

THE ENGINEERING AND MINING JOURNAL

Dredging—I. Prospecting and Historical.

BY J. P. HUTCHINS.

Dredge mining is an attractive investment, largely because of cheap and quick methods used to prospect the available areas. Until recently, machines of the well-drilling type have been used almost exclusively in this work. These have much to recommend them: They are cheap and mobile; they can be operated on floating scows to sample river, lake or sea bottoms; they can be used where a large volume of water, near the surface, would make shaft-sinking costly; a large number of holes can be drilled in a short time at a comparatively small cost; in numerous cases shafts are sunk on the drill-holes for centers and the results of the two methods of prospecting check well.

At first it was held that dredging could extract about 50% of what drill prospecting indicated the value should be. Disparities were accounted for, in part, by attributing it to spilling, leakage and faulty discharge of buckets, incomplete excavation by digging apparatus, incomplete disintegration and washing in screening apparatus, and to losses in the gold-saving apparatus. About 10% was accounted for in this way. The other 40% was explained by the glittering generality, "Prospecting results are always high." No real reason has been given.

In the use of drilling machines for sampling alluvion, care must be exercised that the result shall give a correct value for the area under consideration. Careless sampling is responsible for many failures in dredging. The careless distribution of drill-holes may contribute to this. For the investigation of areas available for dredging the percussion drilling machine is peerless. The drill has its advantages and its limitations. It is necessary to determine whether the material to be investigated is indurated to such a degree as to make dredging unprofitable; but drilling machines are not always capable of determining this. In several cases areas prospected and supposed to be suitable for free working have proven so indurated as to require a different design of dredge. It is necessary to determine the presence of tenacious clay and boulders; here, again, the drill does not entirely satisfy the demand. The depth of material must be ascertained. Great care is necessary to determine whether the bed-rock is the so-called 'false bed-rock.' Its character, hardness and roughness must all be determined, and the drilling machine leaves much to be desired in connection with this phase. Shaft-sinking, however, when not too costly, is preferred. Where a large outlay is contemplated, 'prospe-

dinges' may be used. These are small, but complete, dredges. They perform, on a small scale, the functions of the ordinary dredge. They may be readily moved, having light machinery and being of shallow draft. Where the area to be prospected is traversed by a river or slough, it is easy to move such a dredge from place to place. Where there are no means for floating the dredge through waterways, a still smaller dredge, moved on rollers or skids, may be used. Such prospecting dredges are more costly in installation and operation than drilling machines, but greater reliability of results will justify the additional expenditure. The value per cubic yard, character of material, presence of large boulders and clay, depth of bed-rock and character of bed-rock can be determined; an additional advantage of great importance is that it furnishes a basis for estimating the cost of operating a large dredge.

To understand present practice and improvements it will be well to consider some of the steps in the history of dredging. The first successful work in the United States was at Bannack, in Montana. The dredge was the so-called 'double-lift' type, *i. e.*, the material was excavated by a chain of buckets and discharged about 15 ft. above the deck into a trommel with 5-inch perforations. Larger stones were discharged over the side. The fine was elevated by a centrifugal pump to a sluice and discharged 100 ft. astern. This type is still advocated by some managers and, unquestionably, has advantages, especially when the clay content is so tenacious as to cause loss of gold by incomplete disintegration and insufficient washing. The problem at Bannack was to evolve a dredging pump to stand the handling of 2,000 cu. yd. of fine every 24 hours. The first pump used on the dredge was worn out after 70 hours' use. This problem was solved, and a pump of excellent construction, designed by the dredge manager, was used for several years. This pump was taken apart after seven months' run, over 400,000 cu. yd. of fine having passed through it. Its repairs for the seven months had been about \$150.

Other managers in Montana, wishing to eliminate the dredging pump, built the 'single-lift' dredge. The single-lift dredge discharges the material about 28 ft. above the deck. This form of construction introduced a new set of problems. The tendency, for various reasons, was to build of heavier construction throughout.

After this the New Zealand type was introduced into the United States. One was installed at Oroville, in California. A number of dredges of this type have been placed in California, Colorado, Idaho, Oregon, Montana and elsewhere. These dredges were different from those of the double- and single-lift types. The bucket of the New Zealand dredge had been evolved in districts where gold dredging had been successful. On the other hand,

the bucket previously used in this country had been evolved in harbor and canal dredging. In the bucket evolved here, the earlier installation was deficient in strength.

The New Zealand type of gold dredge discharges the material about 16 ft. above the deck into a trommel, the largest perforations of which are about ½ inch in diameter. A stacker, made of a chain of steel buckets, elevates all material not passing through perforations of trommel and discharges it astern of the dredge at a height sufficient to allow for the expansion of the tailing. The fine passes over the gold-saving devices and is discharged 10 to 15 ft. astern of the dredge. On the double- and single-lift dredges no stackers were necessary, for the reason that, with the larger perforations of the trommel, the comparatively small percentage of stones could be discharged over the side of the dredge without shoaling the pond too much. The gold-saving apparatus introduced with the New Zealand type was also essentially different. The hydraulic-mining undercurrent is a wide sluice with steep grade; it spreads the material over a wide surface in a shallow sheet, after previous removal by a grizzly of all stones of diameter greater than 1 or 2 inches. It was evolved in California, but had been successfully used in New Zealand. A modified form of this device was used on a number of dredges with this difference, that cocoa matting (instead of riffles charged with quicksilver) was used to catch the gold. The double- and single-lift gold dredges depended principally, and, in some cases, entirely, on a comparatively narrow sluice with riffles, charged with quicksilver. The material passed over the riffles in a deep sheet, a condition not thought to be conducive to a high saving where gold in particles is encountered.

In the manipulation of the types there was a marked difference. The New Zealand gold dredge worked on a head line running over the bow to an anchorage to hold the dredge against the digging bank. The buckets are lowered in a vertical plane and the material caved by undermining at the bottom. The other types worked on a pivotal stern-spud, and used side-feeding of the buckets horizontally through an arc of 120°, beginning at surface and lowering the digging apparatus one foot at a time, when the lateral limits of the cut were reached. No attempt was made to undermine and cave down this material. Several shovel dredges were built at the time the New Zealand type was installed. On these dredges an undercurrent (similar to that used in hydraulic mining in California) was used. On these was used a shaking screen, similar in action to the rocker of the early California miner. Belt stackers were installed on these machines. These dredges were costly in operation and have been mostly discarded.

As already mentioned, next came a

dredge with the bucket as evolved in canal and harbor dredging. This was strengthened, however, and was provided with shaking screen, belt-stacker and hydraulic-mining undercurrent, usually called 'gold-saving tables.' This was a combination of the better features of the double- and single-lift and shovel dredges. Small buckets were used in this installation, though the tendency had been toward increased capacity. This dredge, while an improvement, had a fault common to all the dredges at that time, and a fault still common to many; this is a lack of co-ordination of capacity in the four processes of which gold dredging consists, namely, excavating, screening, sluicing and tailing. Hence the next improvement was the building of a dredge in which this co-ordination of capacities received more attention. This was done by enlarging screens, tables, stacker and pumps. It was designed to work either on spud or head line, and with a slightly higher discharge of material to permit a greater elevation of coarse tailing farther from the stern. The pivotal spud was placed inboard, to make the digging- and the tailing-arcs of more nearly equal lengths. The troubles encountered when these arcs were of unequal length were thus eliminated. The disposition of the tailing had formerly been a continual source of difficulty and expense. This dredge was designed to allow working on a head line, and also side-feeding through an arc of long radius. This permitted the working of a wide cut, and the disposition of tailing without covering adjacent virgin ground. Previously much untouched territory had been wasted by being covered with tailing. Impact riffles (or those where the fine is dropped on riffles charged with mercury) and larger gold-saving areas were also introduced. There have been no radical changes in design or construction of gold-dredging machinery of late, save that general effort looks to the strengthening and bettering of machinery and hull, and the cheapening of cost of operating.

Building construction with hollow concrete blocks is increasing in vogue. The *Engineering News* has recently offered a prize for the best paper on this new type of construction, which offers many advantages, especially cheapness. A factory, 50 by 100 ft., walls 28 ft. above foundation, recently constructed at Binghamton, New York, cost \$513 for the blocks in the wall and only 6c. per sq. ft. for the mortar and labor of laying, making the total cost \$1,101, or approximately 13c. per sq. ft. of wall, the latter being 10 in. thick. The cost of a 17-in. brick wall, with brick at \$13.25 per M laid, would have been \$3,339, no allowance being made for openings in either case. The hollow wall was laid with blocks 12 by 24 by 10 inches.

Japan has two 1,500-kw. steam turbines in a street-railway power-house in Tokio.

The Utilization of Peat.

The first practical attempt to market the large deposits of peat found in the United States is now being made by the Peatcoal Company, of New York. It is working on a peat bog in New Rochelle, New York, close by the tracks of the New York, New Haven & Hartford Railroad's Harlem river division, and is disposing of its product, as domestic fuel, to the householders of the neighborhood. The work is in charge of H. H. Watherspoon, Jr., who has made a special study of the peat industry in Europe. The company owns five acres of the bog and controls the remaining area, about 25 acres in all. The bog has an average depth of 27 ft., reaching 40 ft. at the center of its area, and is entirely free from stumps or other obstructions. The peat is stated, with complete knowledge of European occurrences, to be superior in quality to that of any of the famous Bavarian localities.

No fixed plant is provided or required; a few temporary sheds serve to protect the finished product, although recent tests

veyor, the upper end of which is hinged above the hopper of the mill, is lowered into the trench at one side, from which peat is dug by hand-shoveling and thrown into the conveyor. In the newest design, refractory objects are automatically ejected through the side of the mill before they can cause injury to the disintegrating beaters on the macerating knives. A Hornby-Ackroyd kerosene engine of 15 h.p. is belted to the mill, and is mounted on the same movable platform, the whole apparatus resting on a short section of track for the purpose of locomotion. The mill itself weighs three tons. The engine consumes \$1.75 worth of kerosene in 10 hours. A trench, 20 ft. wide, is to be carried across the bog to a depth of 5 ft., when the next 20-ft. strip will be attacked to the same depth; or, when completed, the next trip will take another 5 ft. from the same trench. When the hole is exhausted, an ice-pond is ready for another enterprise. No attempt is made at artificial drying or compressing, the former process requiring a large and unnecessary



FIG. 1. PEAT MACHINE AT WORK.

of material that has lain on the open ground through the last winter show only slight loss of thermal capacity. A gasoline-driven centrifugal pump assists in draining the bog, and a portable 18-in. gauge track, laid upon pressed-iron ties, facilitates the handling of material between the molding machine and the drying ground. The surface of the bog is drained by a system of ditches, 4 ft. deep, surrounding and crossing its area, discharging toward one corner, from which the water is lifted over a dike, and emptied into a neighboring stream. The surface vegetation was first removed by plow and harrow, making the bog ready for digging.

The machine is the one designed and for 40 years improved upon by C. Schlickeisen, of Rixdorf-bei-Berlin, Germany. It consists essentially of a disintegrator, a macerator and a spiral propeller, by which this moist pulp is crowded through a brass-lined die, in three parallel square strands which, emerging on removable boards, are cut by hand into blocks a foot long. The outer end of a trough con-

sumption of fuel to accomplish the same result that can be attained by natural means, although in a greater length of time, while, owing to the unavoidable lamination of the pulp under pressure, the latter process makes a less durable briquette than is produced by the natural contraction of a network of fibers. A feature of the Schlickeisen process is that the tarry constituents of the peat are forced to the surface of the pulp-strands, which, upon drying, protect the inner mass from subsequent absorption of moisture, without hindering the effectual drying of the inner portion. The truth of this is evident from inspection of the material during its drying stages.

The product of the mill, averaging 6,500 pieces per hour, and containing about 85% water, is laid upon the level ground, and in two hours loses about 10% of its moisture, when the blocks can be handled without breaking. They are then stacked in small piles and in the next two hours lose nearly another 10% of their water, after which the drying process goes on more

slowly. Under favorable conditions, about 18 days are required to finish the drying. In this process the blocks shrink from a volume of 120 cu. in. and a weight of 6 lb., to 24 cu. in. and 1.3 lb. The finished product carries 12% of chemically combined water, but as this may vary, the fuel is sold by cubic measure instead of by weight.

Coal Briquettes in Japan.

According to a recent consular report, the proposed plant for the manufacture of briquettes in Japan has been located at Tokuyama, and commenced operations April 24, under the ownership and control of the Japanese Admiralty, which also owns the Omine mine, from which the coal will be taken for the manufacture of



FIG. 2. DIGGING PEAT FROM BOG.

The expense of the operation is small, owing to the simplicity of the plant and the cheapness of Italian labor. The average wage of the 21 men regularly employed is \$1.75 per day; four more men are called in at times. The daily output ranges between 30 and 35 tons, at a total cost of \$1.50 to \$1.75 per ton, although lower figures have been reached.

Hydrocyanic (prussic) acid may be detected by an alkaline solution of phenol-

the briquettes. To convey the coal to the factory a railway has been built, about 10 miles in length, connecting the mine with the main line of the Sanyo railway system. The capacity of the factory under normal conditions is said to be about 150,000 tons per annum, its full capacity being, however, 250,000 tons. The estimated cost of the briquettes is \$4.50 per ton. The total expense incurred in starting the plant was about \$500,000. The machinery was purchased in England. The output



FIG. 3. DRYING PEAT BLOCKS.

phthalin with a 1:2,000 solution of copper sulphate. A red color is produced as the phenolphthalin is oxidized to phenolphthalein. The test is said to be sensitive in a 1:500,000 solution of hydrocyanic acid. The observation is quoted from F. Weehuizin.

