Colo., is manager of the Moon Gulch Gold Mining Company.

Albert Williams is superintendent of the Kentucky Ridge mine at Grass Valley, California.

Hiram W. Hixon intends to sail for Europe Nov. 7, and will be abroad for about a month.

Dr. Barrett, medical officer for the Guggenheims in the Yukon, is on a visit to his former home, Kingston, Ont.

We shall be obliged if R. F. Fitts, formerly of Greeley, Colorado, will send us his present address.

W. H. Knowles, of Los Angeles, Cal., has been in Gilpin county, Colo., to look after mining interests there.

Chester W. Purington is at St. Petersburg, Russia, and expects to be in London about the middle of November.

Forbes Rickard, of Denver, recently made an examination of the Saratoga mine in Gilpin county, Colorado.

Prof. Willet G. Miller, provincial geologist of Ontario, is making an examination of some of the outlying districts of the Cobalt silver area.

James Stirling, an Australian mining geologist, is now making an examination of the property of the Clara Consolidated Gold and Copper Mining Company.

Lester W. Strauss is in Peru, where he has been examining coal lands along the line of the Oroya & Huancayo railroad, and cinnabar deposits near Huancavelica.

Cortlandt E. Palmer, consulting engineer for the Guanajuato Development Company, has been spending some time at that company's mines at Guanajuato, Mexico.

Alexander Agassiz, president of the Calumet & Hecla Mining Company, accompanied by his son Rudolph, is at the property on his semi-annual inspection trip.

It is reported that J. W. Paul, chief of the Department of Mines of West Virginia will resign, in order to accept a position with the United States Geological Survey.

H. H. Heiner has resigned his position as first vice-president of the Sunday Creek Coal Company, to become president of the Maynard Coal Company in the Hocking Valley region.

J. J. Stein and Mr. Mackeridge, of London, England, have been looking over mining interests in the Frontenac Mines Syndicate, Ltd., operating in Gilpin county, Colorado.

Eugene G. Grace, heretofore superintendent, has been appointed general manager of the Bethlehem Steel Company, at Bethlehem, Penn. C. Austin Buck has been appointed superintendent.

S. E. Bretherton has returned to San Francisco, from Los Angeles, where he was engaged in the investigation of a new wet process for the extraction of copper and zinc from sulphide ore.

Walter L. Ehrich has resigned his position as superintendent of the Bonanza Belt Copper Company, at Johnson, Cochise county, Arizona. His address for the present is 463 Fifth avenue, New York.

H. P. Jones, general manager of the Pittsburg-Buffalo Coal Company, was overcome by smoke while directing operations against the fire in the company's Hazel mine, near Canonsburg, Penn. He is now recovering.

Alexander Leggat returned last week to Butte, Mont., after two months spent in eastern Montana. He has left Butte again to examine copper properties in Meagher county, Mont., for Eastern owners, and expects to spend the winter there.

Robert Hawxhurst, Jr., has recently completed an examination of the Miño silver mines and the Santa Jovitas copper mines in the district of Tarapaca, Chile, and remains in Chile as general manager of the Poderosa Mining Company of Collahuasi.

Allen Gibb, chief engineer for R. Williams & Co., of London, who is in charge of the development of the copper mines of Katanga, and has been visiting important mining and smelting districts of the United States, sailed for London on Saturday last.

Dr. R. W. Brock, acting director of the Geological Survey, of Canada returned to Ottawa, Oct. 28, after a three months' visit to British Columbia, during which he inspected a number of mining camps and accompanied the Canadian Mining Institute on a portion of its trip.

Albert Ladd Colby, of New York, consulting engineer, has returned with his family from Europe after over a year's absence, studying by-product coke ovens and recovery processes and testing American coal in different types of by-product ovens. Until he opens a new office in New York, his address will be care Engineers' Club, or South Bethlehem, Pennsylvania.

C. W. Henderson, who has been an assistant with Charles G. Yale in the suboffice of the Division of Mineral Resources, United States Geological Survey, at San Francisco, Cal., has been transferred and placed in charge of the similar office at Denver, Colo., while Chester Naramore has left the Denver and gone to the San Francisco office. The change was made by Waldemar Lindgren, in charge of the gold and silver inquiry, at the desire of both gentlemen; both are graduates of the mining college of Stanford University.

Obituary

Charles Hartshorne, who died in Philadelphia, Oct. 31, was long connected with the Lehigh Valley Railroad Company, and was for some time vice-president of the Lehigh Valley Coal Company. He had large interests in the anthracite region.

Samuel Devere Burr died at his home in Plainfield, N. J., Oct. 28, aged 53 years. He was born in New York, graduated from Rutgers College, and for a number of years was connected with the iron and metal industries. He wrote largely for the technical press, and was the author of several books on technical subjects.

Charles Redenbaugh was killed Oct. 17 by the accidental discharge of a gun, while hunting near Silao, Guanajuato, Mexico. His body was sent to the residence of his parents in Omaha, Neb., for interment. For two years past he had been superintendent of the mill of the Peregrina Mining and Milling Company, near Guanajuato.

James Kerr, who died at his summer residence at New Rochelle, N. Y., Oct. 31, was best known for his political activity, having been prominent in the Democratic party. His fortune was made in coal, however. Born in Mifflin county, Penn., in 1855, he was for many years a resident of Clearfield, Penn., and took an important part in the development of the Clearfield coal region. It was largely through his influence that the New York Central built its road into that region, which had been entirely tributary to the Pennsylvania. Mr. Kerr was president of the Pennsylvania, Beech Creek & Eastern Coal Company, and of several smaller companies, and was a director of the O'Gara Coal Company, of Illinois.

Societies and Technical Schools

Canadian Mining Institute—The office of the secretary and the library of the institute have been removed from 413 Dorchester street west to rooms 3 and 4 in the Windsor Hotel, Montreal.

Mining and Metallurgical Society of America—The New York Section held its monthly meeting at the Times Square Hotel, Oct. 31. After an informal dinner, there was a general discussion of the question "What action may be taken by the society to secure the publication of reports by mining companies which shall contain information necessary for the full protection of the interests of mine investors." Local sections of the society are being organized at Chicago, Philadelphia, and San Francisco.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 30—The United States Circuit Court in this city, temporarily presided over by Judge Frank S. Dietrich, of Boise, Idaho, has been hearing the case of the City of Oroville against the Indiana Gold Dredging Company, the operations of whose dredges in the Feather river, according to the complaint, threatened to alter the channel so as to endanger the city of Oroville by flood when high water prevails. Affidavits of a number of engineers were submitted to prove that the deposit of tailings left by the dredge company is not in the actual bed of the Feather river, and that its existence cannot ordinarily increase any danger of flood. On the other hand, District Attorney Robert T. Devlin pronounced the existence of the bed of tailings a menace to the new city levee.

Judge Dietrich finally entered an order modifying an injunction of the Superior Court of Butte county, and permitting the company to continue dredging for gold in the channel of the Feather river under certain restrictions. It is ordered that a 50-ft. cut must be made through the transverse ridge of tailings which now impedes the flow of the stream. Unless the cut is made to the level upon which the present objectionable ridge lies within 15 days, the order will become void. The Indiana company is permitted to dump gravel and rock tailings in elongation of the ridge which runs parallel with the Feather river, but it cannot erect or maintain a ridge extending above the present level of the ground upon which the dredger may be working. The judge said in his decision, that he did not believe that either party wanted to injure the other, but that the city desired to obviate the possibility of the deposit of tailings in the river bed contributing to cause such another flood as occurred in 1907 at that point. He thought that the transverse ridge of tailings was undoubtedly a menace to the welfare of Oroville, and would change the flow of the river in the event of unusual high water. It will be seen that this decision dissolves the injunction against the dredging company to a certain extent, as it is permitted to continue operations in the place where it has been at work; but at the same time it must remedy the evils complained of by the city. This is an exceptional case, as none of the other dredges in that locality are throwing up transverse ridges of cobbles, etc., anywhere in the river bed.

The plant owned by the Richmond Foundry and Iron Works, at Point Richmond, San Francisco bay, went into the hands of a receiver shortly after the financial panic of last year. It has now been changed from its original purpose and arranged for the treatment of custom ores. Being on the bay shore and close to the line of the Santa Fe railway, ores may be shipped by water or rail.

The committee of officials from the city of Sacramento who were appointed to investigate the dredge operations on the American river, near Folsom, has completed investigations, and failed to find any damage being done. The dredge operators showed them the dredges in operation. Most of these are from one to two miles from the main stream, and in fields. The committee was shown how the light soil was thrown back into the dredge ponds in which the boats float, and that on top of this soil the cobbles, rocks, etc., were dumped, holding it down in the ponds so it cannot escape. The stone heaps effectually dam all tailings away from the river proper. The committee decided that if any damage might be done to the river they could not determine it until seeing what effect the stone-pile dams had in the winter months. Also that the amount of sediment finding its way into the river would have to be determined by the city engineer. Also that while the discoloration of the river water was due to dredges, no legal steps can be taken at this time to put a stop to dredge mining in that locality.

The California commissioner to the Yukon-Alaska-Pacific exposition, to be held at Seattle next year, has sent a representative to the mining counties of the State to make a collection of California minerals to be exhibited on that occasion. He is visiting mine managers to get samples of ore and attractive specimens. Every time there is an exposition anywhere this same step is taken, and it may be said that very little comes of it in the end. Mere ore samples and a few fancy specimens attract little attention from mining men in other parts. A collection belonging to the State is in the museum of the State Mining Bureau, where it has been growing in size since first established nearly 30 years ago. There is another large collection at the State University and still another at the State Library. It would seem that from these three collections a good one could be chosen which would represent the mines of California better than a small one brought together hastily by the efforts of one man. Moreover, more graphic representations of the condition of the California mining industry could be made with a little effort than by showing a few cases of minerals.

The United States Circuit Court of Appeals in this city has affirmed the decision of the Alaskan court in the case of the Alaska Perseverance Mining Company against C. M. Thorndyke and others, thus giving 1000 in. of water in Lurney creek to the mining company.

Goldfield, Nevada

Oct. 29—This week all litigation between the Florence Goldfield Mining Company and the Little Florence, the leasing company, was settled out of court. This settlement involves not only the $117,935, in dispute between the two corporations on the claim that it belonged to the leasing company for ore extracted and shipped, but also the $2,500,000 damage suit brought by the Little Florence against the Florence Goldfield as an outgrowth of interruptions to the working of the lease and the declaring forfeited some of the lessee's territory. The exact terms of the settlement will not be made public until the two companies make their reports to their stockholders, but it is admitted that concessions were made by both sides. Mr. Keelyn, the managing director of the Little Florence company, is quoted as saying, "Under the terms of the agreement the sum paid to us was in excess of $100,000 together with other valuable considerations, which will be made public in our report to our shareholders, but not before." An order has been issued by Judge Langan directing that the $117,935, now impounded in the court be paid to the Florence Goldfield company. The first lawsuit between the two companies was an action for $125,000 damages brought by the Florence on the ground that the Little Florence had not strictly complied with the terms of the lease and had not operated the property in a miner-like manner. Then there was a cross bill brought by the Little Florence for $119,580 said to be due it from ores taken from the lease, the claim being made that the latter had been operated strictly according to agreement. This was followed by an action for $2,500,000, damages against the Florence Goldfield on the ground that that company had wrongfully forfeited a lease of the Little Florence on the Mohawk Florence property. Judge Langan some weeks ago ordered Mr. Lockhart, president of the Florence company, to pay into

the court, pending the settlement of the dispute, the money claimed by the Little Florence which was held up by the Goldfield Florence company. Lockhart was found guilty of contempt in refusing to turn over this money, but appealed to the Supreme Court, which tribunal sustained the lower court. Lockhart then rather than go to jail gave a check for the amount in dispute and later the Little Florence filed an application with the court to have the amount paid by the clerk of the court to the Little Florence company. This action was still pending when the settlement was effected.

The Florence company has announced another 10c. dividend to be paid Nov. 2. This will make a total of $420,000 paid during the past 12 months. After this dividend is paid the treasury will still have a surplus of more than $500,000. All of this money has been derived from royalties paid by leasers.

The first official statement of the mineral output of the State for the first six months of 1908 ending June 30, has been submitted to the Governor by the bullion tax collector. The low production of Esmeralda county is ascribed to the industrial strife which kept the camp idle during last fall and winter, and from which it has not yet entirely recovered. The report gives the tonnage and value by counties as follows: Churchill, 449 tons, value, $41,916; Esmeralda, 87,658 tons, value, $2,078,347; Eureka, 10,492 tons, value, 88,135; Lincoln, 73,343 tons, value, $370,924; Lyon, 10,740 tons, value, $23,103; Nye, 150,170 tons, value, $3,906,456; Storey, 20,132 tons, value, $276,510. A total of 352,982 tons, value, $5,785,321. The total mining expenses amount to $4,567,154. The high ratio of operating expenses to the value of the ore will probably be considered by the next legislature and the law so amended that the mining companies will not be allowed to make the expenses in their returns so high that it frequently deprives the State of its just proportion as bullion tax.

Investigations made by the United States Government have disclosed the fact that about 300,000 acres of land valued at $100,000,000 have been wrongfully acquired and now held by Harriman for the Southern Pacific system. The investigations disclosed, in one instance, the fact that a section of land, on which at one time was located a town, contained mines which had been working for the past 40 years—this was the Olinghouse mine—yet the railroad company's agent filed a non-mineral affidavit in taking up the land. Some of the richest mineral territory of the State is involved.

After eight months of experiment and vicissitudes and Greenawalt chlorination mill has begun the regular treatment of custom ores. The new mill employs a new process invented by J. E. Greenawalt, of Denver. The ore is roasted after being crushed to only 20-mesh, and is then leached by an aqueous solution of chlorine in redwood tanks having a capacity of 100 tons of ore each. The chlorine is generated by the electrolysis of common salt. The claims for the new process are the high extraction and the low cost. The management expects to make treatment charges so low that the mining of Goldfield ores assaying as low as $15 per ton will be profitable.

Salt Lake City

Oct. 29—A controlling interest in one of the oldest silver-lead mines in Utah has been conveyed to the United States Smelting, Refining and Mining Company, the deal involving approximately $3 a share for stock in the Bullion Beck & Champion Mining Company, operating in the Tintic mining district. The Bullion-Beck mine was discovered in 1876 and has been almost a steady producer ever since, although during the last few years the ore extracted has come almost entirely from leases. In the latter part of the 80's and early part of the 90's, the Bullion-Beck was after the Centennial Eureka the most important shipper and dividend payer in Utah. The company's records show that $2,738,400 has been divided among shareholders, the last dividend being paid in June; this amounted to $10,000. The company is capitalized for 100,000 shares. Development has been carried to a depth of 1400 ft.; the Centennial Eureka mine has been explored to a depth of 2200 feet.

The construction of at least two more smelters in Utah, both to engage in the treatment of custom ores, is believed to be a foregone conclusion. While the American Smelting and Refining Company is said to be putting forth every effort to block the plans of the Utah Consolidated to erect its proposed copper plant in Tooele county, it is believed here that the effort will fail and that President Broughton will soon let it be known that a majority of Utah Consolidated directors have sanctioned his smelter construction plans. In the meantime, Manager J. B. Risque has exercised all the options held by his company on lands in Tooele county, and everything is in readiness for starting construction. The plans for the proposed smelter have been drawn for some months.

The second smelter project is one in which financial backing will come from F. Augustus Heinze and the interests largely identified with the Ohio Copper Company and the Silver King Coalition Mines Company. It has been intimated that possibly the Bingham Mines Company will join in the enterprise, yet, as far as the last-named corporation is concerned, the report is yet to be confirmed. Before Mr. Heinze experienced financial distress in Wall Street a little over a year ago, he had laid plans to launch a gigantic mining and smelting enterprise in Utah. The nucleus for this was to be the Ohio Copper Company, which he controlled, the Silver King Coalition and Bingham Consolidated companies, with which he had become identified. A smelter site and valuable water rights were secured in Tooele county, the Miners' Smelting Company was formed under the laws of the State of Maine and contracts entered into with the Silver King Coalition and Daly-Judge Mining companies at Park City. This insured a large supply of lead ore, as these are two of the leading lead producers of the State. Contracts were also made with the Ohio Copper Company, which will shortly rank among the most important producing copper mines of Bingham, while tentative arrangements had been made with other producers which guaranteed a tonnage justifying the erection of a smeltery of extensive proportions. While nothing has been stated officially to indicate just what is to be done, things have transpired lately which plainly indicate that Mr. Heinze has not given up his Utah projects and this includes the proposed smelter, but he is no longer a controlling factor in them. Former United States Senator Thomas Kearns and David Keith of the Silver King Coalition company have been moving spirits in the smelter enterprise and it is claimed that W. A. Clark has been induced to come into the combination.

Butte

Oct. 29—The furnaces of the Idaho Smelting and Refining Company's plant at Ponderay, Idaho, were blown in last week and the plant is now ready for the treatment of all ores sent by members of the Montana Mine Owners Asociation. The reconstruction of the smelter was instigated principally by the small mineowners of Idaho and Montana, who were dissatisfied with the rates on treatment of ores scheduled by the American Smelting and Refining Company's plant at East Helena, Montana.

On last Tuesday, the return day on the order to show cause why proceedings in bankruptcy against the North Butte Extension Copper Mining Company should not be dismissed, the Ingersoll-Rand company and the United States Fidelity and Guaranty Company, creditors of the mining company, filed objections to the dismissal. Hearing of the objections was set for November 10. The directors of the company are making every effort to pay off the indebtedness represented by the objecting creditors so that the bankruptcy proceedings may be dismissed. Considerable difficulty is being experienced in carrying out the plans for the reorganization of the company and the formation of a new company to be called the North Butte Extension Development Company. Many of the stockholders of the old company are refusing to pay the 50c. assessment to obtain stock in the

new company. The time for payment of the first assessment has been extended 10 days by the reorganization committee. A. M. Andrews, treasurer, has recently made a report covering the expenditures of the company during his term of office.

Bernard Noon, attorney for the Tuolumne Copper Mining Company, has returned from New York where he has been for the past three months in the interests of the company. He states that he has closed negotiations for the sale of the entire remaining treasury stock of the company.

Denver

Oct. 31—The reconstruction of Stratton's Independence, Ltd., though so long drawn out, is stated here to have been a success. The creditors of the company have been paid in full, and work is resumed on the completion of the mill for the treatment of the low-grade ores, which occur in such large quantities in the company's mines. When the last financial stringency occurred the force was considerably reduced, and all work was suspended about the middle of last April, since which the mill has been in the hands of a caretaker. It is now expected that milling will be in full operation by Dec. 1. Meanwhile the production of high-grade ore by the lessees is steadily increasing, and the shipments for last month exceeded $30,000, about 25 per cent. of which should accrue to the company.

The Fluorine, on Copper mountain, in the Cripple Creek district, is one of those peculiar surface ore deposits, which, in the early days, gave rise to the expression "shipping the scenery," for Jas. A. McClurg, of Denver, at that time took upward of $100,000 out of what might be termed yellow clay, possibly the result of disintegration of the surface outcrop of some lode not yet discovered. The cyanide plant put up later, and known as the Sioux Falls plant was a failure, but now it has passed into new hands, and is said to be running successfully on 75 tons per day, the output of the mine. It is worked under lease.

Another of the old-time shippers, known as the Hoosier, on Tenderfoot hill, and long idle, has been put in operation by a leasing company, and with excellent prospects of being a producer once more.