Phosphate rock is reported as a discovery in San Diego county, California. The indications are said to be promising.

of the factory of the Rentan Kaisha, which manufactures briquettes at Nagasaki, was 50,000 tons in 1904. The capacity of the plant has been increased from 70,000 to 120,000 tons per annum, and the Japanese Admiralty continues to take the output at \$8.50 per ton.

Nine-tenths of all the varied trouble in operating gasoline engines is connected with ignition disorders.

The Price-Pancoast Colliery. I.

BY GEORGE W. HARRIS.

While the anthracite industry has been developed along practically fixed lines, as regards the mining of the coal for a number of years, yet the surface arrangements and methods of preparing the article for market reflect a marked improvement in mechanical features and the production of smaller sizes. I shall not attempt to review the subject as regards the whole anthracite field, but shall endeavor, in the description of the Price-Pancoast colliery, to present features of practice characteristic of the upper portion of the Lackawanna region. This region includes mine inspection districts 1, 2, 3 and 4, or territory from Forest City to Pittston. In 1903 this section produced 18,817,214 tons, or 28.01% of the 67,171,951 tons mined in all the anthracite regions, and engaged 29,211 out of a total of 151,827 employees in and about the mines in the whole field.

The Pancoast and Pine Brook breakers were both destroyed by fire about one year ago and have just been rebuilt. In planning the new structures, J. R. Bryden, the general manager of these and other collieries in the district, aimed to have them the best and most up-to-date plants in the field. Particularly in the case of the Pancoast was this made possible, for not only the breaker but practically all the surface improvements have been rebuilt on the most substantial and improved lines.

The Price-Pancoast colliery, opened about 23 years ago, is situated in the borough of Throop, within 1,000 ft. and northeast of Scranton, and includes 535 acres of coal lands lying southeast of the Lackawanna river. The coal seams dip toward the river at 7 to 11°. Local shallow basins are occasionally encountered, but mining is not complicated by any pronounced anticlinals or synclinals. The main hoisting shaft is about 3,300 ft. directly up the pitch from the river, and the dip workings are developed by slopes. To the south and east, or up the pitch, self-acting or engine planes bring the coal to water-level gangways which lead to the shaft. Altogether, in the four seams there are seven stationary engines on the slopes and planes. The pitch in all the chambers permits the ready handling of cars by mules.

At present four seams are being worked, but the larger part of the coal comes from the Clark and No. 2 Dunmore beds, the lowest so far developed. The relation of the seams to each other and their depth below the surface are shown by the following section, taken at the main shaft: From the surface to the Diamond bed (9 ft. 6 in. thick), 160 ft.; rock, 60 ft. 6 in.; top split Big bed; rock, 50 ft. 9 in.; bottom split Big bed (3 ft. to 4 ft.); rock, 142 ft.; Clark bed (5 ft.); rock, 168 ft.; No. 2 Dunmore bed (5 ft.). At present the top split of the Big bed and No. 1

and 3 Dunmore seams are not being worked.

The mine is not troubled with wet workings; most of the water occurs in the upper seams and is handled by 12

tower of the same material, aggregating 100 tons of steel. From the top of the concrete shaft lining to top of rail at the cage landing, where the loaded cars run to the dump, is 121 ft. 9 in. From this lat-

nels and the cage guides are carried by 15-lb., 7-in. I-beams. At the top cage landing there is a platform, carried by the connecting span, 31 by 75 ft. in area. The arrangement of the tracks leading to the dumps is shown in one of the accompanying illustrations. After the car is dumped, it passes to a side track, and is raised by a short car haul to an elevation sufficient to carry it by gravity to a transfer carriage back of the cage. The empty is then shifted so that it can be run upon the cage and push the loaded car off. Eight men and one boy are employed on this platform to move and dump cars. In addition there is a dock boss for the company and one for the men at the dump.

At the dump the coal passes to the breaker proper. This building is 110 ft. wide, 130 ft. long on the center line and 130 ft. in height. It is built of timber, with mortise and tenon joints, 1,508,000 feet of lumber being used in its construction. To further strengthen stringers subject to especially heavy strain, metal angle brackets are used. The main posts are 14 by 14 in. yellow pine and the



FIG. 1. GENERAL VIEW OF PRICE-PANCOAST COLLIERY.

Knowles, one Jeanesville and one Dean pump. The large number of pumps is necessitated by the occurrence of small basins in which water collects. The lower seams are dry and dusty.

The mine has two main shafts, coming out near the breaker. The coal-hoisting shaft is 11 by 34 ft., with two hoisting compartments, each 7 by 11 ft., and two airways, one 6 by 11 ft. and the other 14 by 11 ft. The other shaft serves as the hoistway for men. The shafts are lined down to solid rock with concrete, 3 ft. thick, which serves also as foundation for the steel head frames.

In considering the Price-Pancoast breaker, as regards machinery and methods employed, it should be borne in mind that it is especially adapted to the 'dry' preparation which has always been characteristic of the Lackawanna region, water being used only in the washeries in the recovery of the smaller sizes. Much of the practice in vogue in the other anthracite regions would require the introduction of water to be applicable to the Scranton colliery. Here the breaker is run entirely dry, and water is used only in the washery. The Lackawanna method has resulted in the accumulation of the immense culm heaps during former mining operations, whereas great quantities of fine coal have been carried into the streams or spread over large areas and lost by the use of water in the breaker.

The Price-Pancoast breaker was designed for a capacity of 2,000 tons a day, and is arranged in two symmetrical units about the center. The center of the hoisting compartments is not on the center line of the breaker, a line passing through the centers of the hoisting shaft and the dump being deflected from the breaker center line by an angle of $49^{\circ} 11'$.

The head frame is practically a part of the breaker, but it was built by the Passaic Steel Company, of Paterson, N. J., while the breaker proper was designed and built by Kingsley & Wescott, of Scranton, Pa. The head frame is constructed of steel, with a connecting span and intermediate

ter point to the center of the sheaves is 35 ft. Thus from the lowest seam worked there is a hoist of about 722 ft., which is made in 22 sec., 7 sec. additional being required to change cars at top and bottom, making an average of two cars per minute. From the top seam, three cars are

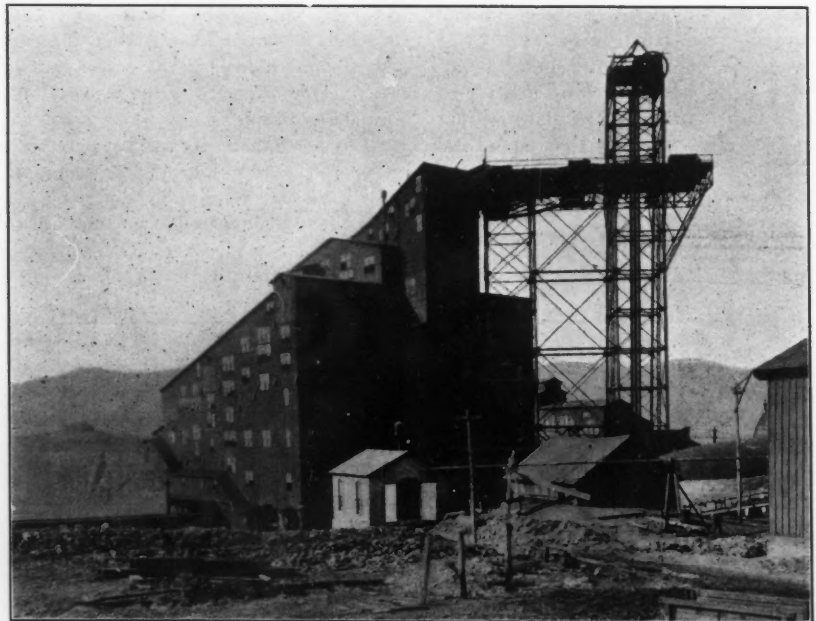


FIG. 2. PRICE-PANCOAST BREAKER.

hoisted per minute. At the time of my visit to the colliery the best record of a run of 9 hours was 1,019 cars. The mine car is known as the old Diamond car, which holds about 1.75 tons. This record is all the more noteworthy for the reason that the coal all comes from one opening. There are breakers in which more cars are dumped in a day, but the coal comes from several shafts.

The head-frame towers have posts made of four angles from 5 by $3\frac{1}{2}$ by 7-16 in. to $3\frac{1}{2}$ by 3 by 5-16 in. and lattice work, with diagonal braces and struts of $3\frac{1}{2}$ by $2\frac{1}{2}$ by 5-16 in. angles. These struts connecting the towers are 9-lb., 7-in. chan-

nel posts are 12 by 12 in. hemlock. Stringers carrying rolls, main-line shafting, or heavy machinery are 12 by 14 in., or 12 by 16 in. oak. The whole frame is stiffened by 8 by 8 in. diagonal braces. The foundations are rubble masonry laid in cement mortar with a cap of concrete 1 ft. thick.

The breaker makes seven sizes, namely, grate, egg, stove, chestnut, pea, No. 1 buckwheat and No. 2 buckwheat or rice coal; the washery makes four sizes, namely, pea, and three grades of buckwheat. All the waste from the breaker, including fine coal and slate, goes to the washery, to which is sent also culm from

an adjacent bank. The coal from the dump takes two general courses, dividing at the first set of bars—that dropping through the first set being prepared separately from the larger coal dropping through and over the second set of bars; however, all coal of the same size goes to its pocket on either side of the breaker

est coal which has passed over both sets of bars *A* and *B*, while on either side are chutes for the coal passing through the first set *A*. All of this coal goes to one set of main screens. The first set of bars *A* are spaced 2 in. apart, and through these pass all the fine coal and thin slate and bony, which goes direct to a pocket,

larger pieces are cleaned of slate by men and then sent to rolls *D*, which break to egg and under. The coal from the rolls, together with that which passes through shaker *C*, goes to circular screen *E*, where it is separated into egg, stove, nut and pea sizes, everything smaller going to buckwheat circular screen *F*. Screen *F*

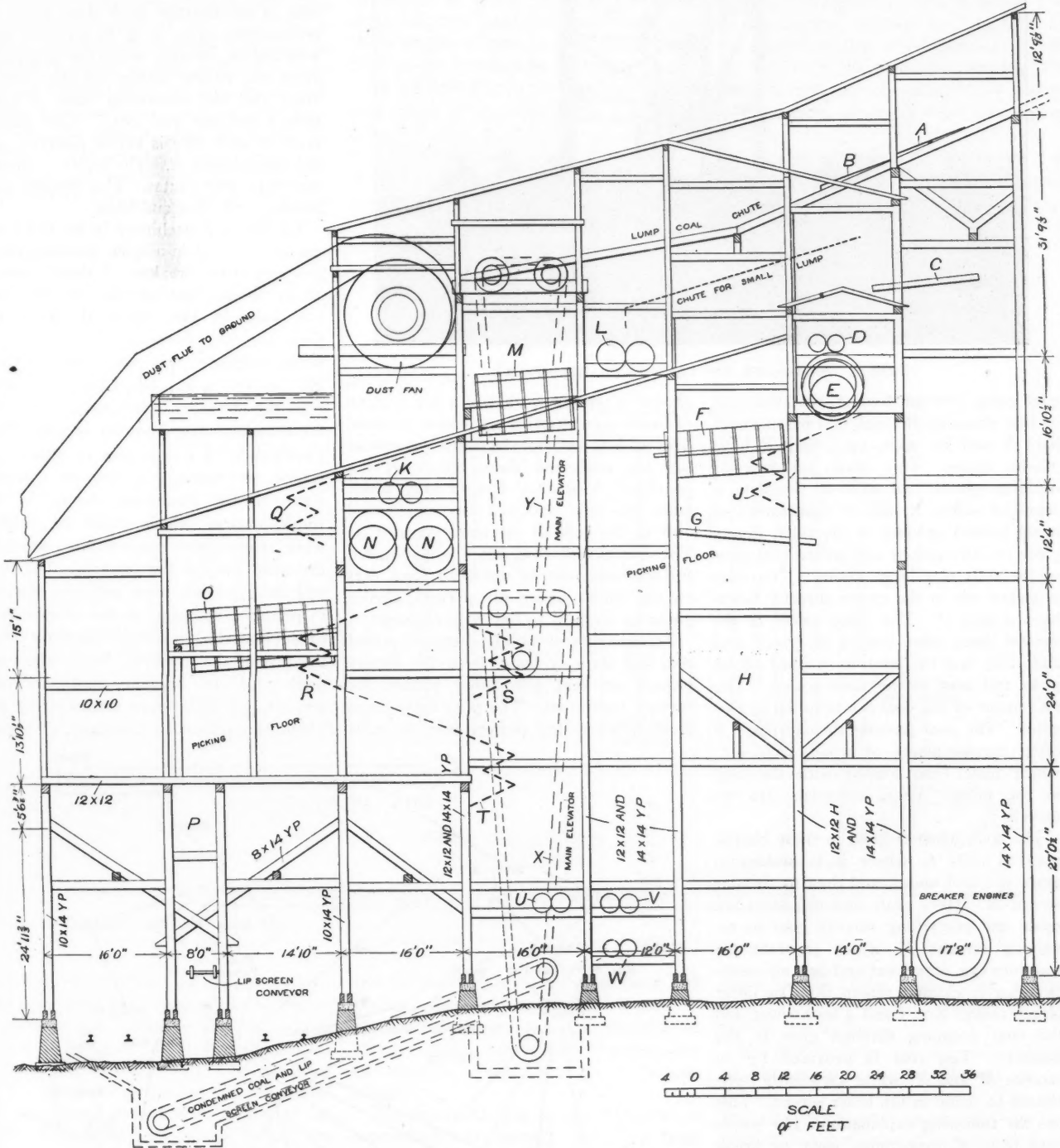


FIG. 3. PRICE-PANCOAST BREAKER. DIAGRAM SHOWING GENERAL ARRANGEMENT.

and the mixture is sent to market. The nature of the two lots of coal is quite different, requiring special treatment, and by preparing each by itself, the capacity of the breaker is increased, economy effected and cleaner coal shipped.

At the dump are two sets of chutes for handling coal. In the center is the large-

whence it is fed to shaker *C* or mud-screen. In following the course of the coal, it is to be understood that one side only of this double breaker is included in the enumeration of machinery and labor employed; any variation will be noted.

First, considering the preparation of the mud-screen coal. From shaker *C* the

makes No. 1 buckwheat, all smaller going to shaker *G*, which screens out the dirt, the coal going to pocket *H*, and thence by conveyor to the boilers for raising steam. The four sizes made by screen *E* first go over four Fern pickers, which remove the flat pieces of bony and slate, and then to four Emery slate pickers *J*. From the

Emery pickers, the egg, stove and nut are hand-picked by men and boys, and finally the prepared coal goes to pockets for shipment.

Having described the preparation of the

for the other sizes, at *R*. The clean coal from all screens finally goes to pockets *P*, 12 in number, which are so arranged that coal can be loaded on two tracks. Each pocket holds 100 tons, so that the breaker

lift to the top being made in this manner, as the whole distance would make too heavy a strain on one elevator.

The whole breaker contains four shakers, twelve circular screens, six pair of coal rolls and twenty-seven Emery pickers, the latter distributed as follows: Eight at *J*, two at *Q*, one at *S*, eight at *R* and eight at *T*. There are two picking floors on each side of the breaker, each floor being approximately 25 by 30 ft. in area and filled with chutes, through which the coal passes from the Emery pickers to the pockets. Here the last remaining slate is hand-picked by men and boys. One picking floor on each side is below pickers *J* and the other below *R*. The waste is thrown into side slate chutes. The breaker force numbers 100 men and boys.

The breaker machinery is driven by two engines, housed in a brick building, which is a part of the breaker. A double engine, 18 by 30 in., running 100 rev. per min., and built by the Finch Manufacturing Company, of Scranton, Pa., runs the screens, shakers, rolls and pickers. A single, 16 by 24-in. Allis-Chalmers engine runs the elevators, conveyors and the fan for removing dust from the breaker. This distribution of power was to provide an elastic arrangement in case of a breakdown to the machinery driven by the single engine, which could be stopped while repairs were made without affecting the main part of the breaker. The rock and culm pockets have sufficient capacity to permit a stoppage of the scraper lines of an hour or so without shutting down the rest of the breaker. Rope drives are used. Of the breaker machinery, the screens and rolls were furnished by the Finch Manufacturing Company, of Scranton,

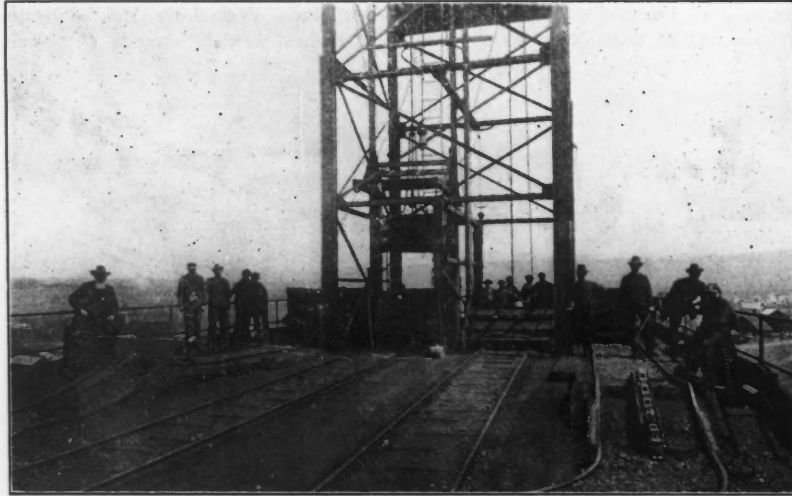


FIG. 4. TRACKS ON TOP LANDING OF HEAD-FRAME.

coal going through bars *A*, the treatment of that dropping through and passing over bars *B* will be taken up. Bars *B* have 3½-in. spaces. This latter coal consists of large pieces, and most of the slate is removed before it has an opportunity of being broken up finer in the rolls. Every piece of slate picked out before coal goes to the rolls is a large saving. The slate is picked out in the chutes directly below bars *A* and *B*. The large pieces in the central chute often consist of mixed coal and slate, and the latter is chipped off by picks and sent to the slate pocket. The movement of this coal is controlled by two gates. The coal passing through bars *B* often carries pieces of wood, iron, etc., which have been loaded with the coal in the mine. These materials are removed.

The coal, when cleaned in these chutes, goes to rolls *L*, where it is broken to grate size and under, and then to circular screen *M*. Here grate and egg sizes are made and everything smaller goes to revolving screens *N*, which separate the coal into egg, stove, nut and pea, all smaller going to circular screen *O*. The latter screen makes Nos. 1 and 2 buckwheat, and the coal dropping through goes to the washery. Egg coal is provided for in screens *M* and *N*, while apparently none should be made in the latter screen. This has the following explanation: The stove-coal rolls *K*, sometimes used to break down grate size, lose a tooth occasionally and let egg coal through. Then the market sometimes demands all the egg coal that can be made, in which case the rolls *K* are spread to make egg size. The grate, egg, stove, nut and pea coal from these screens go over Emery pickers, and any remaining slate is hand-picked from all the above sizes except pea. The Emery pickers for grate are placed at *Q*; those

should be able to work half a day without railroad cars, starting on empty pockets. The loading lips have screens for removing fine coal, and these screenings are conveyed to another scraper line, which takes this fine coal and any condemned coal to the boot of the main elevator *X*. The condemned coal, after being loaded for shipment, can be unloaded from cars on the tracks under the pockets, thence going by scrapers to the main elevator.

The middling or tailing, pieces of mixed coal and slate or bony, from the Emery pickers are sent over other pickers for further separation. The pure bony from these latter tailing pickers goes to rolls

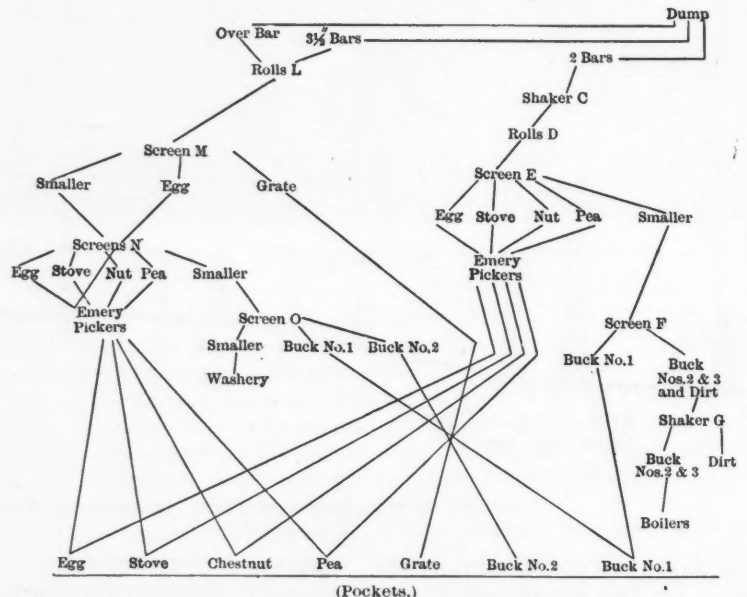


FIG. 5. COURSE OF COAL THROUGH BREAKER—ONE SIDE.

U, *V* and *W*, according to size, and this re-broken bony is then sent again, by elevators *X* and *Y*, through screens *M* and *N*. Elevators *X* and *Y* are each 58 ft. center to center of sprocket wheels, the

ton, Pa., the conveyors by the Cross Engineering Company, of Carbondale, Pa., and the slate pickers by F. H. Emery & Co., of Scranton, Pa.

(To be continued.)

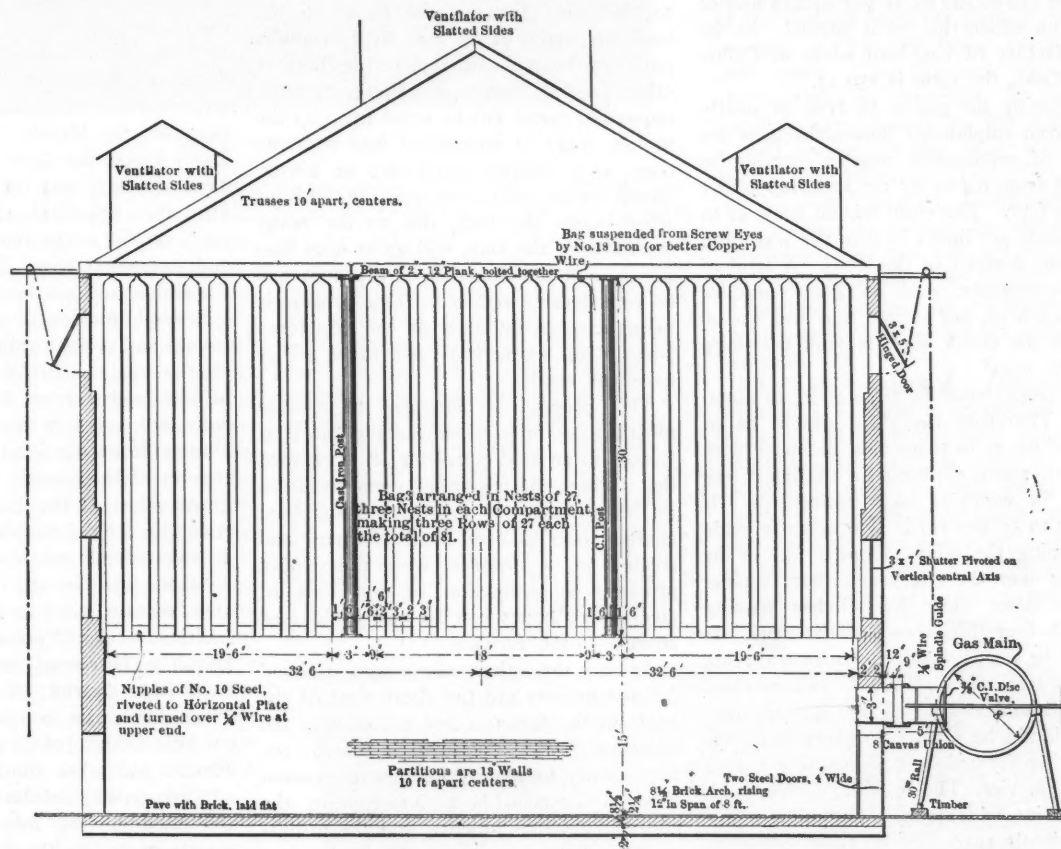
Bag-Houses For Saving Fume.

One of the most efficient methods of saving fume and very fine dust in metallurgical practice is by filtration through cloth. This idea is by no means a new one, having been proposed by Dr. Percy, in his treatise on lead, page 449, but he makes no mention of any attempt to apply it. Its first practical application was found in the manufacture of zinc oxide direct from ores, initially tried by Richard and Samuel T. Jones in 1850, and in 1851 modified by Samuel Wetherill into the process which continues in use at the present time in about the same form as originally. In 1878 a similar process for the manufacture of white lead direct from galena was introduced at Joplin, Mo., by G. T. Lewis

house is now a standard accessory. It has received also considerable application in connection with silver-lead blast-furnace smelting and in the desilverizing refineries. Its field of usefulness is limited only by the character of the gas to be filtered, it being a prerequisite that the gas contain no constituent that will quickly destroy the fabric of which the bags are made. Bags are also employed successfully for the collection of dust in cyanide mills, and other works in which fine crushing is practiced, for example, in the magnetic separating works of the New Jersey Zinc Company, Franklin, N. J., where the outlets of the Edison dryers, through which the ore is passed, communicate with bag-filtering machines, in which the bags are caused to

until it is necessary to discharge the filtered fume by shaking. In the bag-houses employed in the metallurgy of lead, the fume is introduced at the bottom into brick chambers, which are covered with sheet-iron plates, provided with the necessary nipples; or else into hopper-bottom, sheet-iron flues, with the necessary nipples on top. In either case the bags are tied to the nipples, and are tied up tight at the top, where they are suspended. When the fume is dislodged by shaking the bags, it falls into the chamber or hopper at the bottom, whence it is periodically removed.