The Elkton Consolidated Gold Mining Company has distributed its regular bimonthly dividend of 1c. per share and an extra ½c. per share, amounting to $37,500 in all.

Strikes of unusually rich oreshoots are reported in several of the Cripple Creek mines this week.

London

Oct. 24—The general meeting of El Oro Mining and Railway Company, Ltd., of Mexico, was held in London on Oct. 20, R. T. Bayliss, the chairman, presiding. The official report is a document containing full information as to the working of the mine and the progress of the development work. It is acompanied by plans and tables of statistical data, together with a supplementary letter from the general manager, R. M. Raymond, enlarging on some of the most important points dealt with in the official report. Besides these reports the shareholders received an interesting address from the chairman, who being a mining engineer of wide experience, was in a position to explain and criticize in an exceptionally authoritative way, the position of the company.

In this address Mr. Bayliss drew attention to four important points in connection with the development of the mine. The first was the satisfactory results obtained in the south end of the mine, the second the large tonnage of ore developed in the footwall orebody in the north end of the mine, the third the developments in the 1000-ft. and 1150-ft. levels in the bottom, and the fourth the remarkably satisfactory developments on the San Patricio vein in the Somera claim, which has only recently been actively developed. The bulk of the ore during the past twelve months has come from the upper levels, and as this portion of the mine is approaching exhaustion, or perhaps it would be fairer to say has become a fixed or limited asset, it is satisfactory to find that the report speaks hopefully of the development in depth and is optimistic about the development of other veins, particularly those on the Somera claim. The total ore reserves on June 30, were 433,964 tons of an average value of $8.53 per ton, as against 606,119 tons of a value of $8.35 at the corresponding date of the previous year. These figures show a considerable reduction in the ore reserves, which is explained somewhat by the fact that scanty development work has been done in the bottom of the mine. The developments on the Branch vein on the 1000- and 1150-ft. levels of El Oro mine and upon the second level of the San Patricio vein in the center of the Somera claim, are considered satisfactory by the directors, so that the decrease in the ore reserves may before long be wiped out.

As regards the results of the past year's work, the 200-stamp mill crushed 267,387 dry tons of ore, which yielded, from treatment in the cyanide works, $2,253,086, being an average recovery of $8.43 per ton. This represents an all-round extraction of the gross gold and silver values of 89.41 per cent. The total average working cost, including every expenditure in Mexico was $5.27 per ton. This cost includes 70c. for development and 39c. for State and Federal taxes.

The accounts show a profit of £205,209 for the year. Two dividends of 1s. 6d. each have been paid, calling for £167,062. The issued capital now stands at £1,147,500, an increase of £67,500 over the amount issued last year, due to the purchase of outstanding interests in the Somera Gold Mining Company, Ltd.

The company has floated the Suchi Timber Company, with a capital of £60,000, retaining a half interest. A large sawmill has been erected and the company hopes to profit by the sale of heavy and finished lumber. The profits from the railway owned by El Oro company have been more or less as in the preceding year.

The Consolidated Mines Selection Company, Ltd., a financial company operating principally in South Africa, has issued a report for the year ended June 30, 1908. The directors refer to the depression that has existed for some time past in the Transvaal, owing to which the securities held by them have been greatly reduced in value. The depreciation at June 30, 1908, is given at £613,027, as against £480,760, the amount shown at June 30, 1907. The increase in depreciation is chiefly due to the reduction of valuation called for in the company's holdings in claims. The present valuations are made, "so as to bring them into line with the prevalent ideas as to the value of such assets, as established by the amalgamation and reconstructions carried through this year. These ideas may, and the directors believe will eventually prove to have erred on the side of caution."

Since the date of the report an improvement has taken place in mining business in the Transvaal and the benefit of these improvements, provided they are maintained, will be shown in next year's accounts. What this improvement in share-claim valuations means to this company will be seen from the statement that the estimated depreciation of £613,027, at June 30 has been reduced to £250,000, taking the value of the quoted securities on Sept. 30.

The report refers to the progress made by the developing and producing mines, and draws attention to the decrease in working costs obtained by the industry. For January, the Rand costs averaged 19s. 3d. per ton and the profits 12s. 7d. In June the average was 18s. working costs and 13s. 8d. per ton profits. The company has interested itself in some of the recent reconstructions, namely, those of the Bantjes, the Consolidated Vogelstruis Deep and the Cloverfield mines. The report contains information as to the more important holdings of the company, which are mostly situated in South Africa. It has, however, interests in other parts of the world, among which are the Karabournon and Koniah mercury mines in Asia Minor and the Viloro Syndicate, a dredging company operating at Oroville, California. An investment in a mining proposition in Colorado has turned out unsuccessful.

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

Alabama

JEFFERSON COUNTY

Tennessee Coal, Iron and Railroad Company—This company has started up the DeBardaleben coke plant at Bessemer, which has been out of blast for a year. The coke will be stocked for the present. The two furnaces at Bessemer are being overhauled and made ready to go into blast soon.

Williamson Furnace—This furnace, at Birmingham, has been leased to W. C. Wilson, of that city, who has put it in blast. The furnace has been idle for two years.

Arizona

YUMA COUNTY

Clara Consolidated—Three shifts are working in shaft No. 1 sinking to the 500-ft. level, and ore has been encountered, believed to be the body which dips from shaft No. 2. Work is also pushed in the Morro tunnel, which is in about 200 ft. of ore carrying gold and copper.

California

AMADOR COUNTY

Bay State—The work of unwatering this property is going on slowly. The water is down to the 400 level. The shaft is 1000 ft. deep.

Original Amador—Work is being done at this property in the direction of substituting electricity as a motive power instead of gasolene.

BUTTE COUNTY

Cape Horn—This company has a large body of pay gravel, but the work this season was restricted, owing to lack of water supply. Electrical apparatus for power is about to be installed.

Gunn Channel—Operations have commenced upon this channel 2½ miles north of the Cape Horn mine. Extensive prospecting work to determine values has been started.

CALAVERAS COUNTY

Conradi—This gravel mine near Railroad Flat is being opened by Ed. Rigney and associates, and men are preparing the claim for winter work.

Grey—This mine has been leased by Geo. Conovich and the new tunnel is to be driven further into the lode.

Middle Fork—This mine, five miles west of West Point has been bonded to local men who will at once start development work.

New Diggins—At this mine, near West Point, E. Rigney and others have secured a large tract of auriferous gravel, and 60 men are digging ditches and preparing for the water season.

Washington—This old mine, on the ridge between San Antone creek and Indian creek, has been placed under bond, and the work of reopening has commenced. The mine has been idle for some time.

FRESNO COUNTY

Dallas Mining Company—This company, which is mining for gems, is preparing for increased activity the coming winter, and is putting up buildings, etc.

HUMBOLDT COUNTY

California Mining and Dredging Syndicate—This company at Orleans, Fred T. Hale, superintendent, has had a good season; repairs to ditches and flumes are now being made.

INYO COUNTY

Skidoo Mines Company—The 10-stamp mill of this company, with cyanide plant, has commenced turning out about $20,000 per month, and plans are being made for enlarging it. Fifty men are working for the company and 30 more on leases on the property.

NEVADA COUNTY

Alma—At this mine, Deadman's Flat near the head of Osceola ravine, men have been set at work. The ledge is narrow but rich, and has not been worked for some years.

Consolidated St. Gothard—This company, owning the Delhi mine at North Columbia, Hamilton Eddie superintendent, has declared a dividend of 5c. per share. The company has a good plant with chlorination works.

Golden Gate—C. C. Haub, who has this property at Grass Valley under bond, has again found the good shoot of ore encountered some time ago. A 10-stamp mill to be run by electric power, is to be erected.

PLACER COUNTY

Peckham Hill—L. A. Stockley, manager of this mine, has bought a boiler, rock-crusher and battery of Nissen stamps. The tunnel is now 1800 ft. in.

PLUMAS COUNTY

C. A. Bissell has applied to the California Débris Commission for a permit to mine by hydraulic process, the Lone Star mine and the Concordia mine near Cromberg.

SHASTA COUNTY

Old Diggings and Buckeye Districts—From these districts shipments are being made to the smelters from several other mines in addition to those from the Quartz Hill and Reed.

SIERRA COUNTY

Litigation is impending in certain portions of Sierra county, between the gravel miners and those who are locating quartz claims of late. What is locally called claim jumping seems to have been going on to a considerable extent. The gravel miners have located most of the ground and worked it more or less for years, but the discovery of rich quartz lodes in the past six months or a year has led a number of quartz prospectors to make locations on ground which has long since been taken up for gravel mining. The sinking of a shaft on the Pythian Hill property in Forest district has brought about ill will between the gravel and quartz miners.

Cox—This ledge, below Howland Flat, has been bought by M. H. Heide and two tunnels are being run.

Sierra Buttes—The mines and plant of this company at Sierra City have been closed down for the winter.

SISKIYOU COUNTY

Great Northern Dredging Company—This company at Hamburg is building the main body of the DuBois suction dredge.

Lowden—This property at Seiad Valley is to be bonded for dredging purposes by J. R. Wade, of Callahan.

San Jose Ditch—This ditch and dam, owned by the G. A. Hicks estate, has been sold to Los Angeles men. The ditch will be repaired and extended to the Klamath river for power and hydraulic mining purposes.

TRINITY COUNTY

The rich strike of free gold ore in the Yellow Jacket mine at the head of Nigger gulch has had the effect of drawing in that direction hundreds of prospectors. At the Hoodoo mine, on the east fork of Trinity river, six miles from the Yellow Jacket, high-grade ore has been struck. Three other good finds have also been made in the Yellow Jacket section.

Golden Jubilee—At this mine, Carrville, 60 men are at work, and both the Huntington and the stamp mills are running. The new tramway will soon be finished.

Maple Creek—These mines above Junction City, have been sold and C. B. Rack, representing the new company, has taken possession. The mines will be equipped for the winter run.

TUOLUMNE COUNTY

Tarantula—This mine and adjoining claims, adjacent to the Eagle-Shawmut mine, at Chinese, are now being opened by the United Gold Mining and Milling Company. A tunnel is being driven and contracts have been made for a 40-stamp mill. Charles A. Mau, of Los Angeles, is manager for this new company.

Colorado

BOULDER COUNTY

Black Beauty—Longmont, Colo., men, with Dr. Ayer Stradley as manager, have resumed operations on this group near Wall Street, and they will drive a tunnel several hundred feet into Buckshot mountain.

Camp Albion—Boston people are interested with Thomas L. Wood, of Boulder, Colo., as manager in this mine, near Arapahoe Peak, and they have started up the Cashier mill and are reported to be turning out between 10 and 15 tons of concentrates daily. This is in the nature of a test, it being the intention of the company to erect a much larger mill next spring.

Richmond Mining Association—Ohio men are interested in mines at Salina, Colo., and they are investigating with a view to the erection of a mill for the handling of their own ores. W. B. Le Veque, Salina, Colo., is manager.

CLEAR CREEK COUNTY

Burnett Mill Site—J. B. McCormick, of Pennsylvania, has bought for $5000, this mill site in Jackson mining district.

Gambetta—A lease and bond calling for $10.000 has been taken up by the Joplin Tunnel and Mining Company, on the above group near Georgetown. B. J. O'Connell, Georgetown, Colo., is manager.

Lamartine—This property has been leased to John Lang, of Idaho Springs, for five years and is being worked by 12 sets of subleasers, the average daily product being 150 tons. A concentrating mill has been built at the tunnel mouth by John G. Roberts, of Idaho Springs, for the purpose of handling the dump, estimated to contain 150,000 tons, worth an average of $6 per ton.

Bellevue Hudson—A new mill with a daily capacity of over 100 tons has been erected by Law & Sons, who are working the Anamosa vein under lease. It is claimed that there is about 50.000 tons on the dump which will pay to handle. The property is situated at Georgetown.

Colorado Blue Bell Group—At this property in Virginia cañon, machinery is to be placed and property actively operated, under the management of P. Mixsell, Idaho Springs, Colo. It is the purpose of the company to erect a mill on the Mixsell mill site near Idaho Springs.

Diamond Joe—W. M. Kirk, Russell Gulch, Colo., has taken a lease and bond on this property and will install machinery at once, using electric power. He will work it through the Two Brothers tunnel.

Memphis & Idaho Springs Mining Company—This company is arranging for the resumption of operations on its Seaton Hill property; it will work through the Newhouse tunnel, as well as install heavier machinery at the shaft. Woodruff & Malone, of Denver, will be the local representatives.

Merry Monarch—A large air-compressor plant is being hauled to this property and heavier developments are planned.

GILPIN COUNTY

Bezant—Ore running high in gold, silver and copper has been opened up in Quartz Mill shaft at depth of 400 ft. J. H. Bawden, Central City, Colo., is superintendent.

Buckley—Denver men have taken hold of this property, with W. Morphy as manager, and are installing a Leyner air compressor. Daily shipments of 30 tons are being made to stamp mills.

Evergreen—An order has been placed for a 80-h.p. boiler and new concentrating tables are to be installed in the mill recently completed. Shad Reid, Apex, Colo., is superintendent.

Great Mammoth—M. B. R. Gordon & Co., of Russell Gulch. Colo., have taken a lease and bond on this property and are arranging for the installation of a steam plant of machinery. Large bodies of low-grade ore have been uncovered.

Hall—A 40-h.p. boiler is to be installed, the property passing into the hands of John Stewart, of Denver, under lease and option. The shaft is to be deepened. M. Whalen, Russell Gulch, Colo., is superintendent.

Hughes—A new shaft building has been completed and a steam plant of machinery installed on this property on Bellevue mountain, which has been started up under lease and bond by R. I. Hughes, of Russell Gulch, and B. F. Threewit, of Denver. Regular shipments are being made, the smelting ores carrying good values.

Moon Gulch—Indiana and Greeley, Colo., men have incorporated and have taken hold of the claims of the Siren Mining Company. L. C. Todd, Rollinsville, is manager. It is reported that the company will arrange for the erection of its own mill in spring.

Old Town Consolidated—Manager George K. Kimball, Jr., of Idaho Springs, is making a trip to Pittsburg, Penn., to consult with the directors in regard to the erection of a large mill at the mouth of the Newhouse tunnel, near Idaho Springs, for handling the ores of the Old Town, which average at least 100 tons per day.

GUNNISON COUNTY

United Colorado Mines Company—At this company's Enterprise mine, at Dorchester, in Taylor Park, work was started in July, the mine having been closed down since the previous fall. There is a flow of about 26 cu.ft. of water per min. from the tunnel. This was piped to the mill, 600 ft. below, where it is used to run an air compressor. The tunnel is in 5750 ft. During the winter 20 men will be kept at work driving the tunnel ahead, cutting a raise to No. 2 tunnel, 800 ft. above, and carrying on general prospecting. A good sized body of ore has been encountered, running well in gold and silver.

LAKE COUNTY—LEADVILLE

Bald Mountain Tunnel—In this adit, at the head of California gulch, work with three shifts using two machine drills is progressing favorably; already several small veins have been cut carrying gold. It is expected that the tunnel will reach the Sunday vein by the first of the year.

Berdella Tunnel—This enterprise, in St. Kevin district, was recently incorporated under the laws of Colorado and known as the Independent District Consolidated Mines Company, to develop this section of the district. The company is capitalized for $1,500,000; it controls an area of 390 acres and will continue the work of the Berdella and Rosse tunnels started last summer by a Kansas City outfit. The tunnel is now in 310 ft., and will be driven in the neighborhood of 2000 ft.; it is 4½x7 ft. in the clear. The first vein to be cut will be the President, 475 ft.; then the Amity at 725 ft.; then the Iron Hat and Fairplay group, and finally the Berdella vein at 2000 ft. The Rosse tunnel is in 600 ft., and will be driven another 620 ft. to cut the St. Kevin vein. The directors of the company are: Charles Cavender, J. A. Lamping, John A. Ewing and E. C. Davis, Leadville; W. C. Davis, Denver; G. W. Moorman, Cloversport, Ky.; Arthur Board, Louisville, Ky.; and W. E. Bowden, who is also general manager.

Dinero Tunnel—In this tunnel, in the Sugar Loaf district, the work of crosscutting on the vein is now in full swing, but as yet the hanging wall has not been caught. The water at the breast of the tunnel is diminishing as the old workings are drained.

Empire—This company has secured an option on the Anona claim, Empire gulch, and is taking out some fair ore. It is the intention of the company to do extensive exploration work south of Long & Derry hill, and to this end electricity has been installed. Good ore has been taken from

the surface workings of the different claims that will be developed by this company.

Matchless—Two shafts are being sunk on this property, Fryer hill, and small shipments are being made. At No. 7 shaft prospecting is being carried on in virgin territory; it was in this shaft in early days where bodies of rich ore were found.

Idaho

SHOSHONE COUNTY

Charles Dickens—A special meeting of stockholders is about to be called for the purpose of investigating the company's finances. Suits against the company for approximately $90,000 were recently started in the district court of this county.

Butte & Coeur d'Alene—Shipments of ore will commence as soon as the wagon road now under construction is completed. Shipping by this means, it is estimated that enough ore has already been blocked out to last the mine for several years to come.

Oreano Property—A strike of about 6 in. of solid steel galena and about 2 ft. of good concentrating ore has been made. This ore was encountered in the lower adit at a distance of 900 ft. from the portal and at a depth of 700 ft. from the surface. The property adjoins the Standard mine of the Federal company on the northwest.

Bunker Hill & Sullivan—Judge Dietrich, of the United States district court, has ordered that the judgment entered in favor of the plaintiff in the suit of James L. Stafford against this company for $7600 be vacated and set aside, it appearing to the court that the plaintiff is not entitled to recover, but that the defendant company is entitled to its costs in the action. Safford had an agreement with the company for the working of the tailings from the mill in the creek, and claimed that by the acts of the company he was prevented from working them.

West Hecla—A contract for 200 ft. of work has been let to John Backlund, of Burke.

Montana-Standard—This property, located on Prospect creek, east of the town of Burke, has been forced to curtail its production because there is no place to put the ore, all the bins being full. A large amount of first-class shipping ore has been stored separately, and this will be sent across the snow to the railroad as soon as the season permits.

Michigan

COPPER

Wyandot—The crosscut from the 700-ft. level of the exploratory shaft has passed through the recently encountered Amygdoloid lode which was found to be about 28 ft. wide and carrying a fair amount of copper. No lateral opening will be started on this lode at present, but the crosscut will be extended on to the approximated line of the Lake and Adventure strikes.

Copper Range—At this company's Globe shaft the drifts from the 1000-ft. level have been extended about 200 ft. each way on the Baltic Lode—copper has appeared from time to time but as yet payable ground has not been encountered.

Superior—No. 1 shaft has been stripped down to accommodate two skipways for the entire distance and will soon be timbered and ready to receive the skiproad. Work is progressing on the surface equipment, the shaft house is equipped ready to handle rock, and a combined engine and boiler house is in the course of erection. The boiler house will hold five boilers which are to be supplied by the Calumet & Hecla company from its recently closed boiler plant at Lake Linden. No. 2 shaft, which is down 260 ft. with a single-compartment, is being widened to two compartments and about 200 ft. of this additional width has been completed.

Calumet & Hecla—At this company's electric power plant the third 2000-kw. generator has gone into commission—which gives this plant a normal output of about 10,000 h.p. The first section of the new regrinding mill is practically ready to treat the tailings and will go into commission within a few days.

North Lake—The sand pipe this company is sinking to accommodate its diamond drill outfit has reached depth of about 320 ft. and it is momentarily expected to strike the ledge. Drilling will then be started and the first drill core will be taken from this tract.

Lake—The new 20-drill air compressor will go into commission within a few days. As the present compressor is only capable of operating 3 drills, this new machine will greatly facilitate sinking. Drifting continues from the second level and both faces of the drift show the same characteristic rich formation. The north drift is in about 75 ft. and the south drift nearly 300 feet.

Ojibway—This company will soon cut the Kearsarge lode in the crosscut from the 2d or 500-ft. level of No. 2 shaft. In the upper level the lode was decidedly shallow and leached, but it is believed by the management that with this additional depth the lode will be beyond surface influences.

Missouri

ZINC-LEAD DISTRICT

Granby Mining and Smelting Company—This company has started up its lead furnace at Granby.

Granby Land—Chenowith, Brown & Swarens, of Joplin, have leased 40 acres in Poor Man's gulch, north of Smelter hill, from the Granby Mining and Smelting Company, and will begin draining the land at once.

Halloween—This company, of Spring City, has its shaft in ore at 160 ft. A 100-ton mill will be erected.

Indianola—This company, of Joplin, has been incorporated with a capital stock of $50,000. H. C. Kramer, of Kramer, Ind., and W. C. Kramer, E. Kreilsheimer and L. Kreilsheimer, of Joplin, are the stockholders.

McAbee, Freeman & Co.—This company, of Joplin, is sinking a shaft west of the Halloween at Spring City and will soon be in the ore.

Old Dominion—This company, of Joplin, recently bought the 20-acre lease and mill at the John L. mine north of Webb City, in the sheet-ground district.

Montana

BUTTE DISTRICT

Butte & Balakalava—Within the past 95 days the shaft has been sunk a distance of 300 ft. and sinking is now in progress below the 1000-ft. level. The last crosscut was driven on the 700-ft. level and drifting was there done on the vein, both east and west. Orders from Duluth are being awaited before deciding whether to sink to the 1200-ft. mark or to start crosscutting on the 1000-ft. level.

Raven—The sinking of the shaft from the 1200- to the 1500-ft. level has been started. On the 1100-ft. level considerable development work has been done, but it cannot be said that commercial ore has as yet been found. A new level will be made on the 1400, and it is hoped that with an additional depth of 200 ft., ore will be found of better grade and in larger quantity.

Davis-Daly—The management in Butte has been instructed to order a new steel gallows frame for use at the Colorado shaft. A Webster, Camp & Lane, 20x48-in. first-motion hoist, good for a depth of 2400 ft., and formerly used at the Red Metal's Rarus mine, will be installed on the Colorado.

Anaconda—Foundations for the new hoisting engine are being laid at the Belmont mine. The gallows frame at the Red Metal Company's Corra mine has been sold to the Anaconda company and will be used at the Belmont.

Red Metal—The compressor at the Corra mine is being moved to the Rarus to be used as an auxiliary to the Rarus's plant. At the Tramway mine the station on the 1600-ft. level is nearly completed. The total Red Metal production is averaging between 800 and 1000 tons daily.

North Butte—More than 900 men are employed on this company's properties. Shipments from the mine to the Washoe smelter in Anaconda average 1400 tons daily.

North Butte Mountain—Sinking is in progress in the incline shaft. The shaft is down 100 ft. and will be sunk to the 200-ft. level before any drifting is done.

East Butte—Drifting east and west on the 900-ft. level is in progress, and it is stated that the vein is widening as the drift advances. The ore is chiefly bornite. On the 400-ft. level a new body of ore has been cut, but its extent is not yet determined.

FERGUS COUNTY

Chicago, Milwaukee and St. Paul Railroad—At a meeting of the operators and the miners of the company's coal mines at Roundup no agreement was reached regarding a settlement of the wage scale. The miners insist on 75c. per ton, which is 5c. more than the operators' offer. About 150 men are out of employment as a result of the disagreement.

LEWIS & CLARK COUNTY

Spring Hill—This property, situated four miles south of Helena, will be closed down Nov. 1. The ore from the mine has been treated at the mill of the Whitlatch Mining Company, but the lease on the mill expires on that date and cannot be renewed. It is planned to erect a 50-stamp mill on the Spring Hill property as rapidly as possible, when operations will be resumed.

Nevada

NYE COUNTY—TONOPAH

The production for the week ending Oct. 17 amounted to 5135 tons valued at $131,700. The Tonopah Extension company produced 45 tons; MacNamara, 300; Tonopah Mining Company, 2900; Belmont, 600; Montana-Tonopah, 745; Midway, 100; West End, 105; Jim Butler, 240 tons.

Belmont—Most of the work is confined to the lower levels of the mine. A crosscut to the vein has been started at a depth of 104 ft. in the winze sunk from the 1100-ft. level. This drift is fully 300 ft. deeper than any other working in the district. On the 1000-ft. level the winze is 20 ft. wide in some places in the stope. In the stope started from the west drift driven from this winze at a depth of 30 ft. 8 the vein is 4 ft. wide.

Tonopah Mining Company—During the week 402 ft. of development work was done. Sinking in the shaft, which is 1253 ft. deep, has stopped while a station is being cut at the 1200-ft. level so that the hoist used in sinking, now on the 900-ft. level, can be transferred to the 1200-ft. level. The hole being drilled from the bottom of the Red Plume shaft is 317 ft. deep, but slow progress is being made, owing to the necessity of frequently using cement in the shattered ground in which the drill is now working. In accordance with the plan of finding out more about the deeper formations a diamond-drill hole is to be sunk from the 740-ft. level of the Silver Top shaft, 30 ft. northwest of the shaft. It is planned to drill this hole to a depth of 1000 ft. below that level.

Tonopah Extension—Since the finding of ore in the rhyolite this company has been prospecting that formation considerably. The drift, started along the vein found in the north crosscut of the 770-ft. level, is now 50 ft. long; at first low-grade ore was found, but the ore in the face is considerably richer. On the 600-ft. level ore is being stoped along a distance of 300 ft. The winze started last week from this level at a point below raise No. 7 is now 10 ft. deep. This winze is following the footwall of the vein.

Jim Butler—The Stone Cabin shaft is now 707 ft. deep. A station is being cut at the 700-ft. level. The work is still confined entirely to the different levels of the Stone Cabin shaft.

Ohio

MEIGS COUNTY

Maynard Coal Company—A controlling interest in this company, heretofore owned by B. R. and H. J. Maynard, has been bought by H. H. Heiner and George H. Baker, both experienced coal operators. The property of the company includes two mines at Rutland and one at Connellsville, the three producing about 250,000 tons of coal yearly.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for September and the three months of the fiscal year from July 1 to Sept. 30 is as follows:

	July.	Three Mos.
Earnings	$2,513,762	$6,590,556
Expenses	2,359,323	6,407,081
Net earnings	$ 154,439	$ 183,475

For the three months, as compared with last year, there were decreases of $2,177,986 in gross receipts; of $1,778,710 in expenses, and of $399,276 in net earnings. Expenses were 97.2 per cent. of gross earnings.

BITUMINOUS COAL

Pennsylvania Coal and Coke Company—The court at Scranton, Penn., on Oct. 26, authorized Receiver T. A. Watkins to issue $1,250,000 in 6-per cent. receiver's certificates to run for two years from Oct. 1, interest payable semi-annually, unless previously called for payment. This authorization supersedes that of August last, covering $500,000 receiver's certificates. The Scranton Trust Company, trustee for the bondholders, assented to the present issue. Of the certificates, $1,000,000 have been sold, the proceeds so far as necessary, to be used to take up valuable collateral, the remainder to be used to pay both the principal and interest of underlying obligations maturing at an early date.

Pittsburg Coal Company—This company's statement for the nine months ended Sept. 30 is as follows:

	1907.	1908.	Changes.
Net earnings..	$4,207,364	$2,106,791	D. $2,100,573
Charges.....	2,098,316	1,971,564	D. 126,752
Surplus.....	$2,109,048	$ 135,227	D. $1,973,821

Charges this year were made up as follows: Depreciation of plant and equipment, $777,514; depletion of coal lands, $409,269; interest on bonds, $784,781. The decrease in net earnings this year was 49.9 per cent.

BITUMINOUS COAL

Pittsburg-Buffalo Coal Company—The fire at the Hazel mine, near Canonsburg, which was reported last week, has been extinguished, and the mine is in operation again.

United Mine Workers—A special convention of district No. 5 assembled in Pittsburg, Oct. 28, to consider the following questions:

"The forcing of the parents of the miners under 21 years of age, to sign papers releasing the Monongahela River Consolidated Coal and Coke Company, from damages under the new liability law.

"The using of the so-called safety explosives.

"Operators' refusal to comply with the agreements on deductions and agreements on the increase in the amount of wages checked off."

Resolutions were adopted condemning all these practices. The convention was chiefly devoted to a rather disorderly discussion of the pending dispute between the local and National officers of the union.

Texas

COOKE COUNTY

Arrangements are being made to open up a mine on the Inglish tract near Myra, where the existence of coal has been proved. P. C. Davidson, of Myra, is at the head of the enterprise.

Utah

BEAVER COUNTY

King David—This company has completed a five-mile pipe-line by which the property will be supplied with water for domestic and milling purposes. New power and hoisting equipment is being installed; it is expected that this equipment will be ready for operation by the end of the year.

Majestic Mines Company—The new management is in charge, but the plans for the future have not been fully outlined. Attention is now being directed toward the further exploration of the Harrington & Hickory lead mine.

SALT LAKE COUNTY

South Columbus—In the Wedge mine at Alta, recently acquired by this com-

pany, leasers are working with considerable success.

Utah Apex—A raise from the Parvenue adit to connect with the upper workings of the mine has been started.

SUMMIT COUNTY

Daly West—The drift from the Ontario adit is now nearly 400 ft. within the sidelines of this company; 650 ft. yet remains to be driven in order to reach the main Daly West orebodies. The company is producing about 600 tons of ore weekly; the concentrating mill is being run on part time.

TOOELE COUNTY

Bingham Metal Mines—This company has spent about $75,000 in the acquisition of property, development and equipments; it is driving an adit which is projected to be run through to the Bingham side of the Oquirrh mountains and used for transportation purposes. A large area of patented ground has been acquired, but as yet no ore has been developed. The company is working on the theory that the lime beds of upper Bingham cañon extend to the Tooele side. It is understood that the company has at present about $25,000 in its treasury.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Oct. 24 were as follows: Coniagas, 64,498 lb.; Cobalt Lake, 62,940; Crown Reserve, 126,000; Chambers-Ferland, 140,000; Drummond, 125,000; La Rose, 385,000; McKinley-Darragh, 57,000; Nipissing, 189,380; O'Brien, 192,140; Silver Leaf, 114,870; Temiskaming & Hudson Bay, 60,000; Trethewey, 132,000; total, 1,598,828 pounds.

Little Nipissing—Superintendent S. D. Madden announces the finding of a new vein of native silver on the property leased from the Peterson Lake Company.

Red Rock—F. C. Chapin, who recently purchased this mine, states that about three-fourths of the surface has never been stripped. A force of 25 men will be put to work immediately. The shaft will be put down 100 ft. farther and a new boiler and compressor installed.

La Rose—A new vein was encountered recently in the face of a crosscut at the 90-ft. level, 260 ft. east of the main workings. The vein runs at right angles to the main vein and carries 4000 oz. silver to the ton. The company is working 170 men and 15 drills, the largest number of drills it ever operated.

Nancy Helen—The vein recently found at this mine is improving with depth. About 11 tons of high-grade ore already has been sacked and a carload soon will be shipped.

Temiskaming—Another rich vein has been struck at a depth of 200 ft.; it is 4 in. width and carries native silver. Vein No. 2 at a depth of 250 ft., has widened to 43 in. of high-grade ore, somprising silver sulphides, native silver, some smaltite and a little calcite. A new vein has been found in the new shaft in the course of cutting a station at the 100-ft. level within a few feet of the shaft. It is about 12 in. wide.

ONTARIO—MILLER LAKE

Bonsall Locations—These properties, comprising 320 acres, lying between Miller and Everett lakes, west of the Montreal river, are being developed by a syndicate of Cobalt men. Miners have been at work for some time, and seven good veins have been found, the largest 7 in. wide, yielding high-grade ore. A quantity of ore has been sacked for shipment.

ONTARIO—MONTREAL RIVER DISTRICT

Crown Jewel—A 12-in. vein rich in silver has been found.

ONTARIO—SILVER LAKE DISTRICT

Clinton Location—Two new strikes were recently made, consisting of a narrow vein on the surface rich in native silver, and a vein of decomposed matter 8 in. wide with quantities of leaf and native silver.

ONTARIO—LAKE OF THE WOODS DISTRICT

Olympia—The company has been working in a 4-ft. vein of gold ore and 250 ft. of tunnelling in the hillside has been done. A 10-stamp mill is in operation and satisfactory runs have been made.

ONTARIO—ALGOMA DISTRICT

Bruce—This copper mine has been sold to R. W. Leonard, one of the owners of the Coniagas mine of Cobalt, for $50,100.

Mexico

CHIHUAHUA

Greene Gold-Silver—A receiver was appointed on Oct. 24 for the assets of this company upon application of one of its creditors. The assets were found to be $1.48 cash in bank and an assortment of old furniture.

GUANAJUATO

Mills of the Camp—Guanajuato now has 580 stamps and 13 tube mills distributed among the mills as follows: Guanajuato Reduction and Mines Company, 160, and four tube mills; Peregrina Mining and Milling Company, 100, and two tube mills; Guanajuato Amalgamated Gold Mines Company, 100; Guanajuato Consolidated Mining and Milling Company, 80; Pinguico Mining and Milling Company, 40, and four tube mills; San Matias Mining and Milling Company, 40, and two tube mills; El Cubo Mining Company, 20; Nayal Milling Company, 20; Santa Natalia Mining Company, 10, and one tube mill; Central Mine, 10 stamps.

Peregrina—This mill is dropping 100 stamps and crushing 13,000 tons of ore monthly. Practically all this ore comes from the mine which is in good condition.

Santa Natalia—The Shapley Brothers have completed their mill which includes 10 stamps and a tube mill. All the product is slimed and treated in cone tanks by air agitation.

Ruby Tunnel—This mine has been sold by E. J. Kimball to San Francisco men, the price being 120,000 pesos.

DURANGO

Herculaneo—An important strike is announced at this mine belonging to Santiago Sarabi, near Mapimi. The working force has been increased and considerable ore has already been extracted.

JALISCO

El Favor—Machinery, consisting of stamps, Wilfley tables, vanners, tube mills and cyanide apparatus, has been ordered for this mine in the Hostotipaquillo district. Oil engines will be used until electric power can be installed.

OAXACA

Santa Catarina—Enlargement of the mill has been delayed by slow shipment of supplies. The mill is to have five additional stamps and a complete cyanide plant.

PUEBLA

Teziutlan—A circular to stockholders states that the smelting-converting plant has been completed. The mine has lately been operated at 50 per cent. of its normal production and the ore stocked in readiness for resumption of smelting. It has been decided not to start the smelting plant for the present and to defer payment of dividends until prices of metals improve. The Ocotes mine in Oaxaca is developing satisfactorily and will soon be a source of revenue for the company.

SONORA

Greene-Cananea—Everything is going along nicely at Cananea and an output of a little more than 60 tons of copper per day is being made, the concentrator running at two-thirds capacity. All of the machinery is giving the best of satisfaction, including the ore-receiving and reclaiming system. Besides reducing costs, this method of systematically mixing the charge is greatly improving the metallurgical results. At present the company is operating four blast furnaces, one reverberatory furnace, and two McDougall roasters. The McDougalls are operated merely to furnish tonnage to the reverberatory furnace, the blast furnaces not giving the required amount of flue dust. Four more blast furnaces and two more McDougalls are available. The converter department has five stands, of which only two are in blast at the same time at present. Fuel oil is being used under the boilers for the concentrator and smelter; also in the reverberatory furnace.

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, Nov. 4—Coal trade in the West still shows some small signs of improvement here and there. The Lake trade is having a dull close, however; on the whole the season has been disappointing. There is a possibility of some trouble with the miners in the Pittsburg district, arising out of the explosives question and the attempt which the miners claim that some companies are making to evade liability placed on employers for injuries to minor employees under the new law.

In the East the Seaboard bituminous trade continues dull, and coal sales are slow. The anthracite coal trade is also quiet, only slight revival having followed the coming of cooler weather. The Coastwise trade is a little better. Coal continues in abundant supply, and there is no lack of cars.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct 24, in short tons:

	1907.	1908.	Changes.
Anthracite	4,656,934	4,163,779	D. 493,155
Bituminous	32,074,344	27,070,636	D. 5,003,708
Coke	11,515,031	5,620,934	D. 5,894,097
Total	48,246,309	36,855,349	D. 11,390,960

Total decrease this year to date was 23.6 per cent.

Coal shipments reported by Southwestern Interstate Coal Operators' Association, eight months ended Aug. 31, short tons:

	1907.	1908.	Changes.
Missouri	1,776,335	1,374,271	D. 402,064
Kansas	4,146,205	3,021,155	D. 1,125,050
Arkansas	1,482,765	1,087,151	D. 395,614
Oklahoma	1,892,570	1,477,700	D. 414,870
Total	9,297,875	6,960,277	D. 2,337,598

The total decrease this year was 25.1 per cent.; due partly to a suspension of work in April and May this year.

New York

Anthracite

Nov. 4—Prepared sizes are fairly active and in good demand, but small steam sizes are dull and in abundant supply. Schedule prices are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam prices are: Pea, $3.25@3.50; buckwheat No. 1, $2.25@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50. All prices are f.o.b. New York harbor points.

Bituminous

Trade is light in all sections of this consuming territory and the demand is by no means urgent from shoal-water ports, which are liable to close up before long. In New England factories are not working steadily, and the demand for coal is light. In New York harbor trade is dull and without interest. Good grades of steam coal fetch $2.45@2.65, depending upon quality.

In the Coastwise-vessel market rates are firm but unchanged. The rates for large vessels from Philadelphia are: Boston, Salem and Portland, 55c.; Lynn, 65c.; Newburyport, 70c.; Portsmouth, 60c.; Saco, 90@95c.; Bath, 75c.; Gardiner, 80c.; Bangor, 70@75c.; Providence, New Bedford and the Sound, 50c. per ton.

Birmingham

Nov. 2—There is very little change in the coal production in Alabama. There is room, though, in the mines for many more laborers, and quite a number of miners are still waiting to be given employment. Sales agents look forward to a better condition in this market in the next few weeks. Prices remain firm.

Coke is in good demand and prices are above the usual amount. There is a little accumulation of coke, but it is expected that it will be needed during the winter.

Chicago

Nov. 2—The coal market continues to be uncertain because of the lack of demand in heavy business establishments and because of the lack of regulation of the market by concerted shipments adjustable to profitable or unprofitable conditions.

Eastern coals share in the demoralization due to over-shipments. Smokeless hovers near its cost to mine and ship, selling for $2.80@2.90 for run-of-mine and $4.05@4.30 for lump. Of other coals from east of Indiana, Hocking Valley is the most in demand and is fairly firm at $2.90 @3.15, though the prospect of lower prices holds off many purchasers of large quantities. Youghiogheny is uneventful at $3 for steam lump, shipments being confined to contracts.

Indiana and Illinois coals are dull, with the demand for domestic good and for steam sizes poor. Lump and egg bring $1.80@2.65 in carload lots; run-of-mine $1.65@2.15, with sales of low-grade coals large except for screenings, which are very dull at $1.10@1.65.