The cost of attending a bag-house, collecting the fume, etc., varies from about 10c. per ton of ore smelted in a large



BAG-HOUSE, GLOBE SMELTING WORKS.

and Eyre O. Bartlett, the latter of whom had previously been engaged in the manufacture of zinc oxide in the East, from which he obtained his idea of the similar manufacture of white lead. The difference in the character of the ore and other conditions, however, made it necessary to effect numerous modifications before the process became successful. The eventual success of the process led to its application for filtration of the fume from the blast-furnaces at the works of the Globe Smelting & Refining Company, at Denver, Colo., and later on for the filtration of the fume from the Scotch hearths employed for the smelting of galena in the vicinity of St. Louis.

In connection with the smelting of high-grade galena in Scotch hearths, the bag-

revolve for the purpose of mechanical discharge. The filtration of such dust is more troublesome than the filtration of furnace fume, because the condensation of moisture causes the bags to become soggy.

The standard bag-house employed in connection with furnace work is a large room, in which the bags hang vertically, being suspended from the top. The bags are simply tubes of cotton or woolen (flannel) cloth, from 18 to 20 in. in diameter, and 20 to 35 ft. in length, most commonly about 30 ft. In the manufacture of zinc oxide, the fume-laden gas is conducted into the house through sheet-iron pipes, with suitably arranged branches, from nipples on which the bags are suspended, the lower end of the bag being simply tied up

plant like the Globe, to about 25c. per ton in a Scotch-hearth plant treating 25 tons of ore per 24 hours.

No definite rules for the proportioning of filtering area to the quantity of ore treated have been formulated. The correct proportion must necessarily vary according to the volume of gaseous products developed in the smelting of a ton of ore, the percentage of dust and fume contained and the frequency with which the bags are shaken. It would appear, however, that in blast-furnaces and Scotch-hearth smelting a ratio of 1,000 sq. ft. per ton of ore would be sufficient under ordinary conditions. The bag-house originally constructed at the Globe works had about 250 sq. ft. of filtering area per ton of charge smelted, but this was subsequently

increased, and Dr. Iles, in his treatise on lead smelting, recommends an equipment which would correspond to about 750 sq. ft. per ton of charge. At the Omaha works, where the Brown-De Camp system was used, there was 80,000 sq. ft. of cloth for 10 furnaces 42 by 120 in., according to Hofman's 'Metallurgy of Lead,' which would give about 1,000 sq. ft. per ton of charge smelted, assuming an average of eight furnaces to be in blast. A bag-house in a Scotch-hearth smeltery, at St. Louis, had approximately 900 sq. ft. per ton of ore smelted. At the Lone Elm works, at Joplin, the ratio was about 3,500 sq. ft. per ton of ore smelted, when the works were run at their maximum capacity. In the manufacture of zinc oxide the bag area is from 150 to 200 sq. ft. per square foot of grate on which the ore is burned. In the manufacture of zinc-lead white at Cañon City, Colo., the ratio is 150 : 1.

Assuming the gas to be free, or nearly free from sulphurous fumes, the bags are made of unbleached muslin, varying in weight from 0.4 to 0.7 oz. avoirdupois per square foot. The cloth should have 42 to 48 threads per linear inch in the warp and the same number in the woof. A kind of cloth commonly used in good practice weighs 0.6 oz. per square foot and has 46 threads per linear inch in both the warp and the woof.

The bags should be 18 to 20 in. in diameter. Therefore the cloth should be of such width as to make that diameter with only one seam, allowing for the lap. Cloth 62 in. in width is most convenient. It costs 4 to 5c. per yard. The seam is made by lapping the edges about 1 in., or by turning over the edges and then lapping, in the latter case the stitches passing through four thicknesses of the cloth. It should be sewed with No. 50 linen thread, making two rows of double lock-stitches.

The thimbles to which the bags are fastened should be of No. 10 sheet steel, the rim being formed by turning over a ring of 0.25 in. wire. The bags are tied on with 2-in. strips of muslin. The nipples are conveniently spaced 27 in. apart, center to center, on the main pipe.

The gas is best introduced at a temperature of 250° F. Too high a temperature is liable to cause them to ignite. They are safe at 300° F., but the temperature should not be allowed to exceed that point.

The gas is cooled by passage through iron pipes of suitable radiating surface, but the temperature should be controlled by a dial thermometer close to the bag-house, which should be observed at least hourly, and there should be an inlet into the pipe from the outside, so that, in event of rise of temperature above 300°, sufficient cold air may be admitted to reduce it within the safety limit.

In the case of gas containing much sulphur dioxide, and especially any appreciable quantity of the trioxide, the bags should be of unwashed wool. Such gas

will soon destroy cotton, but wool with the natural grease of the sheep still in it is not much affected. The gas from Scotch hearths and lead-blast furnaces can be successfully filtered, but the gas from roasting furnaces contains too much sulphur trioxide to be filtered at all, bags of any kind being rapidly destroyed.

The Knoth Steel Process.

Henry Knoth, superintendent of the steel plant at Monterey, Mex., in a recent patent (U. S., 788,650) proposes that the liquid slag (resulting from an initial heat prepared in the usual manner in a basic open-hearth furnace) be used continually to purify other heats by being returned to the same furnace, the losses in the basic properties of the slag, by continually purifying heats, being replaced by lime or other fluxing materials. Preferably, the unpurified metal (to be acted upon by the molten slag) is introduced into the furnace in a molten condition; or better, blown in an acid converter, in both of which cases the bath, due to the ready condition of the slag, will go at once into action, and the duration of the heat will be considerably reduced. This process is being extensively used at the Monterey Steel plant, where it is said to be giving excellent results.

The process is intended to operate most successfully when the pig metal is treated in an acid converter; it is claimed that (where the unpurified metal is blown in the converter to 1% carbon, and then charged into an open-hearth furnace and treated in accordance with the Knoth process) a production of 200 tons of steel in 24 hours can be easily obtained from a 30-ton furnace.

Among the other advantages claimed for the process are the short time of the heats in the furnace, and accordingly the increased life of the furnace hearth; the opportunity to repair the furnace bottom between heats without interrupting the continuity of the process, and the utilization of all the basic properties in the slag.

In his recent series of lectures on 'Flame' at the Royal Institution, Sir James Dewar illustrated in a striking form the large amount of energy expended in the production of a small amount of light. The following figures show how inefficient the various lighting devices now employed are from a scientific point of view: Candle—Percentage of light, 2; non-luminous energy, 98. Oil—Percentage of light, 2; non-luminous energy, 98. Coal gas—Percentage of light, 2; non-luminous energy, 98. Incandescent lamp—Percentage of light, 3; non-luminous energy, 97. Arc lamp—Percentage of light, 10; non-luminous energy, 90. Magnesium lamp—Percentage of light, 15; non-luminous energy, 85. Cuban firefly—Percentage of light, 99; non-luminous energy, 1.

The Correlation Committee of the United States and Canada.*

Shortly before the death of the late G. M. Dawson, formerly Director of the Canadian Geological Survey, a movement was inaugurated (by President C. R. Van Hise, of the University of Wisconsin) looking to the official co-ordination of the nomenclature and stratigraphy of the formations common to both Canada and the United States. The result was a conference between Dr. Bell, of the Canadian Survey, and Dr. Walcott, of the United States Survey, and the selection of committees, the personnel of which included: C. W. Hayes and C. R. Van Hise for the Geological Survey of the United States, and Robert Bell and Frank D. Adams for the Canadian Survey. The committee, severally or collectively, visited the Lake Superior regions in question in 1904. These were: The Marquette; the Penokee-Gogebic; the Mesabi; the Vermilion; the Rainy Lake; the Lake of the Woods; the Thunder Bay; and the original Huronian (the area described by Logan and Murray), on the north shore of Lake Huron, and extending from Sault Ste. Marie to Thessalon and northward.

Several incidental corrections of sequence and unconformity were established; as the real unconformity between the Middle and Lower Marquette series, a point not noted in the publication of the United States Geological Survey; the intrusion of the granite in the Marenescan green schist in the Penokee-Gogebic district; the slight misplacing by Logan of an overturned and so-called 'lower slate conglomerate' in the original Huronian area; certain relations of unconformity or faulting, or both, possibly overlooked by Logan in Huronian conglomerates of the Echo Lake district; the recognition of the Thessalon series, a name given to green chloritic schist (of Logan), by the committee; and other similar corrections and additions. The substance of the report is contained in the following stratigraphy recommended by the committee, with the exception of the note by Dr. Lane.

CAMBRIAN—Upper sandstones, etc., of Lake Superior.

Unconformity.

PRE-CAMBRIAN.

Keweenaw (Nipigon).

Unconformity.

Huronian { Upper (Animikie).

Unconformity.

Middle.

Unconformity.

Lower.

Unconformity.

Keewatin.

Eruptive contact.

Laurentian.

* Dr. Lane dissents as to the position of the Keweenaw as follows: "The use of pre-Cambrian above does not imply unanimity in the committee with regard to the pre-Cambrian correlation of the Keweenaw—a topic the committee as such did not investigate."

The report was alphabetically signed by the committee as follows: Frank D. Adams, Robert Bell, A. C. Lane, C. K. Leith, W. G. Miller, Charles R. Van Hise.

* Abstracted from the *Journal of Geology*, Feb.-March, 1905.

The Newhouse Mine and Mill.

The Newhouse Mines & Smelters is the corporate name of the properties in Beaver county, Utah, controlled by Samuel Newhouse. The mine, locally known as the Cactus, is in Copper gulch, three miles from Frisco. The first development was through a 616-ft. shaft, levels from which, at 50 and 100 ft., opened into the orebody

side. The mill is built in two units, operating separately or in unison as may be desired, each belt-conveyor carrying ore to one unit. Each unit has two sets of 15 by 36-in. rolls, two elevators, followed by a series of rotary screens, seven two-compartment jigs, sixteen Wilfley tables, four Wilfley slime-tables, eight cone-settlers, two sump-tanks and a number of

tanks is pumped to settling tanks at the head of the mill, the settling passing through a launder to slime-tables, the overflow being turned into the jigs as jig water. The concentrate from jigs and tables goes to sets of shaking launders, which deliver their product into cars at the foot of the mill. The tailing from No. 1 and 2 is delivered to 3.5-mm. screen, the oversize from the latter going to the fine-crushing rolls, the undersize taking the course of sizing as described above. The fine jig-tailing passes out, having passed the 3.5-mm. screen in the first process, and consists of a very clean silicious material, practically free from mineral. In the process, five jig sizes are made and five table-sizes, beside the slime. These products show a very perfect separation of the mineral from the gangue, the composition of the ore being favorable to such work. The Hancock jig, devised and patented in Australia, but manufactured in this country by the Allis-Chalmers Company, is also being installed to handle the undersize from the 3.5-mm. screens, after passing it through a hydraulic sizer to extract the slime. It is anticipated that this will greatly increase the mill's capacity. At present the mill is handling 600 tons of ore daily, making therefrom about 100 tons per day of concentrate.

The mill is operated by electric power, by means of motors distributed advantageously through the mill. The power-plant consists of three 200-h.p. Babcock & Wilcox steam boilers, using coal as fuel; an Ingersoll-Sergeant air compressor with the capacity of 2,300 cu. ft. of free air per minute; a Westinghouse steam turbine, Parsons patent, which drives a 400-kw. Westinghouse generator



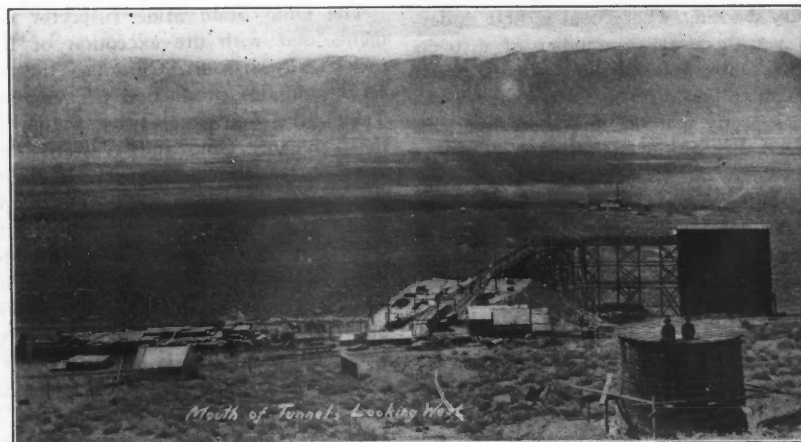
NEWHOUSE MILL.

extending from the surface to the bottom of the shaft. The 616-ft. station is reached by an adit, 6,000 ft. long, which enters on the southern slope, facing Wah Wah valley, and penetrates a mountain spur of granite. The mill and the town of Newhouse are situated a mile from this 'tunnel' entrance, on the margin of the valley. This adit is used for transportation and drainage, the entire output of the mine passing through it to the ore-bins at the entrance; it has a single track of 30-lb. rails, haulage being effected by two 50-h.p. electric locomotives of Westinghouse make. The cars are filled at various chutes having gates, which are opened and closed by compressed air, manipulated by a lever. Each car holds four tons. Seven cars at a time are pushed into a dumping cylinder at the top of the ore-bin; the cylinder is turned 180° by compressed air, emptying the ore upon grizzlies, the oversize passing to the crushers, of which there are three, Allis-Chalmers make.