Anthracite finds steady and increasing sale, with the supply of all grades good and distribution fairly even.

Pittsburg

Nov. 3—There has been no improvement in the Pittsburg district coal trade, the mines not being operated to more than 40 per cent. of capacity, and all of them are railroad mines. The river mines are doing nothing at all. Despite the lack of demand, the large interests continue to quote on a basis of $1.15 a ton for mine-run coal at mine.

Connellsville Coke—A decided improvement in the coke trade is noted this week. There are more inquiries than at any time since the opening of the year. Prices for prompt are much firmer and an advance likely will be made soon. Furnace coke for last-quarter shipment is $1.75@1.90; for next year it is believed that $2 will be the minimum price. Foundry coke continues strong at $2.10@2.25. One large interest has sold some foundry coke for the first half at $2.35 and another sold at $2.40, but the grade was considerably above the ordinary. The *Courier* gives production in both fields at 188,939 tons. Shipments were 8178 cars, as follows: To Pittsburg district, 3079; to points west of Pittsburg, 4527; to points east of Connellsville, 572 cars.

Foreign Coal Trade

Nova Scotia Coal Shipments—Shipments of coal from Nova Scotia mines, nine months ended Sept. 30, long tons:

Companies:	1907.	1908.	Changes.
Dominion	2,404,650	2,521,464	I. 11,814
Nova Scotia Steel	465,292	481,071	I. 15,779
Cumberland	213,409	276,524	I. 63,115
Acadia	230,243	239,081	I. 8,838
Intercolonial	176,572	192,730	I. 16,158
Inverness	202,574	191,992	D. 10,582
Total	3,692,680	3,902,802	I. 210,122

Only one company shows a decrease this year. The total gain was 5.7 per cent.

German Coal Trade—Imports and exports of fuel in Germany, eight months ended Aug. 31, metric tons:

Imports:	1907.	1908.	Changes
Coal	8,631,967	7,564,503	D. 1,067,464
Brown coal	5,953,375	5,770,370	D. 183,005
Total coal	14,585,342	13,334,873	D. 1,250,469
Coke	361,372	363,354	I. 1,982
Briquets	118,434	121,227	I. 2,793
Exports:			
Coal	13,021,410	13,493,433	I. 472,023
Brown coal	13,768	18,029	I. 4,261
Total coal	13,045,178	13,511,462	I. 476,284
Coke	2,472,473	2,421,589	D. 50,884
Briquets	780,848	1,053,026	I. 272,178

The coke exports this year included 17,149 tons to the United States.

German Coal Production—Coal produc-

tion of the German Empire, eight months ended Aug. 31, metric tons.

	1907.	1908.	Changes.
Coal	95,012,415	98,611,055	I. 3,598,640
Brown coal	40,393,072	43,168,329	I. 2,775,257
Total mined	135,405,487	141,779,384	I. 6,373,897
Coke made	14,413,812	14,097,385	D. 316,427
Briquets made	10,746,958	11,996,884	I. 1,249,926

Of the briquets reported this year 9,330,809 tons were made from brown coal, or lignite.

Austrian Coal Trade—Imports and exports of fuel in Austria, half-year ended June 30, metric tons:

	Imports.	Exports.	Excess.
Coal	4,920,570	386,786	Imp. 4,533,784
Brown coal	14,742	4,467,382	Exp. 4,452,640
Total coal	4,935,312	4,854,168	Imp. 81,144
Coke	427,723	101,674	Imp. 326,049
Briquets	77,372	49,698	Imp. 27,674

Imports of peat and peat briquets, 2854 tons; exports, 3771 tons.

New Zealand Coal—Coal production from West Coast and Nelson district collieries, New Zealand, for the half-year ended June 30 was 506,127 long tons in 1907, and 527,832 in 1908; an increase of 21,705 tons.

Belgian Coal Trade—Imports and exports of coal in Belgium, nine months ended Sept. 30, metric tons:

	Imports.	Exports.	Excess.
Coal	3,971,203	3,470,382	Imp. 500,821
Coke	230,244	670,262	Exp. 440,018
Briquets	141,073	346,099	Exp. 205,026
Total	4,342,520	4,486,743	Exp. 144,223
Total, 1907	4,308,311	4,467,360	Exp. 159,049

The changes shown in quantities this year were very small.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 24: Best Welsh steam, $3.66; seconds, $3.54; thirds, $3.30; dry coals, $3.60; best Monmouthshire, $3.24; seconds, $3.06; best small steam, $1.86; seconds, $1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Nov. 4—While the iron trade is still in rather a waiting mood, some revival has been manifest. This has shown itself most prominently in pig iron. There have been many inquiries for foundry and basic iron, and some contracts have been closed for considerable quantities. This is taken by sellers as encouraging, and there is a tendency to be firmer on prices asked for 1909 deliveries. Southern iron continues firmer than Northern, probably because the Southern furnaces have a larger proportion of their capacity engaged.

In finished material the general report is that about 60 per cent. of mill capacity is engaged. So far as new orders are concerned, there is still a good deal of hesitation; but the number of structural contracts is increasing. Some orders for railroad equipment are coming forward, but rail business is light. Reports of price reductions are current, and there is quite a general belief that some may be expected.

Baltimore

Nov. 4—Exports for the week included 920,304 lb. tin scrap to Rotterdam; 2,245,900 lb. steel billets to Liverpool; 10 locomotives to Panama.

Birmingham

Nov. 2—There has been some small-lot buying of iron in Alabama recently. Indications point to a steady improvement in the trade. The furnace yards contain quite a lot of iron, but the statement is made that this product belongs to consumers and awaits instructions for shipments. It is also announced that all demands for iron will be met promptly in this district. As soon as the stocks on hand are reduced or removed other furnaces will be in readiness. There has been no change in quotations, No. 2 foundry selling at $12.50 per ton, minimum, and $13, maximum. Two furnaces were blown in recently in this State, including the little Williamson furnace in the city, which produces less than 100 tons per day and which buys its raw material.

There is a better feeling among the home consumers. The cast-iron pipe manufacturers in the Southern territory are bidding on contracts throughout the country, which will require several months' operations to fill. Some of the larger pipe plants in this section are running full. The Dimmick Pipe Company is filling a contract for three miles of 48-in. pipe for the city of Detroit.

Chicago

Nov. 2—The market for pig iron continues firm and for iron and steel products it is perhaps advancing, though slowly. Sales of pig iron continue to be chiefly of small lots and for delivery within three months from the date of order; but the sales are more numerous.

For 1908 delivery Southern iron is on a basis of $12.50@13 Birmingham ($16.85@17.25 Chicago), still, with the large interests holding to $13. There can be little doubt, however, that the $12.50 price marks actual sales in many cases. For Northern iron the market is solid at $16.50@17. Next year's deliveries mean an adherence to the higher quotations generally.

Structural steel and railroad buying lead the market, but without heavy developments in either. Iron and steel bars have had good sale and other products have a fair market. Coke is considerably better, with Connellsville ruling $4.90, Chicago.

Cleveland

Nov. 2—Smoke from forest fires has interfered with navigation on the Lakes, and ore is coming in slowly. It is believed that November shipments will be light. A few sales are being made at the prices which have ruled through the season: Old Range bessemers, $4.50; Mesabi bessemers, $4.25; Old Range non-bessemers, $3.70; Mesabi nonbessemers, $3.50. All f.o.b. Lake Erie ports, basis of 55 per cent. iron for bessemer and 51.5 for non-bessemer ores.

Philadelphia

Nov. 4—Business in pig iron outside of basic has been confined to small lots for December delivery. Offers of Southern iron are being made for winter delivery and negotiations are now pending. Local makers say they will make no effort to prevent orders slipping away from them if they have to make concessions. Hardware manufacturers have bought small lots of special brands. Foundry work throughout this territory is gaining.

Steel Billets—Business is insignificant but two or three consumers have named figures at which they are willing to do business.

Bars—Country storekeepers who handle iron purchased small lots. Car builders have been recently canvassed without result.

Sheets—A general improvement in store sales is in progress. Galvanized is doing better than other lines.

Pipes and Tubes—A moderate improvement is noted in retail lots.

Plates—A further improvement is noted in both large and small lots. Car builders are buying for winter requirements.

Structural Material—Small orders were placed during the week for winter construction work at many points in eastern territory.

Steel Rails—A fair demand has suddenly developed for traction rails and light steel rails, as a result of long pending negotiations.

Scrap—A large amount of heavy scrap has been contracted for this week, including business in No. 1 yard scrap. Concessions from previous quotations led to the business. In general, however, the dealers are holding prices high.

Pittsburg

Nov. 3—There is a decidedly better tone, particularly in pig iron. Operation of the mills of the large interests are about the same as a week ago, but the small plants are running a trifle better than usual. While waiting for the railroads to come into the market for steel rails the Carnegie Steel Company is operating its three rail mills at the Edgar Thomson works at about 35 per cent. of capacity and is booking small orders for both standard sections and light rails. Today official announcement is made that the Donora plant will hereafter be operated by the wire interest. Some important developments are expected, but secrecy is being observed as to the plans.

Pig Iron—Inquiries for all grades of pig iron for next year's delivery are unusually heavy; conservative estimates place the aggregate at over 100,000 tons. The Massillon Iron and Steel Company, Massillon, O., wants 27,000 tons of Nos. 2, 3 and 4 foundry, but decided to defer placing the order until later in the week. This is the largest inquiry, but there are a number of 5000- and 10,000-ton inquiries and many for 1000 tons and less. Furnaces do not care to quote beyond first quarter, but some sales have been made for delivery through the first half at a trifle above current prices. One interest sold about 800 tons of bessemer iron for delivery up to July 1 at $14.75, Valley furnace, and another sold 2500 tons for first-quarter delivery at the same price. One lot of 600 tons prompt was sold at $14.50 and a sale of 1000 tons at $14.45 is reported for delivery this year, which is the lowest price reached for bessemer iron in many years. Malleable bessemer is firmer and $14.50 is named. Basic iron shows some weakness and last week dropped to $13.85, but it is said less than $14 cannot be done and there likely will be an improvement in the price shortly. Foundry iron is strong, No. 2 being quoted at $14.50@14.60. Gray forge is not in demand and is nominal at $13. These prices are f.o.b. Valley furnaces, the freight rate to Pittsburg being 90c. A Southern interest sold 600 tons of No. 2 foundry to a Pittsburg consumer at $13, Birmingham, which makes the delivered price $17.90. The Southern metal was needed for a special purpose.

Steel—Several inquiries are in for steel billets, two being for 500 tons each on which the regular price of $25, Pitsburg, was quoted. No contracts, however, have been placed. Sheet-bars remain firm at $27.50, Pittsburg; plates at 1.60c., and merchant-steel bars at 1.40c.

Sheets—The situation is unchanged. Some independents continue to shade prices, but the leading interest is adhering to the price of 2.50c. for black and 3.55c. for galvanized for No. 28 gage.

Ferro-Manganese — Prices have advanced, a sale being made today at $46, Pittsburg.

Foreign Iron Trade

French Steel Production—The production of steel ingots in France, half-year ended June 30 was, in metric tons:

	1907.	1908.	Changes.
Bessemer converter..	41,159	38,626	D. 2,533
Basic converter.....	810,993	807,192	D. 3,801
Open-hearth.....	456,841	508,368	I. 51,527
Crucible, etc.....	9,537	10,793	I. 1,256
Total.....	1,318,530	1,364,979	I. 46,449

Most of the open-hearth steel made is basic steel.

Belgian Iron Production—Pig-iron output in Belgium, eight months ended Aug. 31, was 950,640 metric tons in 1907, and 782,700 tons in 1908; decrease, 167,940 tons, or 17.7 per cent.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Nov. 4.

At all U. S. Ports in September and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1908..	$ 3,974,391	$ 4,695,894	Imp.$ 721,503
" 1907..	1,503,836	2,759,019	" 1,255,183
Year 1908..	68,937,380	38,356,816	Exp. 30,580,564
" 1907..	49,879,813	30,862,220	" 19,017,593
Silver:			
Sept. 1908..	4,198,286	3,303,362	Exp. 894,924
" 1907..	6,048,457	3,822,766	" 2,225,691
Year 1908..	38,781,380	30,725,475	" 8,055,905
" 1907..	47,970,793	34,488,224	" 13,482,569

Exports of specie from New York week ended Oct. 31: Gold, $50,000, to Venezuela; silver, $912,820, to London and Paris. Imports: Gold, $79,409; silver, $73,597, both fro mthe West Indies, Central and South America.

The price of bar gold in London has fallen a little, being reported at 77s. 10¾d. per ounce. The Bank of France is still buying gold in the London market.

Silver

SILVER AND STERLING EXCHANGE.

Oct.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
29	4 8645	50⅞	23 7/16	2	4.8600	50	23 1/16
30	4.8625	50	23 1/16	3	.....	....	23
31	4.8610	50⅜	23 1/16	4	4.8600	49⅝	22 15/16

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

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 22:

	1907.	1908.	Changes.
India.....	£9,841,954	£7,477,463	D. £2,364,491
China.....	68,400	516,400	I. 448,000
Straits.....	625,950	112,385	D. 513,565
Total.....	£10,536,304	£8,106,248	D. £2,430,056

Imports for the week, £6300 from South America, £7700 from the West Indies, £60,400 from New York; £74,400 in all. Exports, £127,000 to India.

Copper, Tin, Lead and Zinc

Oct.-Nov.	Copper. Lake, Cts. per lb	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
29	13¾ @14	13½ @13¾	61½	29½	4.30 @4.35	4.82½ @4.85	4.67½ @4.70
30	13⅞ @14	13⅝ @13¾	61¾	30⅛	4.32½ @4.37½	4.85 @4.87½	4.70 @4.72½
31	13⅞ @14	13⅝ @13¾	....	30⅛	4.32½ @4.37½	4.85 @4.87½	4.70 @4.72½
2	13⅞ @14	13⅝ @13¾	62⅛	30⅛	4.32½ @4.37½	4.87½ @4.92½	4.72½ @4.77½
3	.....	.....	62	....	.....	.....	.....
4	13⅞ @14	13¾ @13⅞	62⅛	30½	4.35 @4.40	4.87½ @4.92½	4.72½ @4.77½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Silver has touched today the lowest point yet reached in the decline. London advices, based on the collapse of the bull party in India, intimate that lower prices are to be expected before silver adjusts itself to present conditions of trade.

Copper—The market has been active and large transactions have taken place both for domestic consumption and for export. There appears to be little copper still unsold for November and December shipment, and several of the important producers have now withdrawn from the market. Considerable business has also been done for January and February of next year. Prices have advanced and the market closes strong at 13⅞@14c. for Lake copper; 13¾@13⅞ for electrolytic in ingots, cakes and wirebars. The average at which business in casting copper has been done during the week is 13¼@13½c., and at the close the market is higher.

Copper sheets, cold-rolled, 19c.; hot-rolled, 18c. Wire, 15c. base, carload lots at mill.

The London market for standard copper has been very active in consequence of heavy orders from Europe as well as from this country. To-day the market at one time touched £62 10s. for spot, £63 5s. for three months, and it closes strong at £62 for spot, £62 17s. 6d. for three months.

Statistics for the second half of October show a decrease in the visible supplies of 700 tons.

Refined and manufactured sorts we quote: English tough, £66; best selected, £65@66; strong sheets, £77@78.

Copper exports for the week from New York and Philadelphia, 5267 long tons. Our special correspondent gives the exports from Baltimore at 828 tons.

The Nevada Consolidated and Cumberland Ely companies are to pay the American Smelting and Refining Company a commission of 1 per cent. for selling their copper.

Tin—The London market throughout the week has been firm, and especially the favorable statistics published at the beginning of this month had the effect of further advancing prices. The close is cabled as firm at £137 17s. 6d. for spot, £139 2s. 6d. for three months.

Statistics for the month of October show a decrease in the visible supplies of 1200 tons.

The strong London market stimulated business here and fair-sized transactions

took place. At the close this metal can be bought at about 30½c. per pound.

Visible stocks of tin on Nov. 1 reported as follows, in long tons:

	In Store.	Afloat.	Total.
Great Britain	8,232	4,382	12,614
Holland	874	187	1,061
U. S., exc. Pacific ports	1,674	2,175	3,849
Total	10,780	6,744	17,524

The total shows a decrease of 585 tons during October.

Lead—There has been a fair demand for this metal, which has been freely met by some of the producers. Prices are somewhat higher, and lead at New York is quoted at the close at 4.35@4.40 cents.

The market for Spanish lead in London has been strong and advancing, and the close is cabled as £13 12s. 6d. for Spanish, £13 15s. for English lead.

Spelter—Consumption is gradually increasing, and while not much business is reported, the market is strong and higher at 4.72½@4.77½c. St. Louis, 4.87½@4.92½c. New York.

The London market for good ordinaries remains unchanged at £20, and specials at £20 5s. per ton.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is dull but prices are firm. Quotations are 8¼@8⅜c. for Cookson's; 7⅞@8⅛c. for Hallett's; and 7½@7¾c. for ordinary brands.

Aluminum—Unchanged. For American metal, No. 1 ingots, base 25½c.; sheets, base 35c. French aluminum is offered at 23c. We quote 23@25½c. for ingots.

Quicksilver—New York price steady at $47 per flask of 75 lb. San Francisco, $44@45 for domestic orders, $42@43 for export. London, unchanged at £8 10s. per flask.

Platinum—The market is unsettled, with a strong tendency to higher prices, and a good demand. Latest quotations from dealers are $21@22 per oz. for refined platinum, $24.50 for hard, and $18 for scrap.

Nickel—Large lots, 40c., New York.

The new Pennsylvania railroad station in New York is being roofed with sheets of Monel metal, a nickel-copper alloy, containing about 30 per cent. copper and 70 per cent. nickel. This is the first application of this metal to a large roof. The metal is furnished by the International Nickel Company, the sheets being rolled by the American Sheet and Tin Plate Company in one of its Pittsburg mills.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Spanish Metal Exports

Exports from Spain, eight months ended Aug. 31, metric tons:

Metals:	1907.	1908.	Changes.
Copper	5,221	8,600	I. 3,379
Copper precipitate	11,908	14,568	I. 2,660
Zinc	791	815	I. 24
Lead	121,185	124,328	I. 3,143
Quicksilver	1,488	1,195	D. 293
Minerals:			
Iron ore	6,218,775	5,216,901	D. 1,001,874
Copper ore	871,629	794,999	D. 76,630
Zinc ore	112,024	75,228	D. 36,796
Lead ore	4,147	2,269	D. 1,878
Manganese ore	54,449	16,105	D. 38,342
Pyrites	889,559	975,828	I. 86,269

Exports of salt, 350,247 tons in 1907, and 431,527 tons this year.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 31—There was an unusually heavy shipment of zinc ore this week, and the assay base was sprung on Friday noon to a $37 base by one purchasing agent. The general market was, however, on a $36 base for best grades, ranging down to $35, and as low as $34 for sludge ore. Silicate sold on a $17@18 base price, the highest being $24.50 per ton. The average price, all grades, was $32.72 per ton.