The mine is well developed, the work showing the main orebody to be from 150 to 200 ft. wide; it has been opened a distance of about 1,000 ft. on the strike of the vein. This is a fissure in the granite, having a dip of 60°. The gangue is granitic in character, the ore being chiefly a chalcopryite, accompanied by some gray copper and native copper. The ore is said to carry an average of 40% copper, beside \$2 per ton in gold and silver. There appear to be two fissures 100 ft. apart. Levels have been run regularly from the shaft to both fissures as far down as the 500-ft. station. All development thus far is above the adit level, so that there is no hoisting or pumping. The ore, after being crushed to 1½ in., is transported in self-dumping railroad cars from mine to mill.

The mill-bin has a V-shaped bottom, discharging through automatic feeders upon two belt-conveyors, one on each

slime-settling tanks. The conveyor delivers ore to the boot of the dry elevator, and the latter to a 14-mm. screen; the undersize from the screen to a finer screen and the oversize to the coarse rolls. The undersize noted above goes to a double screen, having an inside of 7 mm. and an outside of 3.5 mm. The oversize from the 7-mm. screen goes to No. 1 jig, the oversize from the 3.5 mm. passing to No. 2 jig. The undersize from the 3.5 mm. goes to a 10-mesh No. 20-wire trommel; the oversize from the latter going to No. 3 jigs, the undersize to two 10-mesh, No. 18-wire screens. The oversize from the last screen passes to the No. 4 jig, the undersize to Calumet sizers. The first pocket of the latter sends product to No.



MOUTH OF TUNNEL, LOOKING WEST.

5 jig, the various other Calumet sizes passing to different Wilfley tables. The overflow from Calumet sizers passes through a launder to a set of cone-shaped settlers, the overflow going to sump-tanks in the basement of the mill. The cones settle a slime product which is drawn off at the bottom, passing thence to Wilfley tables. The slime in the sump-

at a speed of 3,600 rev. per min. This is one of the few installations in the West in which the steam turbine is used in electric generation. The water supply for the mill, and other uses, is piped from Wah Wah springs, on the opposite side of the valley, in which 56,000 ft. of piping is required. The intake pipe, which brings the water from various sources to the

initial reservoir, is of wood; that requiring much pressure is of steel, there being 10,000 ft. of 14-in. pipe and 34,000 ft. of 12-in. The mine development and production are under the superintendence of M. M. Johnson. A. J. Bettles, consulting metallurgist of the Newhouse properties, designed the mill and has general direction of its operations.

Shot-Firers in Ohio.

In view of the importance of the subject and the controversy aroused in Illinois over the matter of shot-firers, the report of Chief Inspector of Mines of Ohio, George Harrison, and District Mine Inspector, James P. Davis, is of special interest. The report was made to the Peerless Coal & Mining Company and to the employees of the Big Walnut mine, of Salem, Ohio, under date of July 30, 1904.

The following is an abstract:

We made a complete examination of the Big Walnut, the Cherry Valley and Leetonia mines in Columbiana county, and the Fairview mine in Mahoning county. We had been led to believe that some of the mines in that locality were of a very dry and dusty nature, and that great danger of dust explosions existed, more especially so in the Big Walnut mine. In this mine, however, we failed to find a particle of dust except that from the drillings of the auger holes in the coal, every working place being more or less damp. We also found that the Big Walnut mine was the only one in the locality where the shot-firers were employed.

'Fast shooting' or blasting coal off the solid, requires the use of much greater quantities of powder, and is always accompanied with greater danger than ordinary shooting, where coal is first undercut, yet there are a number of districts in the State, notably the Jackson county and Massillon districts, where the practice is pretty general, and there is an increased disposition on the part of miners everywhere to dispense with mining, or undercutting, where it is possible to blast off the solid. This practice prevails to such an extent as to have a great tendency to increase the number of miners by placing a premium on unskilled labor. Also in order to get a more marketable product, coal companies are prompted to introduce machines in thin seams and wherever the natural disadvantages do not absolutely exclude their installation.

The Leetonia we found to be a drier mine, and in many instances the conditions more unfavorable for the miners firing their own shots than in the Big Walnut mine, yet the miners there fire their own shots, and have adopted a commendable system. The man in the entry commences firing at the proper time, and as he ignites his fuse he calls to the men next to him in the rooms; he then makes his way along the entry; the two men

notified by him ignite their fuse and follow, giving warning to the next two in turn, and so on until all the men in the entry have ignited their fuse. Four ft. 6 in. of fuse is used in each shot. When the entry man is far enough to be out of danger he stops every man in the entry at that point as he comes out there; they then proceed out of the mine. Any man violating that rule is suspended from work for one week, and on a second offense is discharged.

We find that there is no explosive gas to be discovered in the Big Walnut mine, no coal dust or any exceptional danger more than ordinarily encountered by miners in other parts of the State where solid shooting is practiced, and in consequence, even if we had the power to order shot-firers at the Big Walnut mine or in the Leetonia district, it would be equally fair to the miners in other districts to order shot-firers where fast shooting is in practice.

Bituminous Coal Production in 1904.

The following table contains data taken from the reports of mine inspectors of the various States. The most interesting feature is the computation of the tonnage mined per man:

States.	Total No. Employees.	Total No. Tons Mined. (Short Tons).	Tons Mined to Each Employee.
Pennsylvania...	155,569	99,600,167	640.2
Illinois.....	54,744	37,077,897	676.9
West Virginia..	41,981	30,222,881	719
Ohio.....	45,834	24,583,815	536.3
Alabama.....	17,850	11,273,151	631.5
Indiana.....	17,838	9,872,404	553.4
Kentucky.....	13,679	7,108,594	519.6
Colorado.....	10,769	6,766,551	629.2
Maryland.....	5,996	4,277,196	713.4
Missouri.....	9,875	4,115,695	416.7
Washington....	4,633	2,905,689	627.1
Utah.....	2,215	1,563,274	705.7
Total.....	380,911	239,538,695	
Pennsylvania—Anthracite....	161,330	73,594,369	456.1

The Ohio State Mine Inspector comments that with the exception of Kentucky and Missouri, Ohio has the lowest bituminous production per employee. Taking the four competitive States, Illinois, Indiana, Ohio and Western Pennsylvania, which compose the Inter-State Agreement, he finds that Illinois produced 140 tons per man more than Ohio; Western Pennsylvania 105 tons more; and Indiana 17 tons more. These results can be explained in various ways, but one of two things is certain, viz., either the Ohio coal is higher in cost of production or the miners of Ohio have less work and earn less money in the aggregate than those of other States, a subject of vital importance.

The difficulties of mining readily account for the comparatively small anthracite tonnage per man.

Thermite is a mixture of granulated aluminum with iron oxide. In the chemical exchange, the oxidation of the aluminum gives off twice as much heat as that absorbed by the reduction of the iron, so that a high temperature may be attained.

White Pine County, Nevada.

SPECIAL CORRESPONDENCE.

The copper resources of this district have attracted the attention of mine operators of means, as a result of which plans are complete for erecting a 1,000-ton concentrating mill and two smelting plants near Ely this season; and it is given out by those in position to speak authoritatively that work will begin at once on the construction of a railroad from Toano, a station on the Southern Pacific, to Ely, a distance of 156 miles, with a 9-mile spur from Ely up to the mines. The two principal companies interested in the district are the Nevada Consolidated Copper Company and the Giroux Consolidated Mines Company. The first named will erect a mill and smelting plant on Murray creek, below Ely, and this is the company that is to build the railroad. The Giroux Consolidated Mines Company has ordered the equipment for a smelting plant, to be erected at its mines on Knob hill, six miles from Ely. The Nevada Consolidated Copper Company results from the merging of the interests of the Boston-Nevada, White Pine Copper Company and the New York & Nevada. At its head are James Phillips, president; M. L. Requa, vice-president and general manager. F. W. Bradley and J. B. McKenzie, of San Francisco, are consulting engineers, while Edwin F. Gray is general superintendent at the mines. The company's holdings embrace 74 mining claims on the copper belt, lying west of Ely, and a large acreage in Murray creek valley, together with water rights on this creek. The copper belt has nearly an east-west strike and varies in width from 1,200 to 4,000 ft. The belt or zone is bordered on the south by a lime country and on the north by porphyry. A gossan cap is everywhere apparent on the zone, except in two places where a trachyte dike cuts across the belt. The greatest of the lodes is 600 ft. wide. The capping ranges in depth from 50 to 250 ft.; it consists of a quartz-porphyry, poor in copper and gold, with low percentage of iron. Below the capping, the copper appears usually as chalcocite, but in some places there is a good deal of chalcopyrite. While there are, of course, high-grade streaks and bunches, the general run of the ore is low grade, as has been demonstrated by thorough milling tests, which were conducted for this company last year by J. B. Fleming. The company has two main centers of operation, at Copper Flat and Ruth, which are nearly two miles apart. The Copper Flat shaft is 420 ft. deep, the one at Ruth being 30 ft. deep. The Columbia shaft, less than a mile east of the Ruth, is 300 ft. deep. Extensive development is being conducted from Ruth and Copper Flat shafts. The mill to be erected will have modern appliances for concentrating copper ore; the smelting plant will include converters for reducing the matte to blis-

ter copper. Mill and smelter will be close together and steam-power will be used at the start, but the matter of hydraulic generation of electric power at some distant point is being considered. Mr. Gray states that there are 6,000,000 tons of ore of profitable grade blocked out in these mines.

The Giroux Consolidated Mines Company, of which Joseph L. Giroux is president and manager, has an area of 1,000 acres, lying on the same copper belt as that of the Nevada Consolidated, and adjoining the latter holdings on the west. Mr. Giroux's center of operations is at Knob hill, which is a gossan-capped elevation in the center of the copper zone. The development here is being conducted from five different shafts. There are, however, two main working shafts, 630 and 450 ft. deep, respectively. These two are on opposite sides of Knob hill. The gossan capping is not highly mineralized, the valuable orebodies being below it, where they occur as chalcocite and chalcocite. Drifting from one of the principal shafts shows the ore-shoot to be 100 ft. wide, and the drifting extends in ore a distance of 850 ft. The mine has a large tonnage of 7% ore that can be smelted without concentration. There is, also, an ample supply of milling ore, running from 2% to 3.5% copper. The smelting plant will be erected at Knob hill, and it is expected to be in operation in November. There are about 60 men on the payroll at present. Louis Fraser is mine superintendent.

The writer drove into the Ely district from Newhouse, Utah, *via* Osceola, and went out *via* Hamilton to Eureka. Most of the hauling at the present time is from Eureka, which is the nearest railroad point. The distance from Ely to Eureka is 96 miles; from Ely to Newhouse is 140 miles; from Ely to Wells, on the Southern Pacific, is 150 miles. At Cherry creek, 50 miles north of Ely, are the properties of the Glasgow & Western and Wide West Mining Company, where a small force of men is employed. Hamilton is half way between Ely and Eureka, where thirty years ago Treasure hill was one of the magnets of Nevada silver and lead miners. A small tonnage of high-grade ore is being produced there now by lessees, and there are indications of a gradual revival, as outside parties become interested.

The Machalske process converts calcium phosphate (mixed with alkaline chlorides and coal, and heated to a high temperature) to a phosphorus chloride, and carbides of calcium and of the alkali metal used, sodium for instance. Heated in the presence of nitrogen, the calcium carbide is transformed to the cyanamide, itself a valuable fertilizer.

If explosions occur in the muffler of the gasoline-engine, add more battery.

Cost Data of the Gunnison Tunnel.

BY LINDSAY DUNCAN*.

The west portal of the Gunnison Tunnel was started by excavating an incline sloping 25% to the sub-grade of the tunnel, which was at a depth of 55 ft. below the original surface. A heading was then commenced, 8 by 9 ft. in section, and driven, without timbering, into the soft adobe shale for a distance of 75 ft.; at this point the character of the soil changed abruptly to gravel, through which the heading was being driven (this was at the time of the termination of the Taylor-Moore contract), a total distance of 670 ft. having been made.

The gravel necessitated constant and careful timbering, caves and runs occurring frequently. As would naturally be expected, the cost of this work varied, the factors affecting the cost being the distance from the portal, the amount of timbering required, and the varying character of the soil. In driving the heading through the adobe, coal augers were used for drilling and the ground was freely shot up in advance of the work. Three 8-hour shifts were used, the force at this time consisting of six men at the breast, a driver and one man on the dump. Two dump carts, of ½ cu. yd. capacity, were employed for removing the spoil, using a snatch team of three horses for the incline.

The total cost of driving the heading for the first 70 ft. through the adobe, using the methods indicated, was \$251, which was distributed as follows: Ammunition, \$60; candles, \$2; mucking, \$115.50; disposal of spoil, \$73.50; total, \$251, or \$3.58 per linear ft. The cost of driving through gravel for the remaining 600 ft. (no powder being used in this portion) was as follows:

Sta. 0 + 70 to 1 + 70: Lumber, \$155; candles, \$3.25; mucking, \$269.25; timbering, \$35; spoil disposal, \$132.50; total, \$595, or \$5.95 per ft.

Sta. 1 + 70 to 2 + 70: Lumber, \$170; timbering, \$50; mucking, \$272.50; candles, \$2.50; disposal of spoil, \$159. Total, \$654, or \$6.54 per foot.

Sta. 2 + 70 to 3 + 70: Lumber, \$150; timbering, \$60; mucking, \$381; disposal of spoil, \$140; track-laying, \$151; rail and tiles, \$63. Total, \$945, or \$9.45 per foot.

Sta. 3 + 70 to 4 + 70: Lumber, \$145; mucking, \$270; timbering, \$45; disposal of spoil, \$156; track-laying, \$40; rail, ties, etc., \$14; pumping, \$15. Total, \$685, or \$6.85 per foot.

Sta. 4 + 70 to 5 + 70: Lumber, \$160; timbering, \$60; mucking and laying track, \$404.50; disposal of spoil, \$252.30; rails, etc., \$18; pumping, \$20. Total, \$914.80, or \$9.148 per foot.

Sta. 5 + 70 to 6 + 20: Lumber, \$90; timbering, \$31; mucking and laying track, \$263; disposal of spoil, \$132.60; rails, etc.,

\$9; pumping, \$11. Total, \$536.60, or \$10.732 per foot.

At this point it was decided to abandon the attempt to drive the heading at the high rate of speed (75 ft. per day) necessary to complete the contract within the required time, and to proceed in a more economical and deliberate manner, using fewer men. By proceeding along the line of the tunnel for a distance of 4,700 ft., and by sinking a shaft 250 ft., a good quality of shale would be reached and the requisite speed made more easily than in the gravel of the portal heading.

The shaft, started May 11 (at first with a hand windlass, and later with a small second-hand hoist), was sunk 105 ft. in 17 days at a cost of \$1,285. The shaft is single compartment, 10 by 5 ft., and is cribbed for a distance of 40 ft. with 4-in. native pine. A collar 10 ft. high was placed upon the mouth of the shaft and was surmounted by the usual gallow-frame, built of 8 by 8-in. Oregon fir.

The data given herewith cover the period from February 28, 1905, when the west heading of the tunnel was commenced, to May 27, when, owing to financial difficulties (in which the Taylor-Moore Company had become involved), the Gunnison Tunnel contract was abandoned by that company and was taken over by the United States Reclamation Service.

Zinc Production at Broken Hill.

According to the report of the Department of Mines of New South Wales the output of zinc concentrate in 1904 was 57,016 long tons, from which 300 tons of spelter were produced locally, the remainder being exported. The treatment of zinky tailing in this district has now settled down to a well-established practice.

The Broken Hill Proprietary Company, employing the Delprat process, has increased its plant from 1,000 tons capacity weekly to 3,500 tons. This company is now manufacturing its own salt-cake, using sulphuric acid made by the Carmichael-Bradford process. The Block 14 Company has modified its mill and is now using the Delprat pans in connection with the Potter process. The Australian Metal Company and the Central mine are using magnetic separators; the latter concern doubled the capacity of its plant in 1904, and is now treating 2,400 tons of tailing per week.

The second cement mill in Mexico has been organized under the corporate name of the Monterey Portland Cement Co., with a paid-up capital of \$400,000. It will be located at Monterey, the capital of the State of Nuevo Leon. The demand for cement in the Republic is steadily increasing.

Blowholes in the tops of steel ingots may be avoided by a small amount of thermite containing some titanium.

*Consulting engineer, 821 Ernest & Cranmer Building, Denver, Colo.

Electrolytic Theory.*

BY T. MARTIN LOWRY.

This considers the possibility of extending the hydrate theory to electrolytes so as to take account of the experimental basis of the theory of electrolytic dissociation. The hydrate theory postulates that an aqueous salt solution consists of a mixture of hydrates in equilibrium with the solvent and with one another. But it must be supposed that, even in solution, there is a limit to the possibility of hydrate formation, so that ultimately a stage will be reached at which the molecule, as such, will be unable to combine with any further quantity of water. The ionization of an aqueous electrolyte consists essentially in a further process whereby the fully hydrated molecule combines with additional water to form two or more hydrated ions. The hydration of the ions is thus conceived to be the primary cause of the ionization of aqueous electrolytes. This extension of the hydrate theory may help to remove the fundamental difficulty of Arrhenius's theory, namely, the absence of a motive for electrolytic dissociation. The evidence in support of the hydrate theory of ionization is as follows:

1. The theory is in accord with the fact that the best 'ionizing' solvents are those which are themselves most highly associated.
2. Complete ionization is possible only in presence of a very large excess of water; that is, under exactly those conditions which are most favorable to the formation of complex hydrates.
3. The influence of temperature on ionization is also in accord with the view that the process is essentially one of association with the solvent.
4. Evidence in favor of the hydrate theory of ionization is afforded by a consideration of the mobilities of the different ions in aqueous solution; some of these are as follows: Li, 33.44; Na, 43.55; K, 64.67; Rb, 67.6; Cs, 68.2. The larger atoms yield the more mobile ions; such a result supports the view that in aqueous solution, the ions are present in the form of complex hydrates.
5. The mobility of the hydroxyl ion is more than double as great as that of any other anion; while that of the hydrogen ion is nearly five times as great as that of any other cation. The properties of these two ions are readily explained by supposing that they are either anhydrous, or are combined with a smaller proportion of water than any of the other ions. Confirmation of this view is afforded by at least two independent considerations: (a) The affinity of water molecules for the ions H and OH must be relatively slight, since otherwise liquid water (like fused salt or caustic soda) would be a good electrolyte; (b) whereas nearly all sodium and potassium salts are good conductors,

the acids from which they are derived are often exceedingly poor conductors.

6. Independent evidence is found in the freezing-points of dilute aqueous solutions. At extreme dilution, the molecular depression of the freezing-point reaches a maximum corresponding closely with that required by the theory of electrolytic dissociation. In less dilute solutions, however, values are obtained which cannot be accounted for in terms of this theory as originally propounded, but which are explicable if, as the hydrate theory assumes, part of the solvent is removed as far as freezing-point lowering is concerned.

7. The theory of electrolytic dissociation owes much of its acceptability to the readiness with which it lends itself to exact mathematical treatment. The whole theory can indeed be summed up in one well-known equation. The essential constants of the hydrate theory are, however, quite as simple. Jones and Getman and Biltz have attempted to determine the molecular hydration of dissolved salts. The author, correcting the figures calculated by Jones and Getman, shows that the values point to a regular increase of molecular hydration as the dilution increases; and are, therefore, in accord with the view that ionization involves an increase, and not a decrease, in the hydration of the solute.

8. The theory may be extended to non-aqueous electrolytes in which ionization may again be attributed to the superior combining power of the ions as compared with the molecules of the dissolved salt.

9. In the case of autolytic salts, which became conductors when fused, it is known that polymerization is an essential characteristic of these; hence it is only necessary to suppose that the complex molecules of these are associated with the ions. Evidence of the formation of complex ions has recently been obtained in the case of fused salts by Lorenz and Fausti. Conduction in mixtures of solid oxides, as in the Nernst filament, is doubtless electrolytic in character. Like glass, this filament has the composition of an electrolyte, but behaves as an insulator until the temperature has been raised sufficiently to permit ionic migration. Temperature-conductivity curves for filaments of various composition have been plotted by Reynolds, and are similar in form to those for glass, or for over-cooled, concentrated aqueous solutions of calcium chloride or sulphuric acid.

In discussion, H. D. Law pointed out that molecular mobilities were often largely influenced by the undissociated molecules; an ion might wander more quickly through molecules of its own species than through another's.

W. R. Bousfield showed that the investigation of the relation between hydration and ionization can be approached along three converging lines: First, on the assumption of a rectilinear relationship between freezing-point depression and con-

centration; second, on the assumption that the amount of contraction per gram of solute, in aqueous solution, is a measure of the combination between solvent and solute; and third, by a consideration of the variation of ionic size with temperature and concentration, based on the application of Stokes's theorem, on the movement of small spheres in a viscous fluid. These three lines indicate that the combination of solvent with solute increases progressively and continuously with increasing dilution. With regard to the conductivity of water, he inclined to the opinion that the H and OH ions are not entirely anhydrous, but are combined with a smaller proportion of water than any of the other ions.

A Slag Dam.

BY W. I. FLECK.*

Several large dams have lately been constructed across Rogue river, Oregon, and with results so encouraging as to lead the builders to plan others; but the expense is large, difficult to estimate, and an enterprise of this nature should be attempted only by a strong concern. Hence, when a custom smelter was contemplated for the Rogue river district, it was thought the slag could be utilized for building a power dam. With this in view, a site was selected and work is now going on for the foundation of the smelter.

The place selected is at Savage Rapids, five miles east of Grants Pass. The river has a fall of 8.36 ft. in 400 ft. The smelter is to be placed back on a high bank, 60 ft. above the water line, and 100 ft. from the dam. The river at the rapids has two channels with a small rock island between them. By putting in a coffer construction-dam, or wing, across the head of one channel, the water can be deflected into the other. The holes or depressions in the bedrock will be smoothed up with concrete or hydraulic cement, and prepared by placing board bulkheads (20 to 25 ft. square and 3 to 4 ft. high), to be lined with clay and dried out by a wood fire.

The slag is to be brought out in pots holding 1,000 lb. and poured into the compartments. Rock will also be used with the slag, the latter being poured into the spaces between the rocks. The relief water-ways, spill-ways and fish-way will be molded in, expanded metal and twisted scrap-steel being used around the arches and weak places.

About 10,000 cu. yd. of slag will be used in the construction. Cement costs \$22.50 per ton, and an ordinary dam of the size of this one across Rogue river would cost \$500,000. It is estimated that the cost of the slag dam will be only 8 to 10% the cost of the usual construction. The system is to be patented.

*Abstracted from the *Proceedings of the Faraday Society*, May 18, 1905.

*Engineer, Rogue River Mining, Smelting & Power Co., Grant's Pass, Oregon.

Re-precipitation from Cyanide Solutions.*

BY A. N. MACKAY.

The following notes may be of interest, as describing peculiar conditions encountered in actual practice:

I. In the first case of re-precipitation, a vat of pyritic concentrate obtained on Wilfley tables, carrying about 30% pyrite, and worth about 10 oz. per ton, had been under treatment, but apparently it had been much neglected, for it assayed 8 oz., when I took charge, four months later.

It was decided to turn over the material for aeration, and to do so a trench was cut through the concentrate from top to bottom, and samples were taken for each foot of depth and assayed, with the following results:

	oz.	dwt.	gr.
Sample of top.....	0	12	0
" " middle.....	2	2	0
" " bottom.....	17	8	0
" from top to bottom.....	6	2	0

This showed that the gold extracted in the upper part had been re-precipitated in the lower. Samples were taken every 6 in.; the assays were:

	oz.	dwt.	gr.
Sample of top 9 in.....	0	11	0
" " next 6 in.....	0	17	12
" " " 6 ".....	1	0	0
" " " 6 ".....	5	8	0
" " " 6 ".....	16	2	0
" " bottom 6 in.....	33	0	0
" from top to bottom.....	9	6	0

Washing the average sample with water reduced the content to 8 oz. 8 dwt., while the sample from the bottom 6 in. was reduced to 30 oz.; a rough amalgamation test on the latter sample showed that the content could be brought down to 19 ounces.

This showed conclusively that re-precipitation had taken place in the lower portion. The chief cause seems to have been the use of a too alkaline solution with a slow percolation rate, the excessive alkali having time to act on the pyrite and forming soluble sulphides, which destroyed the cyanide and liberated the gold; probably, also, failure to keep the concentrate covered with solution allowed the formation of sulphates which may have helped in the decomposition of the cyanide.

By turning over twice and circulating a 0.25% solution rapidly, the assay was reduced to 15 dwt., below which it refused to go; the material was then fed into one battery in small lots each day, and sent without concentration to the sand vats. An increase of 3 gr. (5 gr. in some cases) in the residue was noted in those vats into which it was sent; from this it was calculated that the gold in the pyrite had been reduced between 3 and 4 dwt. per ton.

In the second case, re-precipitation took place from a 0.02% solution (that constituted the circulating water used in the

battery) which, after leaving the sand-separation vats, passed over spitzkasten to settle the slime and thence returned to the feed-water tanks. Its gold content was 3 to 4 dwt. per ton. The slime settling in the spitzkasten was run into the agitators, and a sample was taken every 10 minutes and put into a bucket; when complete, it was well mixed and a portion put through a filter-pump for assaying. As a general rule, this was done immediately the sample was ready, but by chance on one occasion it was allowed to stand over night, and, unaccountably, showed an increase in gold. Re-precipitation was suspected, and the next charge also was allowed to stand, samples being taken out at regular intervals; the slime and solution being assayed, the results were:

Time.	Slime.			Solution.		
	oz.	dwt.	gr.	oz.	dwt.	gr.
2 p. m.....	0	4	0	0	3	6
6 p. m.....	0	4	18	0	2	18
10 p. m.....	0	5	12	0	1	21
8 a. m.....	0	7	0	Trace.		
5 p. m.....	0	7	0	Trace.		

Thus it was shown that complete re-precipitation had taken place in about 18 hours. The protective alkali was equal to about 0.04% KOH per ton of solution, and it seems probable that this alkali had acted on the fine sulphide in the slime (about 0.5% FeS₂), forming alkaline sulphides which destroyed the cyanide. This, however, could scarcely take place in the agitators, as the cyanide was added while the agitators were filling; but a few test cases were studied in which: (1) No cyanide was added till the agitator was full; (2) agitation was stopped and no cyanide added till the agitator was full. In both cases an increase in the residue was always observed, the second showing on an average about 3 gr. worse than the first, which was itself 6 gr. worse than the normal residue.