SHIPMENTS, WEEK ENDED OCT. 31

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,200,370	690,450	$72,701
Joplin	2,461,340	389,960	52,738
Galena	897,030	148,930	19,195
Duenweg	818,450	44,390	15,088
Badger	716,670	54,110	14,305
Alba-Neck	539,520	.....	9,174
Miami	625,020	65,840	7,961
Prosperity	313,430	68,050	7,131
Spurgeon	395,180	87,060	6,983
Aurora	440,060	.....	6,598
Granby	425,480	26,000	5,625
Carthage	279,910	.....	5,038
Zincite	204,770	.....	3,685
Carl Junction	185,610	4,180	3,140
Quapaw	171,530	8,610	2,795
Sarcoxie	120,560	.....	1,930
Playter	63,200	13,790	1,432
Stott City	49,840	.....	822
Wentworth	48,200	.....	530
Totals	11,957,210	1,601,370	$237,271
44 weeks	422,998,850	64,665,550	$8,902,917

Zinc value, the week, $194,973; 44 weeks, $7,123,435
Lead value, the week, 42,298; 44 weeks, 1,719,482

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	$46.90	$37.60	$45.84	$35.56	$83.58	$46.88
February	48.30	36.63	47.11	34.92	84.58	49.72
March	49.75	36.19	48.66	34.19	82.75	49.90
April	49.25	35.40	48.24	34.08	79.76	52.47
May	46.90	34.19	45.98	33.39	79.56	56.05
June	47.00	33.06	44.82	32.07	73.66	60.48
July	46.80	34.55	45.79	31.67	58.18	59.90
August	44.56	36.53	43.22	33.42	59.54	60.34
September	41.00	37.63	40.11	34.44	53.52	54.59
October	41.75	35.95	39.83	33.28	51.40	52.63
November	38.60	.....	35.19	.....	43.40	.....
December	31.50	.....	30.87	.....	37.71	.....
Year	$44.36	.....	$43.68	.....	$68.90	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

The highest settling price for lead ore was $55, ranging down to $50 for galena and $40 for "dry bone," or carbonate. The average price, all grades, was $52.82 per ton.

The reserve stock of zinc ore was considerably lessened by the heavy shipment, but the reserve stock of lead now amounts to approximately 3,000,000 lb., being held for a $60 market.

Platteville, Wis., Oct. 31—This week $37 per ton was the highest price paid for zinc ore on a basis of $35 to $36 per ton of 60 per cent. zinc. For 80 per cent. lead ore, $52 was paid; only one car is reported sold on this basis.

Shipments, week ended Oct. 31:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	689,300	.....	580,000
Benton	522,560	163,000	.....
Hazel Green	463,250	.....	.....
Galena	142,100	.....	.....
Cuba City	130,135	.....	.....
Highland	122,600	.....	.....
Days Siding	88,000	.....	.....
Linden	87,390	.....	.....
Livingston	80,000	.....	.....
Harker	65,660	.....	.....
Mineral Point	48,140	.....	.....
Total	2,439,135	163,000	580,000
Year to Oct. 10	91,733,864	9,014,105	3,194,604

In addition to the above, there was shipped to the electrostatic separator, at Platteville, 298,500 lb.; to the Joplin Separator Works, at Galena, 67,500 lb., and to the Enterprise roaster, at Platteville, 131,010 lb. zinc ore.

Chemicals

New York, Nov. 4—The general market is fairly active, but transactions are on a small scale.

Copper Sulphate—The market shows some life, stimulated by the stronger metal market. Standard goods remain at 4.65 per 100 lb. for carloads and up to $4.90 for smaller lots.

Nitrate of Soda—The market is at a standstill, and sales are infrequent. Quotations are 2.15c. for spot and futures up to and including 1910. The 96-per cent. grade sells 5c. per 100 lb. higher.

Phosphates—Messrs. J. M. Lang & Co. report shipments of Florida phosphate rock through the port of Savannah in September, in long tons: To Germany, 5373; Austria, 1641; Great Britain, 750; total, 7764 tons.

Mining Stocks

New York, Nov. 4—The stock markets have been influenced chiefly by election forecasts. The movement of prices has been moderate, but quotations have generally been firm on a moderate volume of business.

Today the election holiday has been followed by a strong and active market with many advances in quotations.

On the Curb the copper stocks have been strong, but business has been on a moderate scale. Cobalt shares were in

some demand, but the Nevada gold stocks were quiet.

One sale of Homestake, of South Dakota, was made at $89.50 per share.

Boston

Nov. 3—Stock market prices have been irregular the past week, but managed to strengthen the day before the election. Prices, with some exceptions, are lower than a week ago. Heavy selling in Utah Consolidated caused a drop from $39.50 to $36 with recovery to $38.25 the same day; subsequently it rallied to $40.50, and closed Monday at $1 off net for the week at $39.50. The decline was characterized as a bear raid with stop orders uncovered on the decline.

Amalgamated ran off almost $2 to $78.87½, recovering all but a small fraction. Copper Range fell $1.50 to $76.50, recovering partially. North Butte fell $1.25 to $83 on rather free offering of the stock, but recovered to $84.75.

Report says that another Philadelphia director will be added to the Nevada Consolidated board at the annual meeting. There are said to be over 1000 La Rose Consolidated stockholders in New England out of the total 4000. The Raven Company has sold some 30,000 shares of treasury stock at $1 per share to leading stockholders.

The only Curb feature has been a split in that body so that there are two curbs, one a Lawson one, which is in the majority, and an anti-Lawson crowd. They trade in two different sections of the city.

STOCK QUOTATIONS

NEW YORK	Nov. 2
Name of Comp.	Clg.
Alaska Mine	⅜
Amalgamated	80⅜
Anaconda	46¼
Balaklala	‡2½
British Col. Cop.	6¾
Butte & London	....
Butte Coalition	27
Colonial Silver	¾
Cum. Ely Mining	8½
Davis Daly	3⅜
Dominion Cop	⅞
Douglas Copper	3⅛
El Rayo	4⅜
Florence	4½
Foster Cobalt	.65
Furnace Creek	.15
Giroux	4½
Gold Hill	¾
Goldfield Con	6½
Granby	‡100
Greene Gold	⅛
Greene G. & S	.09
Greenw'r & D.Val.	‡.75
Guanajuato	1⅛
Guggen. Exp.	178
Hanapah	.15
McKinley Dar.	1.24
Micmac	2¾
Mines Co. of Am.	1½
Mitchell Mining	⅛
Mont. Sho.C	¾
Nev. Utah M. & S	3¾
Newhouse M. & S	4½
Nipissing Mines	10⅝
Old Hundred	1
Silver Queen	1.28
Stewart	⅝
Tennessee Cop'r.	44¾
Tri-Bullion	⅞
Union Copper	⅝
Utah Apex	5⅞
Utah Copper	42¾
Yukon Gold	4⅜

BOSTON	Nov. 2
Name of Comp.	Clg.
Adventure	8⅞
Allouez	37
Am. Zinc	24
Arcadian	3⅞
Arizona Com	34
Atlantic	18
Bingham	‡ 30
Boston Con	14½
Calumet & Ariz.	112¾
Calumet & Hecla	660
Centennial	33¾
Con. Mercur	.35
Copper Range	77¼
Daly West	9
Franklin	13½
Greene Can	10⅝
Isle Royal	23
La Salle	13⅞
Mass	5⅜
Michigan	13⅛
Mohawk	67
Nevada	18
North Butte	84¼
Old Colony	.50
Old Dominion	52¾
Osceola	116
Parrot	27¼
Quincy	93
Rhode Island	4
Santa Fe	1⅜
Shannon	16
Superior	27¼
Tamarack	78
Trinity	17¾
United Cop., com.	‡12¼
U. S. Oil	29½
U. S. Smg. & Ref.	39
U.S.Sm. & Re.,pd.	44¾
Utah Con	39¼
Victoria	4¾
Winona	6¼
Wolverine	140
Wyandotte	2¼

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	28⅞
Am. Smelt. & Ref	93
Am. Sm. & Ref., pf.	105¼
Bethlehem Steel	21⅞
Colo. Fuel & Iron	36¼
Federal M. & S.,pf.	83
Inter. Salt	18½
National Lead	82¼
National Lead, pf.	104
Pittsburg Coal	9
Republic I. & S.	24½
Republic I. & S.,pf.	81
Sloss-Sheffield	7-⅜
Standard Oil	622
U. S. Red. & Ref.	9
U. S. Steel	48
U. S. Steel, pf	111⅜
Va. Car. Chem	32⅞

BOSTON CURB	
Ahmeek	100
Black Mt.	‡3⅛
East Butte	7⅜
Hancock Con.	‡7⅛
Keweenaw	5
Majestic	.66
Raven	.87
Shawmut	09
Superior & Pitts.	‡14
Troy Man	.25

ST. LOUIS	Oct. 31	
N. of Com.	High.	Low.
Adams	.40	30
Am. Nettie	04	03
Center Cr'k	1 80	1 50
Cent. C. & C.	66 00	65 00
C.C. & C. pd.	76 00	74 00
Cent. Oil	110 00	100 00
Columbia	6 00	4 00
Con. Coal	21 00	19 00
Doe Run	125 00	110 00
Gra. Bimet.	30	25
St. Joe	15.00	12 50

LONDON	Nov. 4
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd	0 1 3
Camp Bird	0 15 0
Esperanza	3 2 6
Tomboy	1 1 3
El Oro	1 2 9
Oroville	0 10 0

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 4.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	14
Belcher	.25	St. Ives	24
Best & Belcher	.47	Triangle	05
Caledonia	.18	BULLFROG STOCKS	
Challar	.17	Bullfrog Mining	‡ 03
Comstock	‡.24	Bullfrog Nat. B	‡ 04
Con. Cal. & Va	61	Gibraltar	03
Crown Point	.25	Gold Bar	‡ 03
Exchequer	.32	Homestake King	17
Gould & Curry	.18	Montgomery Mt.	‡ 05
Hale & Norcross	.45	Mont. Shoshone C.	81½
Mexican	61	Original Bullfrog	‡ 01
Ophir	1.82	Tramp Cons	16½
Overman	.15	MANHAT'N STOCKS	
Potosi	.17	Manhattan Cons	‡.05
Savage	.41	Manhat'n Dexter	‡ 03
Sierra Nevada	.32	Jumping Jack	‡ 03
Union	.26	Stray Dog	‡ 03
Utah	.05	MISCELLANEOUS	
Yellow Jacket	.49	Golden Boulder	‡ 05
TONOPAH STOCKS		Bonnie Clare	07
Belmont	1.15	Lee Gold Grotto	...
Extension	.58	Nevada Hills	1 50
Golden Anchor	01½	Nevada Smelting	87½
Jim Butler	.23	Pittsburgh S. Pk	1 03
MacNamara	.51	Round Mt. Sphinx	18
Midway	.26		
Montana	.80		
North Star	.06		
Tono'h Mine of N.	7.12½		
West End Con	.50		
GOLDFI'D STOCKS			
Adams	.04		
Atlanta	.22		
Booth	.32		
Columbia Mt	.21		
Comb. Frac	1 27		
Cracker Jack	.05		
Dia'dfield B. B. C.	.14		
Goldfield Belmont	05		
Goldfield Daisy	1 03		
Great Bend	.33		
Jumbo Extension	.30		
Katherine	...		
Kendall	.15		
Lone Star	.08		
May Queen	.06		
Oro	.12		
Red Hill	.24		
Roanoke	..		
Sandstorm	23		

COLO. SPRINGS	Oct. 31
Name of Comp.	Clg.
Acacia	6¼
Black Bell	....
C. C. Con	‡1½
Dante	‡6
Doctor Jack Pot	7
Elkton	65¼
El Paso	43¼
Findlay	19½
Gold Dollar	8
Gold Sovereign	‡3
Isabella	25½
Index	..
Jennie Sample	2½
Jerry Johnson	‡3⅝
Mary McKinney	‡28
Pharmacist	3¾
Portland	1 02
Un. Gold Mines	.3⅞
Vindicator	80
Work	7

Assessments

Company.	Delinq.	Sale.	Amt.
American Fork, Utah	Oct. 28	Nov. 25	$0 01
Birchville, Cal	Nov. 2	Nov. 20	0.03
Brookland, Utah	Oct. 24	Nov. 9	0.01
Brunswick Con., Cal	Oct. 20	Nov. 19	0.03
Butte & Yerrington, Mont	Oct. 20	Nov. 15	0 01
Caledonia, Nev	Oct. 21	Nov. 11	0.05
Constellation, Utah	Oct. 23	Nov. 20	0 01½
Crown Point, Nev	Nov. 17	Dec. 8	0.10
Glenwood, Utah	Oct. 29	Nov. 17	0.01
Gould, Mont	Nov. 7	Dec. 7	0.05
Highland, Utah	Oct. 23	Nov. 16	0 01
Lady Washington, Nev	Oct. 26	Nov. 16	0 05
La Palma, Mex	Nov. 2	Nov. 21	0.10
Mexican, Nev	Nov. 12	Dec. 3	0.10
Mountain Monarch, Cal	Oct. 24	Nov. 24	0.05
N. Y. Bonanza, Utah	Nov. 5	Nov. 25	0.02
Overton, Cal	Oct. 14	Nov. 16	0 01
Silver King Con., Utah	Nov. 4	Nov. 25	0 05
Uintah Treas., Utah	Nov. 2	Nov. 20	0.01
Utah-United, Utah	Nov. 10	Nov. 27	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68 673	55 678	31 769	25.738
February	68 835	56 000	31 852	25 855
March	67 519	55 365	31 325	25 570
April	65 462	54 505	30 253	25 133
May	65 971	52 795	30 471	24.377
June	67 090	53 663	30 893	24.760
July	68 144	53.115	31 366	24.514
August	68 745	51 683	31 637	23.858
September	67 792	51 720	31 313	23.877
October	62 435	51.431	28 863	23.725
November	58 677	....	27 1 4	.....
December	54 565	...	25 362	.....
Year	65 327		30 188	.....

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

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24 404	13 726	24 825	13 901	106 739	62.386
February	24 869	12 905	25 246	13 098	107 356	58 786
March	25 065	12 704	25 560	12 875	106.594	58.761
April	24 224	12 743	25 260	12 928	98 625	58.331
May	24 048	12 598	25 072	12.768	102 375	57.387
June	21 665	12 675	24 140	12 877	97 272	57.842
July	22 130	12.702	21 923	12 933	95 016	57 989
August	18 356	13.462	19 255	13 639	79 679	60 500
September	15 565	13.388	16 047	13.600	68 375	60.338
October	13 169	13.354	13 551	13.646	60 717	60.139
November	13.391	.....	13.870	....	61 226	
December	13 163	.....	13 393	.....	60 113	
Year	20 004	....	20.661	.....	87 007	...

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

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41 548	27 380	July	41 091	29.207
February	42 102	28 978	August	37 667	29.942
March	41 313	30 577	September	36 689	28.815
April	40 938	31 702	October	32 620	29.444
May	43 149	30 015	November	30 833	....
June	42.120	28 024	December	27 925	.....
			Av. year.	38.166	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6 000	3 691	19 828	14 469
February	6 000	3 725	19 531	14 250
March	6 000	3 838	19 703	13 975
April	6 000	3 993	19 975	13 469
May	6 000	4 253	13 688	12 938
June	5 760	4 466	20 188	12.600
July	5 288	4.447	20 350	13.000
August	5 250	4.580	19 063	13.375
September	4 813	4.515	19 775	13.125
October	4 750	4 351	18 531	13.375
November	4.376	.....	17.281	.....
December	3 658	.....	14.500	.....
Year	5.325	.....	19.034	.....

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

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6 732	4 513	6 582	4.363	27 125	20 563
February	6 814	4 788	6 664	4.638	25 938	20 875
March	6 837	4 665	6 687	4.527	26 094	21 075
April	6 685	4 645	6 535	4.495	25 900	21 344
May	6 441	4 608	6 291	4.458	25 563	19.906
June	6 419	4 543	6 269	4 393	25 469	19 000
July	6 072	4.485	5 922	4.338	23 850	19 031
August	5 701	4 702	5 551	4.556	21 969	19.350
September	5 236	4.759	5 086	4.619	21 050	19.563
October	5 430	4 801	5 280	4.651	21 781	19.750
November	4.925	....	4.775	.....	21.438	.....
December	4 254	.....	4 104	.....	20 075	.....
Year	5 962	.....	5.812	.....	23 771	...