The cyanide solution in the mill was reduced considerably until the alkalinity was only 0.01%, at which point no re-precipitation occurred. The cyanide then in use was that showing 104% KCN and 10% KOH; under the circumstances the worst possible, for the water from the mine had an alkalinity of about 0.02 per cent.

II. A wooden leaching vat (which had been used for treating, by percolation, the sand of a roasted sulpho-telluride ore) had to be dismantled when a change of treatment was made. Some pieces of the wood were carefully cleaned and incinerated, and the resulting ash assayed; the cocoanut matting and the Hessian used in the filter-bottom were similarly treated, the assay as calculated per ton of original being:

	oz.	dwt.
Wood.....	12	8
Hessian.....	3	12
Matting.....	5	14

The wood was a variety of red pine and had been in use about 16 months, treating in that time about 1,200 tons of an average value of 20 dwt. The retention of gold in the matting and Hessian may

have been due to fine particles of ore in them which could not be beaten out, or may have been caused either by insufficient water-washing or by the use of an unsuitable water, for a white incrustation (found on the joints of the timber and consisting of chlorides, sulphates, carbonates, etc., of sodium, calcium and magnesium) assayed 7 oz., the water in use carrying about 10% of solids of similar composition.

An Ore-Sampling Device.*

BY HENRY LOUIS.†

It may be of use to draw attention to a convenient method of sampling either in the field or in the laboratory, which appears to be very little known. I first saw it in use in Sweden and have used it myself a good deal with satisfactory results. The appliances consist of three troughs, V-shaped in cross section and open at both ends, the angle at the apex being 90°. Dimensions depend upon the material being treated; for field work and large parcels broken, say, to 1½ in. ring, troughs made of pieces of 10-in. board, 4 ft. long, held together by a few nails, answer admirably. For laboratory work I use pieces of stout sheet zinc or tin-plate, 12 in. long and 6 in. wide, bent up lengthways, so that each side is 3 in. broad.

To use this appliance, one of the V-shaped troughs is placed horizontally, apex upward, on two sheets of American cloth or canvas, or over two boxes; another trough is placed, apex downward, over the first one, inclining toward it at an angle of 30 or 40°, the lower end resting on the center of the apex of the lower one; the third trough is placed above the second in zigzag fashion, and similarly inclined, its lower end delivering material at the top end of the second trough. Thus, any material poured down the top trough runs fairly into the second, and then falling on to the apex or edge of the first, is divided into two equal parcels. The operation is very rapid, and may be repeated as often as is required, until the sample is reduced to the requisite size. The appliances are simple in the extreme, may be improvised almost anywhere, and if the troughs are made of two-hinged pieces, are very portable. The few tests that I have made have shown that this simple method seems to be as accurate as any other.

There are said to be in operation in the United States 224 steam turbines, with an aggregate output of 350,000 h.p.; the machines vary from 300 kw. to 6,000 kw. capacity.

The silica in diatomaceous earth is of the nature of opal, being a complex hydrated poly-silicic acid. Under polarized light it is amorphous.

*Abstract from paper entitled 'Re-precipitation of Gold from Cyanide Solutions, and Absorption of Gold by a Wooden Leaching Vat.' *Proceedings Institution of Mining and Metallurgy*, May, 1905.

*Abstract of a communication in *Bulletin No. 9*, Institution of Mining and Metallurgy. †Professor of Mining, Durham College of Science, Newcastle-on-Tyne, England.

The Cost of Mining—II.

BY W. R. INGALLS.

In my first paper on this subject, which has been commented upon by Messrs. Finlay, Argall, Tays and Brown, I did not look forward to a discussion of the advisability of keeping accounts which would show the cost of mining, nor did I contemplate a discussion of the itemization of mining costs, except incidentally. My purpose was rather to draw out the experience, reduced to dollars and cents, in mining under various conditions, and by itemization and classification of costs to analyze the differences in conditions. Mr. Finlay appreciated this intention, and remarked that, even in cases of wide difference of conditions, there would still be found operations in which the conditions were more or less parallel. It was far from my purpose to uphold the desirability of attaining a low cost of mining per ton, at expense of the maximum profit; indeed, such argument as I presented on that topic was quite the reverse; but I aimed to draw out the reasons why mining costs should vary so much, not only under obviously dissimilar conditions, but also under conditions that appear approximately analogous, or at least that may so appear to those who have not minutely studied them.

In considering the cost of mining from this view-point, I have taken the trouble to compile the following data, which are mostly from official reports, either the originals or the abstracts published in THE ENGINEERING AND MINING JOURNAL. They refer only to gold, silver, copper, lead and zinc mines; coal and iron mines are excluded from the scope of this inquiry; and the case of the Lake Superior copper mines is reserved for a separate article. Few, if any, engineers being familiar with the fundamental conditions which determine the cost of mining in all of the districts mentioned, explanations from those who are acquainted with them will surely be welcomed, as will be also such further data as will throw more light on the subject.

Grass Valley, California.—North Star Mines Company in 1902 mined 17,399 tons of ore, at cost of \$15.90 per ton, divided as follows: Operating expense, \$7.76; general expense, \$1.11; extraordinary expenses, \$0.57; development, \$5.04; improvements, \$1.42.

Calaveras County, California.—Utica mine. Large vein on Mother Lode. In producing about 300 tons of ore per day there are required two 10-hour shifts, each consisting of 12 miners, 12 helpers, 15 shovelers and 6 trammers; total, 45; in addition to which a crew of 10 timbermen is employed. Miners are paid \$3; timbermen, \$3; helpers, shovelers and carmen, \$2.50 per day.¹

Sutter Creek, California.—Central Eu-

reka Mining Company, in 1902, produced 43,545 tons of ore, at cost of \$1,795 for mining, and \$0.519 for developing.²

Randsburg, California.—Yellow Aster Mining & Milling Company. Eugene H. Barton³ reported the cost of mining 14,601 tons of ore as follows:

Mining.	Cost.	Per ton.
Labor.....	\$10,696.69	\$0.73260
Timbering.....	803.55	0.05500
Timber.....	2,661.47	0.18228
Powder.....	580.68	0.03977
Fuse.....	93.90	0.00643
Caps.....	44.97	0.00308
Lights.....	306.62	0.02100
Blacksmithing.....	498.32	0.03414
Development.....	628.72	0.04306
Haulage.....	643.90	0.04410
Hoisting.....	697.92	0.04780
Total.....	\$17,656.40	\$1.16620
General Expenses.		
Miscellaneous.....	\$1,460.10	\$0.10000
Assaying.....	160.61	0.01100
Salaries.....	950.87	0.06507
Tailing.....	313.33	0.02146
Incidentals.....	440.92	0.03020
Total.....	\$3,325.83	\$0.22773

The general expense is to some extent chargeable to the milling. Water is obtained from wells 6.5 miles from the mine, whence it is pumped at a cost of 19c. per 1,000 gal., which comes to 22.05c. per ton of ore, no part of this being included in the cost of mining. The mine is equipped to produce 500 tons of ore per day. Fuel-oil costs 4.5c. per gal.; lumber, \$32.50 per M. The rate of wages is as follows: Miners, 9 hours, \$3; muckers, 9 hours, \$2.50; carmen, 9 hours, \$3; timber-men, 9 hours, \$3.50; amalgamators, 12 hours, \$4; stationary engineers, 12 hours, \$4; hoisting engineers, 8 hours, \$3.50; pump-men, 12 hours, \$3.50.

Black Hills, South Dakota.—Homestake mines. Vein of mineralized schist, 300 to 500 ft. wide. Worked partially open-cast, partially underground. In 1898 mining cost, \$2.17; general expense, \$0.14. In the year ending June 1, 1903, the cost of mining 1,279,075 tons of ore was \$2.04, not including general expense; total cost, exclusive of milling, was \$2.37. Mine opened to depth of 1,100 feet.

Bingham, Utah.—Massive deposits of pyrite (gold, silver and copper-bearing) in limestone, dipping moderately. Operated chiefly through adits. Timbering with square sets.

Utah Consolidated Mining Company; Highland Boy mine, operated through six adits to 700-ft. level, and by shaft to 800 ft. Ore transported by aerial tramway 12,700 ft. to Bingham station, thence by rail to smelter at Murray. In 1902 produced 167,713 tons of ore at a cost of \$1.45 for mining and tramway, \$0.25 for exploration and development; in 1903, produced 190,256 tons, at a cost of \$1.78 for mining and tramway, \$0.033 for exploration and development; general expenses not included.

Mercur, Utah.—Deposits of gold ore in limestone, lying approximately flat. Mercur Mining & Milling Company, in the year ending June 30, 1902, extracted ore at cost of \$1.41 per ton, including general

expense; in year ending June 30, 1903, extracted 346,359 tons, at cost of \$1.30 per ton. Mining done by caving system. Mine operated through adit, with electric haulage, two locomotives, 10-h.p. each, capable of hauling 20 tons at six miles per hour.

Frisco, Utah.—Horn Silver Mining Company in 1900 produced 27,411 tons of ore, at cost of \$4.88 per ton, of which labor on ore was \$2.087; on dead work, \$0.703; on surface, \$0.850; supplies, timber, fuel, etc., \$1.24.

Cripple Creek, Colorado.—Gold mining in veins in igneous rocks (chiefly andesite). Mines operated through shafts; depths moderate; water variable. Miners receive \$3.40 per day of eight hours (42.5c. per hour). Coal costs about \$4.60 per ton. Considerable timbering required. Mining costs generally from \$2.50 to \$3.50 per ton of ore hoisted, including taxes, insurance and general expense. Sorting of the ore on the surface materially increases the cost per ton of ore shipped.⁴

Stratton's Independence, Ltd., in year ending June 30, 1902, mined 230,699 tons of ore, at cost of \$4.18 per ton, of which \$1.27 per ton was on account of development work. The latter comprised 264 ft. of shaft, 1,521 ft. of raises, 160 ft. of winzes, and 11,738 ft. of drifts and cross-cuts. Total depth of main shaft, 1,430 ft. In year ending June 30, 1903, 229,797 tons were hoisted, at total expense of \$3.70 per ton, of which \$0.87 was for development, which comprised 1,716 ft. of raises and 8,387 ft. of drifts and cross-cuts.

Leadville, Colorado.—Blanket vein, containing massive shoots of argentiferous galena, blende and pyrites. Operated through shafts; depths moderate. Rather larger quantity of water to pump. Timbering with square sets. Miners receive \$3 per day. Mining costs large producers about \$2 per ton, including general expense.

Ouray, Colorado.—Camp Bird vein, a fissure dipping about 70°; average width 6 to 7 ft. Vein material, quartz, impregnated with gold, galena, pyrite and chalcoppyrite. Ore occurs in shoots, wherein the grade is subject to considerable variation. Mine opened by adit 2,200 ft. long. Timbering is required only in the raises, winzes, chutes and floors of stopes. About 40% of the ore broken in stoping is taken out, the remainder is left in the stopes; the percentage of waste trammed out is small. Mine worked by two 8-hour shifts; 3.25-in. machine drills mostly in favor; 40% dynamite; compressors driven by electric power. Large-machine men receive \$4.50 per shift; helpers, \$4; small-machine men, \$4; smiths, \$4; helpers, \$3.25; timbermen, \$4 to \$4.50; helpers, \$3; shovelers, \$3; trammers, \$3; enginemen, \$4.50.⁵

⁴ J. R. Finlay, this JOURNAL, November 21, 1903.

⁵ C. W. Purlington, Transactions American Institute Mining Engineers, 1902.

¹ J. H. Collier, Jr., Transactions American Institute Mining Engineers, 1899.

² This JOURNAL, June 6, 1903, p. 869.

³ This JOURNAL, January 28, 1904.

During the year ending April 30, 1903, there were broken 111,245 tons of ore, wet weight, of which 71,793 tons were delivered to the mill and 39,452 tons were left in the stopes. The ore milled, less moisture, amounted to 66,825 tons. The cost of mining, not including general expense, was \$367,838, or \$5.50 per ton on the ore delivered to the mill (dry weight), or \$3.50 per ton on the ore broken (wet weight).

Telluride, Colorado.—Liberty Bell mine, 1902, produced about 7,500 tons of ore per month, at cost of \$2 to \$2.30, not including general expense.

Butte, Montana.—Immense veins, dipping steeply, in granite. Ore, chalcocite, bornite and chalcopryrite, with enargite, in a quartzose and granitic gangue. Veins attain a width of 100 ft. and more, 10 to 20 ft. stopes being common. The cost of mining at Butte ranges from \$3 to \$4 per ton.

The following returns were made by the Butte copper companies to the assessors of Silver Bow county, Montana: Colusa-Parrot, 265,113 tons, mining cost, \$3.70 per ton; Butte & Boston, 245,333 tons, \$3.27; Parrot, 253,284 tons, \$2.81; Boston & Montana, 907,227 tons, \$2.61; Anaconda, 1,392,835 tons, \$3.49; Washoe, 106,588 tons, \$3.79; Montana Ore Purchasing Company, 293,332 tons, \$3.54. These figures, submitted for taxation purposes, are of little technical value.