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

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Bort, good drill quality, carat		$85.00
Carborundum, f.o.b. Niagara Falls, powd.	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05½@.06
Emery, in kegs; Turkish flour	"	.01¾@.02½
Grains	"	.03½@.04½
Naxos flour	"	.01¾@.02½
Grains	"	.03½@.04½
Chester flour	"	.01½
Grains	"	.03½@.04½
Peekskill, f.o.b. New York, flour	"	.01½@.01¾
Grains, in kegs	"	.02½@.02¾
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone, Am. powd.	100 lb.	1.60@2.00
Italian, powdered	"	.01½@.01¾
Lump, per quality	"	.03@.20
Rottenstone, ground	"	.02@.04
Lump, per quality	"	.05@.25
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	07½@.07¾
ACIDS—		
Acetic 28%	lb.	.022@.027
Boric	"	.08@.08½
Hydrofluoric, 30%	"	.02¼@.03
" 48%	"	.06
" 60%	"	.10
Hydrochloric acid, 20°, per lb.		1.25@1.50
Nitric acid, 38°	per lb.	4.25@4.62½c.
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.25
66°, bulk, ton		18.00
Oxalic	"	.06½@.06¾
ALCOHOL—Grain 95%	gal.	2.63
Denatured	"	.45@.49
Refined wood, 95@97%	"	.49@.55
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	lb.	.04½@.05
ALUMINUM—Sulphate, com'l.	lb.	1.10@1.75
AMMONIA—24 deg. lb	"	.04½@.05½
" 26 deg. lb		.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.23
Carbonate	"	.07½@.08
Muriate grain	"	.05½@.06
Lump	"	.09½@.09½
Sulphate, 100 lb		3.05@3.10
Sulphocyanide com	"	.30
" " chem. pure	"	.40
ANTIMONY—needle, lump	"	.03½@.03¾
ARSENIC—White	"	.03@.03½
Red	"	.07½@.07¾
ASPHALTUM—		
Barbadoes	per ton.	40.00@80.00
West Indies	"	20.00@60.00
Egyptian	lb.	.10@.11
Gilsonite, Utah, ordinary	per ton.	32.00
Trinidad	"	22.50@30.00
California	"	21.00@27.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton.	30.00@35.00
Precipitated 96@98%		36.00@40.00
Powdered, 80@90%	lb.	.02@.02¼
Chloride com'l	ton.	39.00@41.00
Nitrate powdered, in casks	lb.	.05½@.06
Blanc Fixe	per lb.	.02¼
BARYTES—		
Am. Ground	sh. ton.	14.00@17.50
Floated	"	18.00@21.00
Foreign floated	"	19.50@22.50
BISMUTH—Sub-nitrate	lb.	1.50
BLEACHING POWDER—35%, 100 lb		1.25@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4.65
BONE ASH	lb.	.02¼@.04
BORAX	"	.04½@.05½
CALCIUM—Acetate, gray, 100 lb.		1.50@1.55
Acetate, brown	lb.	1.00@1.05
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J	sh. ton.	65.00
Chloride, f.o.b. N. Y	"	11.00@14.00
CEMENT—		
Portland, Am. 500 lb	bbl.	1.55@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb	"	.85
(in sacks)	"	.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y	per lg. ton.	17.50@20.00
Bricks, f.o.b. Pittsburg, M	ton.	175.00
CLAY, CHINA—Am. common ex-dock, N. Y	ton.	8.00@9.00
Foreign	"	10.00@17.50
COBALT—Oxide	lb.	1.40
COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.75
In bags	"	.60@.70
CRYOLITE	lb.	.06½@.06¾
FELDSPAR—Ground best	sh. ton.	10.50@15.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis No. 1	"	18.00
" No. 2	"	15.00
Extra	"	20.00@23.00
FIRE CLAY—F.o b. St. Louis.		
St. Louis, extra quality	per ton.	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	lg. ton.	8.00@10.00
Ground	"	11.50@13.50
Foreign crude ex. dock		8.00@10.00
FULLER'S EARTH—Lump, 100	lb.	.75@.85
Powdered	"	.75@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.01¾@.04
Dust	"	.02@.04¾
Chip	"	.03¾@.07½
Lump	"	.05½@.10½
Large lump	"	.07½@.10½
GYPSUM—		
Fertilizer	sh. ton.	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb.	.01¾
German	lb.	.02¼@.02¾
LEAD—Acetate (sugar of) brown,	lb.	.07¼
Nitrate, com'l	"	.08½@.08¾
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	8.00@10.00
Calcined, powdered	sh. ton.	26.00@35.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	.85@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.01@.01½
75@85% binoxide	"	.01½@.01¾
85@90% binoxide	"	.01¾@.05
90@95% binoxide	"	.06¼
Ore, 80%-85%	sh. ton.	16.00@32.50
MARBLE—Flour	sh. ton.	8.50@10.00
MINERAL WOOL—		
Slag, ordinary	sh. ton.	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb.	.09@.11
Sulphate, double	"	.06½@.08
NITRATE OF SODA—100 lb. 95% for '08		2.15
95% for 1909		2.15
95% for 1910		2.15
96% is 5c. higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.06¼@.06¾
English glassmakers'	"	.08¼@.08¾
Lithopone	"	.03¾@.07
Metallic, brown	sh. ton.	16.50@22.00
Red	"	14.00@18.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½@.03
French, washed	"	.01½@.02½
Paris green, pure, bulk	"	.26
Red lead, American	"	.06¼@.06¾
Foreign	"	.08¼@.08¾
Turpentine, spirits bbl., per gal.		.40
White lead, Am., dry	lb.	.05½@.06
American, in oil	"	.06¼@.06¾
Foreign, in oil	"	.10¼@.10¾
Zinc white, Am. extra dry	"	.05½@.05¾
French, red seal, dry	"	.08¼@.08¾
French, Green seal, dry	"	.10¼@.10¾
PHOSPHATES—Acid		60c. per unit
*Fla., hard rock		10.00@10.25
land pebble 68%		4.25@4.50
†Tenn., 78@80%		6.00@6.50
75%		5.00@5.50
68@72%		4.00@4 50
‡So. Car. land rock		6.75@7.00
" " river rock		5.00@5.50
POTASSIUM—		
Bicarbonate crystal	lb.	$.08½@.09
Powdered or granulated	"	.09@.09½
Bichromate, Am	"	.08¾@.09
Scotch	"	.10¼
Bromide	"	.13@.14
Carbonate (80@85%)	"	.03¾@.04
Caustic, ordinary	"	.04½@.05¼
Elect. (90%)	"	.05½@.06
Chloride (muriate), 100 lb		1.90
Chlorate, powdered	"	.09½@.09¾
Crystals	"	.09@.09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Kainite, long ton, bulk, 8.50; bags, 9.50.		
Permanganate	lb.	.09½@.10
Prussiate, yellow	"	.13@.13¾
Red	"	.31@.33
Sulphate	100 lb.	2.18½@2.21½
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c.
Imported non-arsenical, furnace size, per unit		.12½@.13
Imported, arsenical, furnace size, per unit		.12@.12½
Imported fines, arsenical, per unit.		.08½@.09
Imported fines, non-arsenical, per unit		10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.13
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined, crystals	"	5.50@6.00
SILICA—		
Ground quartz, ord'ry	lg. ton.	10.00@15.00
Silex, ground	"	13.00@15.00
Silex, floated	"	35.00@40.00
Lump quartz	"	5.00@6.00
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.37½@.4
SODIUM—		
Acetate	lb.	.04@.04½
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb		1.00@1.30c.
Soda, caustic, per 100 lb., 76/60		1.75@1.85
Soda, caustic, powdered		.02¾@.03½
Salt cake, per 100 lb., bulk		.40
Salt cake, bbl		.65@.85
Soda, monohydrate, per lb		1.4@1.75c.
Bichromate	lb.	.07½@.07¾
Bromide	"	.13@.14
Chlorate, com'l	"	.09@.09½
Cyanide ("100% KCN")		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Hyposulphite, Am	"	1.35 up
German	"	1.60@1.70
Phosphate	100 lb.	2.10@2.30
Prussiate	"	.08@.08½
Sal soda, f.o.b. N. Y	100 lb.	.65@.70
Foreign, f.o.b. N. Y	"	.80@1.00
Silicate, com'l	"	.80@1.15
Sulphate, com'l (Glauber's salt)	100 lb.	.60@.75
Sulphate, com'l, calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07½@.08½
SULPHUR—		
Louisiana (prime) to New York, Boston or Portland	lg. ton.	22.00
To Philadelphia or Baltimore	"	22.00
Roll	100 lb.	1.85@2.15
Flour	"	2.00@2.40
Flowers, sublimed	"	2.20@2.60
TERRA ALBA—French & Eng.	100 lb.	.85@1.00
TALC—Domestic	sh. ton.	15.00@25.00
French	"	16.00@25.00
Italian, best	"	35.00@40.00
TIN—Bi-chloride, 50%	lb.	.09½ up
Crystals	"	.18½ up
Oxide, lb	"	.33@.35
URANIUM—Oxide	"	3.50
ZINC—		
Chloride solution, com'l 20°	"	.02¼
Chloride, granular	"	.04½@.05
Dust	"	.04½@.05
Sulphate	"	.02@.02½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites, and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ANTIMONY

7597—ANALYTICAL METHOD—A Method for the Determination of Antimony. M. F. Coolbaugh and J. H. Betterton. (West. Chem. and Met., Sept., 1908; 3½ pp.) The method in brief consists of decomposition to the ammonium persulphate, reduction of antimony with stannous chloride, taking up the excess with mercuric chloride and titrating with potassium permanganate. 60c.

ASPHALT

7598—MANJAK, as Worked at Vistabella Mine, Trinidad, British West Indies. J. C. T. Raspass. (Coll. Guard., Sept. 11, 1908; 1/3 p.) Abstract of a paper read at the North Staffordshire Institute of Mining and Mechanical Engineers, which describes the manjak industry of Trinidad giving analyses and a brief description of the deposits. 40c.

BARYTES

7599—CLAUSTHAL BARYTES DEPOSIT—Ueber ein bemerkenswertes Vorkommen von Schwerspat auf dem Rosenhofe bei Clausthal. K. Andrée. (Zeit. f. prak. Geol., July, 1908; 3 pp.). Describes the occurrence and associations of the barytes in this locality. 40c.

CALCIUM CARBIDE

7600—ELECTRIC FURNACES for the Manufacture of Calcium Carbide and Ferrosilicon. (Electrochem. and Met. Ind., Oct., 1908; 6 pp.). Translation of a paper by Dr. Walter Conrad, before the Verein Deutscher Eisenhüttenleute in Düsseldorf, describing numerous electric furnaces from the oldest to the most modern. Illustrated. 40c.

CEMENT

7601—PLANT—A Typical Modern Portland Cement Plant. A. G. Adams, Jr. (Proc. Eng. Assn. South, Vol. XIX, 1908; 17 pp.) Describes carefully such conditions as location, market, fuel, water, transportation, labor, machinery, burning, grinding, etc. Illustrated by a drawing of a typical plant.

7602—THEORY OF SETTING—Zur Abbindungs- und Erhärtungstheorie der Portland- und Romanzemente. F. Janda. (Oest. Zeit. f. B. u. H., Aug. 29, 1908; 4 pp.). A discussion of the chemical reactions involved in the hardening and setting of cement. 40c.

7603—VIRGINIA—Cement Materials of Western Virginia. R. S. Bassler. (Econ. Geol., Aug.-Sept., 1908; 22 pp.). Describes the distribution of cement materials, the cement rocks of northwestern, central western and southwestern Virginia, and gives the analyses of these rocks. Illustrated. 60c.

CHROMIUM

7604—PRODUCTION of Chromite or Chromic Iron Ore in 1907. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 4 pp.). Describes the production and principal features in the industry together with other statistical data of interest.

CLAYS

7605—ANALYSIS—Ueber die Bestimmung der Tonsubstanz, ein Beitrag zur rationellen Analyse der Tone. H. Bollenbach. (Chem. Ind., July 15, 1908; 3 pp.) Advocates an analysis of clay which shall mean something to a manufacturer of clay products, and suggests one such method. 40c.

7606—GEORGIA—Properties and Uses of Georgia White Clays. Otto Veatch. (Mfrs. Rec., Oct. 1, 1908; 1½ pp.). Describes the conditions existing in the clay industry of Georgia as well as the chemical, physical properties of clay. 20c.

7607—ORIGIN OF KAOLIN—Ueber Kaolinbildung, einige Worte zur neuesten Literatur. H. Rösler. (Zeit. f. prak. Geol., June, 1908; 3½ pp.) Discusses the various theories offered to explain the formation of kaolin. 40c.

7608—REFRACTORY CLAY. A. F. Greaves-Walker. (Salt Lake Min. Rev., Sept. 30, 1908; 1 1/3 pp.) Discusses the constituents of refractory clay including silica, alumina, iron, magnesium, lime, alkalies and titanium. 20c.

7609—STATISTICS of the Clay-Working Industries in the United States in 1907. Jefferson Middleton. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 52 pp.) Describes the production and principal features of the industry together with other statistical data of interest.

7610—TEXAS—Note on Texas Kaolin. Arthur Mayer. (Trans. Am. Ceramic Soc., Vol. X, 1908; 6 pp.) Describes the physical properties before and after burning and the chemical properties of kaolin obtained from a mine near San Antonio, Texas.

COAL AND COKE

7611—AUSTRALIA—Coalfields and Collieries of Australia—XXVI. and XXVII. F. D. Power. (Aust. Min. Stand., Aug. 12 and 19, 1908; 3 pp.) Continuation of article previously indexed. 60c.

7612—BELGIUM—Le Marché Charbonnier Belge. G. de Leener. (Commission d'Enquête sur la Durée du Travail dans les Mines de Houille; Brussels, Belgium, 1908; 294 pp.) An exhaustive discussion of every phase of the coal industry of Belgium.

7613—BOILER FEED WATERS—Feed Waters for Boilers at Coal Mines. J. C. W. Greth. (Coal, Sept. 17, 1908; 3¾ pp.) Describes the losses due to impurities in solution and suspension in the water fed to the boilers. Illustrated. 20c.

7614—BRIQUETTING—Ueber Entstaugungsanlagen in Braunkohlen-Brikettfabriken. Gertner. (Zeit. f. B. H. u. Salinenwesen, Band 56, 2 heft; 91 pp.) An exhaustive discussion of the various methods of recovering and utilizing the dust produced during the manufacture of briquets.

7615—BRITISH COAL FIELD—The Wemyss Coal Field. John Gemmell. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1½ pp.) Describes a bore hole which was sunk in this field, modern methods of sinking, pumping machinery, etc. Abstract of paper read before Brit. Instn. of Min. Engrs. 40c.

7616—CAGES—Design of Cages for Modern Collieries—II. J. S. Barnes. (Iron and Coal Tr. Rev., Sept. 18, 1908; 1 p.) Continuation of articles indexed in the JOURNAL of May 2, 1908. Describes cage chains and shackles and cage hangers. Illustrated. 40c.

7617—CANADA—The Mining Operations of the Dominion Coal Company. F. W. Gray. (Can. Min. Journ., Aug. 1, 1908; 3 pp.) Continuation of article previously indexed, dealing with the mines of the Glace Bay basin. 20c.

7618—COAL BIN—Method of Building a Concrete Coal Bin. Ernest McCullough. (Min. Wld., Aug. 1, 1908; 1¾ pp.) Gives formulas for calculating the pressure of coal and also the compression and tensile stresses of the walls and bottom of the bin. 20c.

7619—COAL HANDLING—Maschinelle Fördereinrichtungen vor Ort auf rheinisch-westfälischen Gruben. Forstmann. (Glückauf, Sept. 5, 1908; 9½ pp.) Describes a rather elaborate system of swinging chutes and conveyors for drawing coal out of rooms with moderate slopes. 40c.

7620—COKE—Ueber die Koksausbeute von Steinkohlen. F. W. Hinrichsen and S. Taczak. (Stahl u. Eisen, Sept. 2, 1908; 2½ pp.) A further attempt to determine the coking yield of a coal by laboratory methods. 40c.

7621—COKE-OVEN—The By-Product Coke-Oven. (Journ. Am. Soc. Mech. Engrs., Sept., 1908; 10 pp.) Discussion by various members of the paper by W. H. Blauvelt, in which further information is imparted. Illustrated.

7622—COKING OF PEAT by the Ziegler System. O. K. Zwingenberger. (Journ. Am. Peat Soc., Oct., 1908; 8 pp.) Describes the Ziegler process which consists of carbonizing air-dried peat in upright retorts and recovering the by-products. Contains data on the analyses of peat compared with coke and the uses of peat coke. 60c.

7623—COLLIERY PLANT—New Plant at the Penrikyber Navigation Colliery. (Iron and Coal Tr. Rev., Sept. 25, 1908; 3 1/3 pp.) Describes the hoisting plant, the electrical plant and the arrangement at the pit bottom. Illustrated. 40c.

7624—COLLIERY WORKING—Recent Developments and Future Problems in Colliery Working and Management. G. H. Winstanley. (Iron and Coal Tr. Rev., Sept. 25, 1908; 2½ pp.) Paper read before Nat. Assn. of Colliery Managers, reviewing recent progress in colliery engineering. The author discusses coal-cutting machines, drilling machines for blasting, mechanical haulage, power generation and transmission, the exhaust steam turbine, etc. 40c.

7625—DUST—Coal-Dust Experiments at Altofts. (Iron and Coal Tr. Rev., Sept. 4, 1908; 4 2/3 pp.) Describes experiments to ascertain the extent of the danger arising from the presence of coal-dust such as collects on the sides, roofs, roadways and screens of a colliery and to suggest remedies and furnish data to enable the danger to be safeguarded against. Illustrated. 40c.

7626—DUST—Coal-Dust to Date, and Its Treatment with Calcium Chloride. Henry Hall. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1¾ pp.) Historical notes; test of coal dust in airways; effects of watering; effects of calcium chloride treatment to dust. Paper before the Brit. Instn. of Min. Engrs. 40c.

7627—DUST—Spraying Coal Mines. D. Harrington. (Mines and Minerals, Oct., 1908; 2½ pp.) Describes the method used in Carbon county, Utah, of spraying the working faces with water. Gives the method of constructing pipe lines and the cost of operations. Illustrated. 20c.

7628—DUST—The Problem of Treating Dust in Coal Mines. Frank Haas. (Eng. and Min. Journ., Oct. 24, 1908; 3 pp.) Abstract of a paper read before the West Virginia Min. Assn. at Charleston, W. Va., Oct. 7, 1908. Claims that dust, as such, is not explosive. Preheating the intake air to saturation by exhaust steam is more effective than sprinkling. 20c.

7629—DUST—Vorrichtungen zum Abscheiden von Kohlenstaub auf den Zechen des Ruhrkohlenreviers. Hasebrink. (Glückauf, Aug. 29, 1908; 7 pp.) Describes installations at various German coal mines for preventing the dissemination of dust. 40c.

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7631—ELECTRICITY IN COAL MINING—Installations électriques des Charbonnages réunis Laura et Vereeniging. A. Genart. (Rev.

Univ. des Mines, T. XIII, 1908; 31 pp.) A description of the very complete electric equipment at this Dutch coal mine, including turbo-generators, hoists, locomotives, etc. $1.

7632—EXPLOSIONS—Effects of Humidity upon Coal Mine Explosions. Carl Scholz. (Black Diamond, Aug. 15, 1908; 2¾ pp.) Discusses the fact that explosions are more frequent in winter than in summer and advances the theory that this is explained when it is known that the mine air, being warmer than the air used for ventilation, aids the tendency to absorb the moisture which is carried off through the upcast. 20c.

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7634—FUEL INVESTIGATION—The Nature of the Volatile Matter in Coal. H. C. Porter and F. K. Ovitz. (Eng. and Min. Journ., Oct. 10, 1908; 2 pp.) Discusses the fuel investigations being conducted by the United States Geological Survey along lines to determine the chemical and physical structure of coal. 20c.

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7645—PURE COAL as a Basis for the Comparison of Bituminous Coals. A. Bement. (Bi-Monthly Bull., Sept., 1908; 5½ pp.) Gives a definition and description of so-called pure coal and compares this with certain bituminous coals.

7646—RESCUE APPARATUS—On the Practical Use and Value of Colliery Rescue Apparatus, and the Organization of Rescue Corps. George B. Walker. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1 2/3 pp.) Discusses the rules as drawn up for German collieries, but modified to suit the conditions of British mining. Paper before the Brit. Instn. of Min. Engrs. 40c.

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COPPER

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7654—ANALYTICAL METHOD—Some Observations on the Permanganate Method for Copper. John Herman. (West. Chem. and Met., Aug., 1908; 4 pp.) Describes F. G. Hawley's modification of the Guess method. The method is said to be extremely accurate if carefully performed and is much quicker and easier to perform than any other good method. 80c.

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7656—CHILEAN COPPER MINERALS—Notes on Some Chilean Copper Minerals. Harry F. Keller. (Reprint from Proc. Am. Phil. Soc., Vol. XLVII, 1908; 7 pp.) Describes the characteristics of cupreous manganese, chalcanthite and a double sulphate of copper and magnesium, brochantite containing arsenic acids and atacamite, which were included in a number of mineral specimens collected in Chile. Illustrated.

7657—COPPER-ARSENIC—Neuer Untersuchungen über das Schmelzdiadramm des Systemes Kupfer-Arsen und den elektrischen Leitungswiderstand von arsenhaltigem Kupfer. K. Friedrich. (Metallurgie, Sept. 22, 1908; 10 pp.)) A study of the thermal characters and crystal structures of copper-arsenic alloys of various percentages. 40c.

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FLUORSPAR

7669—GERMAN FLUORSPAR DEPOSIT—Die Flussspatgange der Oberpfalz. M. Priehäusser. (Zeit. f. prak. Geol., July, 1908; 5 pp.) Describes the occurrence of fluorspar in this locality, and discusses its probable origin. 40c.

GOLD AND SILVER

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7673—AMALGAMATION—The Average Rate of Accumulation and Absorption of Gold Amalgam by Copper Plates. Edward Halse. (Inst. Min. and Met., May, 1908; 6 pp.) Gives some details relative to the amount of service done by amalgamation plates and the amount of absorption which took place.

7674—BRITISH COLUMBIA—The "White Bear Mine," Rossland, B. C. H. H. Yuill. (Quart. Bull. Can. Min. Inst., July, 1908; 21 pp.) Describes the methods of working, the development and equipment of this British Columbia mine. Illustrated.

7675—CALIFORNIA—Bonanzas at Twenty-Nine Palms. E. A. Hayes. (Am. Min. Rev., Sept. 26, 1908; 1½ pp.) The old camp on the Colorado desert is being rejuvenated by Los Angeles men. Illustrated. 20c.

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7678—COLOMBIA—The Future Gold Output of Colombia. Henry G. Granger. (Bi-Monthly Bull., A. I. M. E., Sept. 1908; 10¼ pp.) Describes briefly the occurrence of silver-lead ores, platinum and gold and the operation of dredges in the placer deposits of Colombia.

7679—COLORADO—Hahns Peak, Colorado. (Eng. and Min. Journ., Oct. 24, 1908; ¾ p.) Describes the recent resumption of work in this old abandoned gold and silver district. Illustrated. 20c.

7680—COLORADO—Various Mining Districts of Colorado. G. W. Miller. (Min. Sci., Sept. 24; 1908; 2 pp.) Eighth article of a series previously indexed which deals with the ore deposits of Eastern and Western Leadville. Illustrated. 20c.

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7683—CYANIDATION of Silver Ores, Pachuca, Mexico. Claude T. Rice. (Eng. and Min. Journ., Oct. 3, 1908; 7¼ pp.) The ore is completely slimed and at the mills now building air agitation is to be used and the ore only roughly concentrated. Illustrated. 20c.

7684—CYANIDATION of Silver Ores. W. J. Sharwood. (Min. and Sci. Press, Sept. 26, 1908; 2½ pp.) A discussion of the article by F. J. Hobson in which the author furnishes additional information concerning the reactions which take place in the cyanidation of silver ores. 20c.

7685—CYANIDATION—Precipitation and Clean-Up at the Kendall Mill, Kendall, Mont. E. D. Cooledge. (West. Chem. and Met., Aug., 1908; 3 pp.) Describes the treatment of an oxidized silicious ore which is an altered lime occurring in a lime formation near the intrusion of a porphyry dike. The silver content of the ore is unimportant. 80c.

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7687—CYANIDATION—The Estimation of Sulpho and Ferrocyanides, etc., in Cyanide Solutions Containing Copper. Leonard M. Green. (Inst. Min. and Met., Oct. 15, 1908; 7 pp.) Describes the titration of cyanide solutions containing copper; this metal greatly complicates the determination of ferro- and sulphocyanides. Methods used and precautions to be taken.

7688—CYANIDE PRACTICE—Recent Cyanide Practice in Korea. A. E. Drucker. (Min. and Sci. Press, Oct. 3, 1908; 3 pp.) Describes the mill and the treatment of ore at the Oriental Consolidated Mining Company's plant in northwestern Korea which is crushing about 30,000 tons of low-grade ore per month. Illustrated. 20c.

7689—CYANIDING SLIME. E. B. Wilson. (Mines and Minerals, Oct., 1908; 4½ pp.) Continuation of article previously indexed; describes the filter press process; method of construction and operation of the Sweetland press and the Blaisdell pressure filter. Illustrated. 20c.

7690—ELECTRICAL EQUIPMENT of Gold Mines. H. J. S. Heather. (Instn. of Min. and Met. Apr. 9, and July 9, 1908; 36 pp.) Discussion and contributed remarks on the above paper which was previously mentioned in this Index.

7691—FILTER PRESS—An Improved Press for Filtering Cyanide Slimes. Ernest J. Sweetland. (Min. Wld., Oct. 10, 1908; 1 1/3 pp.) Describes the Sweetland filter press, together with the construction and method of operating it. This press handles slime from the cyanide process efficiently and economically. Illustrated. 20c.

7692—GOLD DREDGING on the Choco River, Republic of Colombia, South America. H. G. Granger. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 27 pp.) Describes the conditions existing in the placer districts of the country and the various river systems together with data of the gravels in the country.

7693—IDAHO—Central Idaho Gold Districts—I. S. J. Jellum . (Northwest Min. News, Sept., 1908; 8 pp.) Describes the early discoveries, the geography, topography and geology and some of the principal mines in Central Idaho. Illustrated. 20c.

7694—MEXICO—Guanajuato, the Great Silver Camp of Mexico. Claude T. Rice. (Eng. and Min. Journ., Oct. 3, 1908; 3¼ pp.) The ore now milled comes mainly from the dumps, but the mine tonnage is increasing and the Veta Madre mines are being reopened. Illustrated. 20c.

7695—MEXICO—Jesus Maria and Flores Mills, Guanajuato. Claude T. Rice. (Eng. and Min. Journ., Sept. 26, 1908; 5½ pp.) By cyaniding the silicious gold and silver ore an average extraction of 86 per cent. silver and 88 per cent. gold has been obtained. Illustrated. 20c.

7696—MEXICO—Rejuvenation of Guanajuato Camp, Mexico. Thomas C. Welch. (Min. Wld., Oct. 3, 1908; 4 pp.) Describes the operations of the leading companies and the benefits derived from electric power and improved railway facilities. Illustrated, 20c.

7697—MEXICO—The Granadeña Mines. S. F. Shaw. (Min. and Sci. Press, Sept. 19, 1908; 2½ pp.) Describes the working methods of mining, character of the ore-body and the treatment of the ore in the mill of the Granadeña Mining Co., situated in the Hidalgo mining district about three miles northeast of Santa Barbara. 20c.

7698—MEXICO—The Silver Mines of Mexico. A. F. J. Bordeaux. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 12 pp.) Gives a general survey of the character and present condition of the silver mines of Mexico and is a summary which should be useful to mining engineers.

7699—MEXICO—The Working Mines of Guanajuato. Claude T. Rice. (Eng. and Min. Journ., Oct. 24, 1908; 2 2/3 pp.) Describes some of the recently reopened bonanza mines on Veta Madre and some mines near La Luz and some in the Sierra system. Illustrated. 20c.

7700—NEVADA—Present Conditions in Goldfield District, Nevada. G. E. Walcott. (Min. Wld., Oct. 10, 2 1/3 pp.) Describes the leasing system and the operations of the Goldfield Consolidated, Florence and other properties. Gives data of the royalties paid, the cost of electric power and other information. Illustrated. 20c.

7701—ONTARIO—Larder Lake. H. L. Kerr. (Can. Min. Journ., Oct. 1, 1908; 2 pp.) Describes briefly some of the conditions existing at this gold camp in northern Ontario and describes the route into the camp. Illustrated. 20c.

7702—ONTARIO—The Origin of the Silver of James Township, Montreal River Mining District. A. E. Barlow. (Quart. Bull. Can. Min. Inst., July, 1908; 24 pp.) Describes the geology and the occurrence of silver in this district lying northwest of Cobalt, Ontario, and describes the various minerals and rocks in the district. Illustrated by interesting photographs.

7703—PLACER MINING—Using Placer Water to the Best Advantage. D. A. Stovall. (Min. Sci., Oct. 1, 1908; 1¼ pp.) Gives practical suggestions for appliances to be used in placer work to increase both economy and efficiency. Illustrated. 20c.

7704—PROSPECTING—River Prospecting for Gold. M. MacFarlane. (Min. Journ., Sept. 19, 1908; 1 p.) Describes a simple and effective plant for river prospecting and methods of work in French Guinea. Illustrated. 40c.

7705—QUEENSLAND—The Mount Morgan Gold Mining Company, Ltd. (Queensland)—I. and II. J. B. Wilson. (Aust. Min. Stand., Aug. 12 and 19, 1908; 5½ pp.) Gives the history of the mine and a description of the ore occurrence. Also describes the methods of mining and timbering. To be continued. 60c.

7706—REFINING—Electrolytic Refining of Gold, Silver and Copper at the United States Mint, San Francisco, Cal. Robert L. Whitehead. (Electrochem. and Met. Ind., Oct., 1908; 2 pp.) Conclusion of article previously indexed. Describes the melting room and various furnaces used therein. Illustrated. 40c.

7707—REFINING OF SILVER BULLION Containing Arsenic and Antimony. B. Neilly. (Quart. Bull. Can. Min. Inst., July, 1908; 8 pp.) Describes the method used by the author and tells of some of the difficulties encountered which were overcome. Illustrated.

7708—SAMPLING—Rand Sampling Practice. J. S. Oliver. (Min. Journ., Sept. 19 and 26, 1908; 2½ pp.) Discusses the uniformity of the ore deposits on the Rand and some of the precautions which must be taken in sampling. Describes the systems of sampling employed, and points out some of the errors which are likely to occur. 60c.

7709—SIBERIAN MINING—Hints to Foreigners. (Min. Journ., Sept. 19, 1908; 2½ pp.) Gives much valuable information to any one contemplating a journey in Siberia. Discusses cost of traveling, conditions met with, labor, laws, taxes, freight, cost of supplies and weights and measures. Illustrated. 40c.

7710—SILVER MILL—Hacienda Buburon, an Old Mexican Silver Mill. Mark R. Lamb. (Eng. and Min. Journ., Oct. 3, 1908; 2 pp.) Primitive crushing and grinding appliances in the Guanatjuato district were the predecessors of the stamp and the tube mills of the modern cyanide plant. Illustrated. 20c.

7711—SLIME TREATMENT in Western Australia. Percy Ifould. (Aust. Min. Stand., Aug. 12, 1908; 1½ pp.) Describes the Cassell process which has been installed at a number of mines in Western Australia. Illustrated. 40c.

7712—SLIMES TREATMENT—Method of Settling Slimes, as Applied to Their Separation from Solution in Cyanide Treatment. (Inst. of Min. and Met., July, 1908; 12 pp.) This is a further contribution by H. G. Nichols to the discussion of his paper on this subject and contains much additional information. Illustrated by curves.

7713—STAMP BATTERIES—Reinforced Concrete Foundations for Stamp Batteries. S. J. Truscott and J. P. Fuller. (Inst. Min. and Met., Oct. 15, 1908; 8 pp) Describes the replacement of wooden mortar blocks at Redjang Lebong, Sumatra, by reinforced concrete. Illustrated.

7714—STAMP MILL—An Electrically Driven 300-Stamp Mill on the Rand. Ralph Stokes. (Min. Wld., Oct. 3, 1908; 2 2/3 pp.) Describes the heavy stamp mill erected to serve the Jupiter and Simmer which has a capacity of 75,000 tons per month. Illustrated. 20c.

7715—STAMP MILLS—Some of the Large Stamp Mills of the World—I. Charles C. Christensen. (Min. Wld., Oct. 10, 1908; 3 2/3 pp.) Describes the arrangement of the Alaska Treadwell and Alaska Mexican mills, giving production and cost data. Illustrated. 20c.

7716—STAMP MILLS—Tremain Steam Stamps. C. E. Parsons. (Min. and Sci. Press, Sept. 19, 1908; 3½ pp.) Describes the operation of these stamp mills in Rhodesia and gives cost of their installation, also cost of mining, milling and general expense. 20c.

7717—STAMP MILLING—Weighing Ore in Stamp Mills. Frank A. Ross. (Eng. and Min. Journ. Oct. 24, 1908; 1¼ pp.) Describes the method of weighing ore immediately behind the batteries at the stamp mill of the Daly Reduction Company, Ltd., at Hedley, B. C. Illustrated. 20c.

7718—TAILINGS—Innovation in Gold Saving. F. B. Craig. (Am. Min. Rev., Oct. 10, 1908; 1¼ pp.) Describes the construction and operation of the Stover-Glaze gravity amalgamator and concentrator, a device for separating gold and concentrates from dredger and mill tailings. 20c.

GRAPHITE

7719—GENESIS OF GRAPHITE—A Contribution to the Discussion on the Genesis of the Graphite in Argenteuil and Labele Counties, in the Province of Quebec. F. Hille. (Can. Min. Journ., Aug. 1, 1908; 2½ pp.) Discusses the various hypotheses which have been advanced on this subject and contains some theories by the author. 20c.

7720—MEXICO—The Graphite Mines of Santa Maria. James C. Mills. (Mines and Minerals, Oct., 1908; 1½ pp.) Describes the occurrence of graphite and its uses. The deposit in Mexico is the largest on the Western Continent. The method of treating graphite is also briefly described. 20c.

7721—PRODUCTION of Graphite in 1907. Frank L. Hess. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 4 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

IRON AND STEEL

7722—ANALYSES OF BRITISH PIG Irons Shown at the Franco-British Exhibition, 1908. (Iron and Steel Inst., Sept., 1908; 22 pp.) Describes various kinds of British pig iron, special alloy pig irons, raw materials and by-products. The paper contains complete analyses of the material shown and the exhibit is classified by districts.

7723—ANALYSIS—The Technical Analysis of Magnetite, Hematite and Limonite. R. Bolling. (Can. Min. Rev., Aug. 1, 1908; 1½ pp.) Describes sampling, crushing, drying, grinding and the chemical analysis of these ores of iron. 20c.

7724—BASIC OPEN-HEARTH PROCESS—The Chemical Control of the Basic Open-

Hearth Process. Alfred Harrison and Richard V. Wheeler. (Iron and Steel Inst., Sept., 1908; 20 pp.) Indicates how far the chemist can control the basic open-hearth process and outlines a scheme for completely following the reactions which take place. Illustrated.

7725—BLAST FURNACE—Bausysteme der Eisenhochöfen, deren Beurteilung und Wahl. J. v. Ehrenwerth. (Orst. Zeit. f. B. u. H., June 20, 1908; 3 pp.) Discusses the shape and proportions of various kinds of blast furnaces. 40c.

7726—BLAST FURNACE—The New Rebecca Furnace of the Kittanning Iron and Steel Manufacturing Company. (Iron Tr. Rev., Sept. 24, 1908; 5½ pp.) Describes the construction of this new blast furnace and the equipment at the plant. 20c.

7727—BLAST FURNACE PRACTICE—An Unusual Blast Furnace Product; and Nickel in Some Virginia Iron-Ores. Frank Firmstone. (Bi-Monthly Bull. of Am. Inst. Min. Engrs., Sept., 1908; 2¼ pp.) Describes a peculiar trouble which occurred at Furnace No. 2, Longdale, Va., in which a salamander was formed which had a peculiar compositfon.

7728—BLAST FURNACE PRACTICE—The Relation of Slow Driving to Fuel Economy in Iron Blast Furnace Practice. J. B. Miles. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 4½ pp.) Discusses the subject briefly and gives the rates of driving at a number of furnaces both in the United States and abroad.

7729—BLAST FURNACE SLAG—Die Verwendung von Hochofenschlacken. H. Passow. (Stahl u. Eisen, July 22, 1908; 2½ pp.) A discussion of cement manufacture from blast-furnace slag. 40c.

7730—BLAST FURNACE SLAG—Die Zusammensetzung der Hochofenschlacke in graphischer Darstellung. Graphische Möllerberechnung. W. Mathesius. (Stahl u. Eisen, Aug. 5, 1908; 21 pp.) Tabulates a great number of analyses of slags from German iron works, and illustrates methods for representing the results graphically, on a plane surface and on three dimensions. 40c.

7731—BLAST FURNACES—A Description of Messrs. Bell Brothers' Blast Furnaces from 1844-1908. Greville Jones. (Iron and Steel Inst., Sept., 1908; 15 pp.) The progress in British blast furnace construction is shown in this paper which is illustrated by a series of blast furnace drawings and plans of the works.

7732—CALIFORNIA—The Occurrence and Genesis of the Magnetite Ores of Shasta County, California. Basil Prescott. (Econ. Geol., Aug.-Sept., 1908; 16 pp.) Describes the deposits situated northeast of the junction of the Pit and McCloud rivers in Shasta county. Gives the topography, general geology, ore occurrence, mineralogy and genesis of the ore minerals. Illustrated. 60c.

7733—CARBIDES IN STEEL—Apparat zur Bestimmung der Karbidkohle in Stahl und Eisen. G. Mars. (Stahl und Eisen, July 22, 1908; ½ p.) Describes a simple apparatus for use in determining the amount of combined carbon in iron or steel. 40c.

7734—CARBON STEELS—The Constitution of Carbon Steels. Edward D. Campbell. (Iron and Steel Inst., Sept., 1908; 20 pp.) A further contribution to the theory of iron and steel, which discusses the constituents of carbon steels and the effect of heat treatment.

7735—CONCENTRATION of the Mesabi Ore. H. H. Stoek. (Mines and Minerals, Oct., 1908; 1¾ pp.) Describes the new method of treatment installed at Coleraine by the United States Steel Corporation in order to treat the sandy ores of the Western Mesabi range. Illustrated. 20c.

7736—CONVERTER PROCESS—Experimentelle Untersuchung des Thomasprozesses. F. Wüst and L. Laval. (Metallurgie, Aug. 8, and 22, 1908; 57½ pp.) Describes the methods and tabulates the results of an exhaustive series of tests on the operation of the converter process for steel. 80c.

7737—CORROSION—The Inhibitive Power of Certain Pigments on the Corrosion of Iron and Steel. A. S. Cushman. (Eng. Rec., Sept. 19, 1908; 1¼ pp.) A paper read before the Am. Soc. for Testing Meterials. Discusses a number of methods for testing and several observations made with paint used on iron and steel. 20c.

7738—CORROSION of Steel and Iron Tubing. H. M. Howe. (Eng. and Min. Journ., Oct. 24, 1908; 1 p.) The author replies to a criticism by G. Schuhmann of a previous contribution by him on the above subject. 20c.

7739—CUPOLA CONSTRUCTION and Operation. Thomas D. West. (Foundry, Oct., 1908; 2½ pp.) Discusses the requirements of cupolas, construction, the arrangement and function of tuyeres and the manipulation of cupolas. Paper before the New England Foundrymen's Assn. Sept. 9, 1908. 20c.

7740—DESULPHURIZING PIG IRON—Die Entschwefelung des Flusseisens im elektrischen Induktionsofen. B. Osann. (Stahl u. Eisen, July 15, 1908; 5 pp.) Results of experiments on the removal of sulphur from pig iron by the electric furnace. 40c.

7741—DRY AIR BLAST—Gayley Dry Air Blast Installation. (Iron Age., Oct. 8, 1908; 3½ pp.) Describes the new installation of the refrigerating plant of the dry blast equipment at the Illinois Steel Company's South Works, Chicago. Illustrated. 20c.

7742—DRY AIR BLAST—Gayley Dry Air Blast at Warwick Furnace. Edward B. Cook. (Paper read before A. I. M. E., Oct., 1908; 3 1/3 pp.) Cites results obtained by drying the blast at a merchant furnace of moderate size. Describes the plant used and the savings which were effected. Illustrated. 20c.

7743—ELECTRIC FURNACE—The Stassano Electric Furnace. (Iron Age., Oct. 8, 1908; 2¾ pp.) Contains a description of the furnace and gives results obtained by its use. Illustrated. 20c.

7744—ELECTRIC FURNACES—Progress in the Electric Iron and Steel and Ferro Alloy Industries—I. John B. C. Kershaw. (Iron Tr. Rev., Oct. 1, 1908; 1 2/3 pp.) Describes the improvements that have been made from time to time in the various electric furnaces. Illustrated. 20c.

7745—ELECTRIC IRON FURNACE—Röchling-Rodenhausers neuer Drehstromofen und weitere Fortschritte in der Elektrostahlerzeugung. B. Neumann. (Stahl u. Eisen, Aug. 12 and 19, 1908; 13 pp.) Describes the construction and operation of this electric furnace, and compares its results with those of the usual furnace. 60c.

7746—ELECTRIC STEEL FURNACES—Removal of Sulphur in Electric Steel Furnaces. (Electrochem. and Met. Ind., Oct., 1908; 2¾ pp.) Discusses experiments in which sulphur was removed by the use of lime in the Héroult and the Roechling-Rodenhauser furnaces. Translation of articles by H. Geilenkirchen and B. Osann which appeared in *Stahl u. Eisen* of June 17 and July 15 respectively. 40c.

7747—FREEZING-POINT of Iron. H. C. H. Carpenter. (Iron and Steel Inst., Sept., 1908; 12 pp.) Gives a review of the present condition of pyrometric science relating to the freezing-point of iron and describes a reliable determination of the freezing point.

7748—GASEOUS FUELS—Sulphur in Gaseous Fuels. F. L. Grammer. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 2½ pp.) Contains a suggestion for the operation of open-hearth furnaces where sulphur is dreaded, which consists in using blast furnace gas enriched with by-product coke-oven gas, water or natural gas. 40c.

7749—GENESIS OF ORES—A New Theory of the Genesis of Brown Hematite-Ores; and a New Source of Sulphur Supply. H. M. Chance. (Bi-Monthly Bull. A. I. M. E., Sept., 1908; 18 pp.) Describes the great range of hills and mountains stretching from New York to Georgia which consist of pre-Palaeozic schists, slates and gneissic and granitoid rocks. The author believes that the iron ores found throughout this range are the gossans or oxidized remains of pyrite deposits, practically in place, and therefore underlain by undecomposed pyrite in place.

7750—GENESIS OF ORES—Pyritic Origin of Iron Ore Deposits. G. L. Cabot. (Eng. and Min. Journ., Sept. 26, 1908; 1 p.) Discussion of the article by H. M. Chance in which further information is given. 20c.

7751—GERMANY—The Ilsede Hütte Iron Mines at Peine, Germany. L. W. Mayer. (Bi-Monthly Bull. A. I. M. E. Sept., 1908; 6½ pp.) Describes the operation of the mines and the methods of working. Illustrated.

7752—HARDENING—The Organization of the Hardening Shop. J. Lord. (Birmingham, Eng., Assn. Mech. Eng., March 7, 1908; 24 pp.) Describes the equipment of a hardening shop in a large works wherein the hardening and tempering of tool steel is accomplished with great economy. Illustrated.

7753—IRON ORE BRIQUETS—Das Brikettieren von Eisenerzen—II. (Stahl u. Eisen, Aug. 19, 1908; 9 pp.) Describes the materials and methods for briquetting iron ores at several European plants. 40c.

7754—MAGNETIC CONCENTRATION—Die magnetische Aufbereitung und ihre Anwendung für gerösteten Spateisenstein im Siegerlande. (Oest. Zeit. f. B. u. H., June 27, 1908; 6½ pp.) Discusses the suitability of magnetic separation for roasted spathic iron ore. 40c.

7555—MALLEABLE CASTINGS—Production of Malleable Castings—VIII. Richard Moldenke . (Foundry, Oct., 1908; 5 pp.) Describes the converter process giving disadvantages, the air furnace process including design, and the present method of operating air furnaces of modern construction. Illustrated. 20c.

7756—MANGANESE IN STEEL—Beitrag zur Manganbestimmung nach dem Persulfatverfahren in Stahl- und Roheisensorten. H. Wdowiszewski. (Stahl u. Eisen, July 22, 1908; ½ pp.) A comparison of this and other methods for determining manganese in iron and steel. 40c.

7757—METAL MIXER—The Future Development of the Metal Mixer and the Open-Hearth Process. Arthur E. Pratt. (Iron and Steel Inst., Sept., 1908; 39 pp.) Describes the use of the metal-mixer as a means of obtaining a uniform product for the converter or open-hearth furnace, and describes the evolution of and the purifying action of the mixer.

7758—OIL-BURNING CUPOLAS—Ueber Kupolöfen für Oelfeuerung. (Stahl u. Eisen, Aug. 19, 1908; 5 pp.) Describes a variety of oil burners and cupola furnaces designed for their use. 40c.

7759—ORE HANDLING—A 1908 Iron Ore Handling Plant. W. G. Stephan. (Iron Age, Oct. 8, 1908; 3 pp.) Describes the new ore-handling plant at the Central furnace of the American Steel and Wire Company at Cleveland, Ohio which includes the Hulett automatic unloaders, ore handling bridges and other features Illustrated. 20c.

7760—ORE TREATMENT—The Mechanical Cleaning of Iron Ores, T. C. Hutchinson. (Iron and Steel Inst., Sept., 1908; 15 pp.) Discusses the best method of treating any description of ore, by careful selection and the removal by mechanical means of as much of the impurities mixed therewith as can be easily distinguished by their appearance.

7761—PROPERTIES OF PIG IRON—Experimentelle untersuchung über den Erstarrungs und Schmelzvorgang bei technischen Roheisen. N. Gutowsky. (Metallurgie, Aug. 22, 1908; 11½ pp.) Results of tests on the thermal behavior of pig iron, with particular reference to phosphorus iron. 40c.

7762—SHEETS AND TUBES—The Production of Finished Iron Sheets and Tubes in One Operation. Sherard Cowper-Coles. (Iron and Steel Inst., Sept., 1908; 24 pp.) Describes an electrolytic process for making tubes, cylindrical vessels, sheets and wire in one or two operations from crude or scrap iron or directly from the ore without smelting, rolling or drawing and at a hitherto impossible low cost. Illustrated.

7763—SIBERIA—The Kyshtim Mines and Iron Works in Siberia. (Iron and Coal Tr. Rev., Sept. 18, 1908; ¾ p.). Describes the Niazepetrovsk Iron Works which, with the mines, are being developed by the Berm Corporation of England. The Company employs about 18,000 workmen. Illustrated. 40c.

7764—SILICON—Influence of Silicon on the Physical and Chemical Properties of Iron. Adolphe Jouve. (Iron and Steel Inst., Sept., 1908; 10 pp.) Deals particularly with the influence of silicon upon the magnetic properties and of the chemical properties of iron in relation to the reaction of chemical agents.

7765 — STEEL PLANT — Spending $75,000,000 at the Gary Steel Plant. (Mfrs. Rec., Sept. 24, 1908; 1¾ pp.) Reviews the factors entering into the construction of this mammoth steel plant and mentions some of the features which have been installed 20c.

7766—STEEL PLANT—The Equipment of the Mill Buildings of the Gary Steel Plant. (Eng. Rec., Sept. 26, 1908; 3 2/3 pp.) Describes the gas cleansing process, the blowing engines, electric power station, car loaders, the mills and pig casting plant. Illustrated. 20c.

7767—STEEL RAILS—A Test for Ascertaining the Relative Wearing Properties of Rail Steel. E. H. Saniter. (Iron and Steel Inst., Sept., 1908; 6 pp.) Describes a testing machine to determine the wear of rail steel which imitates the condition of actual practice, and at the same time, completes a test in one or two hours. Illustrated.

7768—SULPHUR DETERMINATION—Die Bestimmung des Schwefels im Eisen und Stahl. M. Orthey. (Zeit. f. angew. Chem., June 19 and 26, 1908; 10½ pp.) Description of the various methods, some of them new, for determining sulphur in iron and steel. 60c.

7769 — TESTING — Ueber Materialeigenschaften im Zerreiss-, Kerbreiss und Kerbschlagversuch. O. Thallner. (Stahl u. Eisen, Aug. 12 and 19, 1908; 13½ pp.) Compares the strengths of irons and various kinds

of steels when tested in pieces into which incisions of different sizes had been made. 60c.

7770—TITANIUM IN IRON—Titan im Gusseisen. (Stahl u. Eisen, Sept. 2, 1908; 2½ pp.) A study, by analysis and testing machine, of the influence of titanium on the strength of cast iron. 40c.

7771—WELDING—A Fusion Process for Welding Steels. (Iron and Coal Tr. Rev., Aug. 28, 1908; 1¼ pp.) Describes a process in which the metals are placed in contact and fixed so, the surfaces being clean and no flux being used. Illustrated. 40c.

7772—WESTERN AUSTRALIA—Yampi Sound Iron Ore Deposists. (Western Australia.) W. D. Campbell. (Aust. Min. Stand., Aug. 12, 1908; 1¼ pp.) Describes the ore deposits on Koolan island which have been known for many years. The ore is a high-grade hematite. Illustrated. 20c.

LEAD

7773—LEAD SILICATE—Ueber die Bildung von Bleisilikaten und ihre Rolle bei den neuen Bleigewinnungsprozessen. S. Hilpert. (Metallurgie, Sept. 22, 1908; 4 pp.) A study of the thermal reaction between lead and silica, with reference to the recent pot roasting methods of smelting. 40c.

7774—MISSOURI—Lead and Zinc Ores in Missouri. J. R. Finlay. (Eng. and Min. Journ., Sept. 26, 1908; 5 1/3 pp.) Describes the mining districts of southeast and southwest Missouri, the general character of the ore, methods and general costs of mining. Illustrated. 20c.

LIME AND SAND LIME BRICK

7775—PRODUCTION of Lime and Sand Lime Brick in 1907. Edwin C. Echel. (Advance Chapter from Mineral Resources of U. S., Calendar year 1907; 9 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

NITRATE OF SODA

7776—CHILE—The Nitrate Deposits and Industry in Chile. L. Lema. (Min. Sci., Sept. 24 and Oct. 1, 1908; 5 pp.) Continuation of article previously indexed, which describes the attitude of the Chilean Government and of the nitrate owners, the methods of working and the labor and economic conditions, including data of costs. 40c.

PETROLEUM

7777—CALIFORNIA—The Santa Maria Field of California. (Petroleum Rev., Sept. 26, 1908; 2½ pp.) This field is called the Baku of America. Describes the wells and gives figures of production from 1902 to 1907. Illustrated. 40c.

7778—CALORIFIC POWER of Petroleum Oils and the Relation of Density to Calorific Power. H. C. Sherman and A. H. Kropff. (Journ. Am. Chem. Soc., Oct., 1908; 4½ pp.) Gives the record of the calorific power of a considerable number of represented American petroleum oils and points out the approximate relationship between the density and the calorific power of such oils. 80c.

7779—ILLINOIS—Geology of Illinois Petroleum Fields. H. Foster Bain. (Econ. Geol., Aug.-Sept., 1908; 13 pp.) Describes the history of the district, together with the geology, occurrence of gas and oil and gives the production of petroleum in Illinois during the last three years. Illustrated. 60c.

7780—OIL SHALE—The Working of Oil-Shale at Pumpherston. William Caldwell. (Iron and Coal Tr. Rev., Sept. 4, 1908; 1 p.) Describes the method of mining, the driving of levels, labor, blasting, conveyance of shale underground and methods of working Paper read before the Brit. Instn. of Min. Engrs. 40c.

7781—ORANGE RIVER COLONY—Petroleum in der Orange River Colony. (Süd-Afrika.) G. J. Kellner. (Zeit. f. prak. Geol., July, 1908; 1½ pp.) Discusses the associations and occurrence of petroleum in this ristrict. 40c.

7782—ROUMANIA—Les Gisements Petroliferes de la Roumainie. L. Demaret. (Annales des Mines de Belgique, T. XIII, 3 livr., 1908; 88 pp.) Conclusion of an illustrated description of the several oil fields of Roumania.

7783—STORAGE SYSTEM—A Modern Fuel-oil Storage System. H. W. Beecher. (Min. and Sci. Press, Sept. 19, 1908; 1 p.) Describes the system of oil storage at the plant of the Pacific Light and Power Co. at Redondo Cal., in which special attention has been paid to protection from fires. 20c.

7784—SUMATRA—The Koninklyke Nederlansche Petroleum Maatschappij. (Petroleum Rev., Sept. 26, 1908; 3¼ pp.) A review of the last 25 years in this petroleum district in Sumatra which is operated by the above company better known as the Royal Dutch Petroleum Company. Illustrated. 40c.

PLATINUM

7785—COLOMBIA—The Platinum Deposits of Colombia. (Iron and Coal Tr. Rev., Aug. 21, 1908; 1/3 p.) Abstract of article in the Journ. Royal Soc. of Arts which describes the early history of the platinum industry and gives production of platinum and gold in this South American country. 40c.

7786—DREDGING for Platinum in the Urals, Russia. L. Tovey. (Eng. and Min. Journ., Oct. 10, 1908; 5 pp.) The richer deposits are becoming exhausted and the gravels too poor to be worked by hand await development of an efficient dredge. Illustrated. 20c.

PHOSPHATE ROCK

7787—ANALYSIS—A Modification of the Volumetric Molybdate Method for the Estimation of Phosphoric Acid in Acid Phosphates and Commercial Fertilizers. Rinaldo Williams. (Chem. Engr., Sept., 1908; 3 pp.) The principal point in this modification is the precipitaton of phosphoric acid as mixed ferric and calcium phosphates.

7788—SOUTH SEA ISLANDS—Phosphates in the South Seas. (Am. Fertilizer, Sept., 1908; 1¾ pp.) Describes large deposits of high-grade phosphates in the islands of the Pacific ocean. 20c.

QUICKSILVER

7789—ASIA MINOR—Mercury Mines at Koniah, Asia Minor. F. F. Sharpless. (Eng. and Min. Journ., Sept. 26, 1908; 2½ pp.) Describes ancient workings discovered after probably 3000 years on deposits of cinnabar which are now being opened and prepared for operation. 20c.

7790—ITALIAN CINNABAR DEPOSITS—Un giacimento cinabrifero nel Pliocene presso Pereta in Provincia di Grosseto. B. Lotti. (Rassegna Mineraria, July 21, 1908; 2 pp.) Describes the geology and the occurrence of mercury ore in this locality. 40c.

RARE METALS

7791—SELENIUM—Die Schmelzdiagramme der Binäen Systeme Cu-Cu_2Se, Ag-Ag_2Se und Pb-PbSe. K. Friedrich and A. Leroux. (Metallurgie, June 22, 1908; 3 pp.) Experimental results on the physical and thermal properties of alloys of selenium with copper, silver and lead. 40c.

SAND AND GRAVEL

7792—PRODUCTION of Sand and Gravel in 1907. Ernest F. Burchard. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 6 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

STONE

7793—STONE INDUSTRY in 1907. A. T. Coons. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 45 pp.) Describes the production and principal features in the industry together with other statistical data of interest.

7794—WEATHERING OF BUILDING STONE—Die Prüfung der naturlichen Bausteine auf ihre Wetterbeständigkeit. J. Hirschmald. (Zeit. f. prak. Geol., July, 1908; 8 pp.) Describes methods of testing the durability of a building stone, with remarks on the relation between composition, structure and durability. 40c.

SULPHUR

7795—MEXICO—Geologia Quimica de los Criaderos de Azufre de Mapimi (Estado de Duango.) J. D. Villarello. (Sociètè Scientifique "Antonio Alzate," Mémoires T. 26, 1908; 30 pp.) Describes the deposits, discusses their origin, proposes a utility for the product of these sulphur mines.

7796—SULPHUR ORE FOR ACID MAKING—Impiego del Minerale di Solfo per la preparazione dell'acido solforico. G. Oddo. (Rassegna Mineraria, Aug. 21 and Sept. 21, 1908; 9½ pp.) A discussion of the possibility of utilizing the crude Sicilian sulphur rock for acid making. 60c.

TIN

7797—BOLIVIA AND PERU—Una Inspeccion de los Yacimientos de Estaño de Bolivia y una Exploracion por el Mismo Metal en el Peru. E. A. L. de Romaña. (Boletin del Cuerpo de Ingenieros de Minas del Peru, No. 57, 1908; 99 pp. and many plates.) An exhaustive description of the geology and mineralogy of the Bolivian tin deposits and the methods of working them; also a review of the discoveries of tin in Peru.

7798—QUEENSLAND TIN ORE—Einige Bemerkungen über die Zinnerziagerstätten des Herberton-Distrikts in Queensland. (Zeit. f. prak. Geol., July, 1908; 5 pp.) A full discussion of the occurrence and origin of the deposits. 40c.

ZINC

7799—EUROPEAN SMELTERS—Leistung en von Zinköfen. (Metallurgie, Sept. 8, 1908; 7 pp.) A complete tabulation of the construction and operating details of the European zinc smelteries. 40c.

7800—MISSOURI—Lead and Zinc Ores in Missouri. J. R. Finlay. (Eng. and Min. Journ., Sept. 26, 1908; 5 pp.) See under "LEAD."

7801—ZINC LEAD WHITE—Making Zinc-Lead White at Canyon City. (Min. Wld., Aug. 1, 1908; 3 pp.) Describes the method of utilizing Western zinc-lead ores, after concentration, for making a high-grade pigment. Describes the construction of furnaces and the uses of zinc-lead white. Illustrated. 20c.

ECONOMIC GEOLOGY

7802—BARBADOS—Geological Formation of Barbados. J. B. Harrison. (Bull. Pub. Co., 1908, Barbados; 16 pp.) Gives a sketch of the geological formation of the Scotland district of Barbadoes and other parts of the island. 20c.

7803—FAULTS—The Growth of Faults. W. H. Marston. (Journ. Brit. Fed. Sec. Min. Students, Aug., 1908; 6 pp.) Discusses earthquakes and the causes of faults. Illustrated.

7804—IDAHO—The Ore Deposits at Mineral, Idhao. H. W. Turner. (Econ. Geol., Aug.-Sept., 1908; 11 pp.) Describes the geology, ore deposits, calcareous replacement deposits, quartz-tourmaline veins and the effect of the basalt dikes on the deposits. Illustrated. 60c.

7805—IGNEOUS ROCKS—The Distribution of the Elements in Igneous Rocks. H. S. Washington. (Bi-Monthly Bull., A.I.M.E., Sept., 1908; 30 pp.) Discusses the general chemical composition of igneous rocks and the occurrence of certain elements therein.

7806—MAGMATIC WATERS—The Relation of Magmatic Waters to Volcanic Reaction. H. W. Hixon. (Journ. Franklin Inst., Oct., 1908; 10½ pp.) Discusses the relation of magmatic waters to valcanic action, ore deposition, mountain folding and kindred phenomena. It is shown that combined water varies from 0.6 to 7.4 per cent. in eruptive rocks and this fact is used as a basis for discussion. 60c.

7807—MEXICO—Le Minéral d'Aranzaxu, Estado de Zacatecas. J. D. Villarello. (Institut Géologique, Mexico, February, 1906; 26 pp and 3 maps.) A discussion of the ore deposits and brief description of the mines operating in this district.

7808—MEXICO—Le Minéral de Mapimí. J. D. Villarello. (Instituto Géologique de Mexico, 1906; 18 pp. and 2 maps.) A discussion of the mineral resources of this district.

7809—NEW SOUTH WALES—Report on the Drake Gold and Copper Field. E. C. Andrews. (Dept. of Mines and Agriculture, N. S. W., No. 12, 1908; 41 pp.) Describes the history, geography, geology and the mine workings in this neglected field in New South Wales. Illustrated by sketches and maps.

7810—NEW ZEALAND—The Geology of the Cromwell Subdivision, Western Otago Division. James Park. (Bull. No. 5, New Zealand Geol. Surv., 1908; 92 pp.) An elaborate description of the physiography, general and economic geology and petrography of this district of New Zealand. Profusely illustrated and accompanied by 10 maps and 6 sheets of sections.

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7816—ASSAY PLAN. L. F. S. Holland. (Min. and Sci. Press, Oct. 3, 1908; ¾ p.) Suggests a plan which has been used for the Smuggler-Union Mining Company which reveals at a glance the location, value and width of veins represented by the samples assayed. Illustrated. 20c.

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7852—JIGGING—Separation of Metallic Ores by Jigging. Arthur Taylor. (Inst. Min. and Met., Oct. 15, 1908; 12 pp.) Describes the construction and section of jigs and the treatment of ores by jigging. Illustrated.

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7896—ASSAYING—Methods of Making Crucible Assay Calculation. Robert B. Brinsmade. (Min. Wld., Oct. 3, 1908; 1½ pp.) Describes the classes of ores suitable for crucible assay and the charges used when using different fluxes. Gives the solution of two practical problems to explain simplicity of calculations. 20c.

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