Anaconda Copper Mining Company: The production in 1897-1898 was 628,051 tons of ore from the Anaconda mine, and 813,487 from the Syndicate mine. The cost per ton was as follows:

Item.	Anaconda.	Syndicate.
Labor.....	\$2.470	\$2.244
Explosives.....	0.105	0.133
Coal.....	0.144	0.144
Supplies.....	0.110	0.108
Assaying.....	0.007	0.006
Administration and general expenses.....	0.177	0.138
Personal injuries.....	0.028	0.023
Timber.....	0.290	0.305
Water.....	0.018	0.014
Repairs and renewals.....	0.327	0.219
New constructions.....	0.237	0.110
Total.....	\$3.913	\$3.444

Coeur d'Alene, Idaho.—Steeply dipping fissure veins and shear zones, containing large and wide bodies of silver-lead ore. Mostly opened by adits; water power available and generally used; timber abundant and cheap. Miners receive \$3.50 per day. Three methods of mining employed: (1) timbering (square sets); (2) filling; (3) timbering and filling. Cost of mining and milling, \$2.50 to \$3.50 per ton (Finlay).

The Bunker Hill & Sullivan Mining Company in 1902 extracted 260,500 tons of ore, at cost of \$2.09 per ton. Miners receive \$3.50; muckers, \$3; timbermen, \$4. In 1903 the cost of mining 288,713 tons of ore was \$1.633 per ton, not including general expense, which came to 11.5c. per ton. All the ore was trammed from the mine by electric haulage through the Kellogg tunnel (12,000 ft. long), at a cost of 7c. per ton. In addition to the ore, 47,000

* This JOURNAL, July 25, 1904.

tons of waste was trammed. Drifts, cross-cuts, raises and winzes cost an average of \$7.31 per foot, 4,043 ft. being driven.

Douglas Island, Alaska.—Auriferous dike of syenite in carbonaceous slate. Dike stands at steep angle and attains width of 420 ft. Situated close to the sea, with respect to which the position of the orebodies has great influence on the methods and costs of mining. Mines formerly worked chiefly open-cast; henceforth the underground mining will be the more important. Miners receive \$2.50 per day, with board and lodging.

Alaska-Treadwell, opened by shafts to 900 ft. below sea-level. Water less than 50-gal. per min.; levels opened 110 ft. and 150 ft. apart; no timbering required; hoisting by skips from storage bins. Vertical pillars left to support walls, 20% loss of ore estimated. In stoping, one drill breaks 34.96 tons of ore, with consumption of 12.53 lb. of No. 2 dynamite, in 10 hours, in addition to which 0.85 lb. of powder per ton of ore is consumed in bulldozing.

In the year ending May 30, 1903, the Alaska-Treadwell mined 759,625 tons at cost of 0.9022, not including general expense. Development work amounted to 6,145 ft. An average of 33 machine drills was employed in the mine (7 on development, 4 on cutting out, 7.5 in pits, and 14.5 in underground stoping). The total of holes drilled was 783,360 ft., and of ore broken 906,625 tons, making an average of 1.14 tons per foot of hole drilled. The average work per machine per 10 hours was 34.4 ft. of hole drilled. Machine drillers in the open pit were paid \$3.50 per day, with board and lodging; underground, \$2.50, with board and lodging; the difference being due to the extra danger in the open-cuts.

Alaska-Mexican, 1900: Mined 166,449 tons, at cost of \$1.0834 per ton, not including general expense. Development work, 3,094 ft. In 1901, mined 178,960 tons, at cost of \$1.1923. Development work, 5,441 ft. In 1902, mined 207,455 tons, at cost of \$1.059. Development work, 5,286 ft. Scale of wages: Machine drillers, \$2.50; helpers, \$2.25; common labor (white), \$2; smiths, \$4; plus board and lodging in each case. Indian labor, \$2, without board or lodging.

Alaska United, 1901: Ready Bullion mine—171,642 tons raised, chiefly from 450 to 600-ft. levels. Cost per ton, \$1.1788, not including general expense. Development work, 2,535 ft. "700-ft." mine—89,840 tons raised, chiefly from 400-ft. level. Cost, \$1.2281 per ton. Development work, 1,708 feet.

Rossland, British Columbia.—Zones of sheared rock, mineralized with auriferous pyrrhotite and chalcopryrite up to width of 100 ft. or more, dipping at about 70°. Vein-filling very hard; stopes timbered with square sets; ore stands 10 cu. ft. to the ton. About 20% is sorted out as low-grade (to second-class dump.) Timber-

ing costs about 21c. per ton of ore raised, 27c. per ton of ore shipped.⁷

Center Star Mining Company, operating on large vein of auriferous copper ore. The costs per foot of development work and per ton of ore mined during the year ended September 30, 1903, were as follows:

	—Development.—			Mining, per ton.
	Winzes, per ft.	Raises, per ft.	Drifting, per ft.	
Drilling.....	\$6.10	\$7.31	\$4.53	\$0.405
Blasting.....	2.48	2.40	1.08	0.030
Explosives.....	3.13	3.72	2.72	0.145
General mine labor.	0.51	0.64	0.43	0.040
Mine lighting, candles.....	0.26	0.19	0.14	0.015
Mine lighting, electric.....	0.30	0.22	0.13	0.010
Smithing.....	1.00	1.14	0.72	0.065
Tramming and shoveling, direct.....	5.51	0.65	1.21	0.240
Tramming and shoveling, apportioned	0.64	0.35	0.42	0.085
Timbering, labor..	1.81	3.08	0.02	0.190
Timbering, material	0.33	0.57	0.01	0.010
Machine drill fittings	0.86	0.94	0.60	0.055
General mine labor.	1.57	1.18	0.84	0.090
Hoisting, underground.....	4.79	.....	.....	.....
Hoisting, main shaft	1.48	0.89	0.94	0.190
Compressed air....	1.74	2.08	1.07	0.120
Mine ventilation...	0.23	0.17	0.13	0.015
Pumping.....	0.71	1.09	0.34	0.035
Assaying.....	0.55	0.47	0.14	0.030
Surveying.....	0.20	0.17	0.11	0.010
General expense....	3.57	2.71	1.51	0.185
Totals.....	\$38.77	\$29.97	\$17.09	\$2.065

The development work done, and the cost, and the averages per foot, are shown in the table below:

	Feet.	Amount.	Per ft.
General work.....	.....	\$3,058	.....
Raises.....	168.0	5,577	\$29.97
Winzes.....	79.0	3,062	38.77
Drifting.....	2,903.5	49,622	17.09
Totals.....	3,168.5	\$61,319	\$19.35

Under general work are included stations, re-timbering, machinery and equipment, repairs and maintenance.

The total quantity of ore mined and sold was 88,387 tons, of which 3,934 tons came from development work. The average cost of mining, viz., \$2.065, is computed on the 84,453 tons of ore stoped. The development work, costing \$61,319, amounted to about \$0.725 per ton on the ore stoped.

Ymir Gold Mines, Ltd., in 1901, mined 70,640 tons of ore, at average cost per ton of \$1.814 for mining, \$0.150 for administration and \$0.279 for general and contingent expense; the last two items should be proportioned between mining and milling.

Ducktown, Tennessee.—Huge lenticular deposits of cupriferous pyrite in schist. Lenses vary from a few feet to 150 ft. wide, with great length, dipping steeply. Opened as yet to only moderate depth. Ore stoped out in chambers; no timbering.

Tennessee Copper Company, 1902, mined 250,769 tons, at \$0.8411, not including general expense.

Flat River, Missouri.—Immense shoots of lead ore; galena disseminated in magnesian limestone; position approximately flat; stopes 80 ft. high and 60 ft. wide not uncommon. Mines operated through shafts, 300 to 500 ft. deep, with efficient equipment. No timbering required; water, 200 to 2,000 gal. per min. Miners receive \$1.85; shovelers, \$1.75; all nine hours.

⁷ B. McDonald, *Journal Canadian Mining Institute*, Vol. VI, p. 123.

Coal (from southern Illinois) costs \$2.20 per ton. Mining cost, about \$1 per ton, including general expense and delivery to mill, on basis of about 1,000 tons per day, but not including development work, construction or amortization of plant. These statements refer to the conditions before the recent strikes, as result of which wages have been increased, time reduced to eight hours, and efficiency of labor decreased, somewhat increasing the cost of mining. Prospecting in this district, both from surface and underground, is done chiefly by diamond drilling.

Joplin, Missouri. — Deposits of zinc-blende and galena in lenses of chert in limestone; also sheet deposits of similar ore. Considerable variation in character of ore as to hardness, and as to roof, but the sheet deposits are generally very hard. The deposits lie approximately flat and at moderate depth, say 150 to 250 ft. Life of the mines is short and conditions decree cheapness of plant rather than durability. Ground is not developed ahead, except by churn-drilling from surface. Cost of opening mine to produce 75 to 100 tons of ore in 10 hours, including concentrating mill, is about \$15,000. Miners are paid \$2.25 and shovelers \$2 per day. About 25 to 37.5 tons of ore is stoped per drill per day. The cost of mining in ground that requires no timbering is approximately as follows: Miners and helpers, 17c.; trimmers and shovelers, 8c.; drill sharpening, etc., 5c.; explosives, 10c.; hoisting (labor), 6c.; supplies, 4c.; fuel, 9c.; supervision, 9c.; total, 68c.; not including any pumping or general expense. The actual costs in six different mines operated during the same year were as follows:

Surface plant.....	\$0.00	\$0.000	\$0.004	\$0.010	\$0.017	\$0.006
Rep. surface plant.....	0.007	0.005	0.002	0.011	0.017	0.008
Undergr'n plant.....	0.000	0.000	0.002	0.016	0.053	0.016
Rep. und'g plant.....	0.000	0.005	0.001	0.021	0.040	0.014
Hoisting.....	0.023	0.032	0.023	0.035	0.042	0.031
Fuel.....	0.028	0.031	0.036	0.040	0.067	0.040
Mining.....	0.248	0.258	0.241	0.231	0.282	0.252
Development.....	0.000	0.041	0.022	0.011	0.023	0.019
Blacksm'g.....	0.029	0.033	0.041	0.034	0.035	0.034
Shoveling and tram'g.....	0.121	0.174	0.123	0.148	0.161	0.143
Explosives.....	0.085	0.073	0.096	0.110	0.125	0.098
Tools.....	0.003	0.003	0.004	0.020	0.015	0.009
Timber and track.....	0.005	0.003	0.004	0.011	0.028	0.010
Lighting.....	0.004	0.007	0.006	0.008	1.010	0.007
Lubricating.....	0.000	0.000	0.000	0.000	0.001	0.000
Pumping.....	0.000	0.000	0.000	0.000	0.020	0.004
Accidents.....	0.002	0.000	0.002	0.000	0.009	0.003
Totals.....	\$0.56	\$0.66	\$0.60	\$0.71	\$0.94	\$0.70

The sheet-ground of the Joplin district is a mineralized, fine-grained chert, averaging about 8 ft. in thickness, extremely hard and requiring the heaviest type of machine-drills.

Recently, a 120-ft. iron and steel span of the bridge across Crum creek, on the Baltimore & Ohio railroad, was removed and replaced by an entire new bridge, between train time on that much-traveled road, without the least disturbance of traffic. The actual time occupied by the work was just six minutes.

Electrostatic Concentration.

BY R. C. CANBY.

I have recently completed tests of several ores upon a dielectric separator, which depends for its operation upon an electrical principle capable of as exact mechanical application as the most efficient magnetic separator. Indeed, to see the Sutton-Steele dielectric separator in operation one would believe the separating roller must actually be magnetic. In this machine the action does not depend upon the relative electrical conductivity of the particles to be separated, but upon an electrical susceptibility which is constant; one of the minerals is continuously attracted, regardless of the length of time of exposure; the others are continuously inert, or not at all affected, without regard to time of exposure. Thus there is obtained an almost absolute separation.

For example, a 50% zinc middling, assaying 3% copper, separated into a 53% zinc product with 0.7% copper, thus showing a recovery of 97% of the zinc in the zinc product, and 66% of the copper in the copper concentrate. Nearly all of the Mexican zinc-lead ores carry considerable fluorspar, so that the magnetic zinc-product which I was producing, although satisfactory in zinc content, was objectionable in the Belgian market on account of the fluorspar. Mr. Sutton effected a perfect separation of the fluorspar and blende in this zinc product. To form an idea of the range of possibility of this machine, it will separate, completely, 'rosin' zinc blende from blackjack. From its remarkable selective action, its great simplicity and its small power for operating, I feel confident that this form of separator is destined to play a great rôle in the solution of the much-vexed zinc problem. The El Paso Foundry & Machine Company is installing testing works at El Paso for the demonstration of the Sutton-Steele process.

Covering for Boilers and Steam Pipes.

An engineer of experience recommends a composition consisting of 40% by volume, of clean, well-ground clay, 25% of sawdust, 15% of lime paste (slaked lime), 10% of asbestos and 10% of hair. Either the asbestos or the hair may be omitted, in which case 20% of the other should be taken. This composition is mixed with water to the consistency of mortar.

In application, put on first with a brush a thin wash coat made from half a pailful of the composition reduced with water. Then apply a scratch or light coat about 0.25 in. thick. After the scratch coat is dry, add successive coats about 0.5 in. thick at a time until the desired thickness is obtained.

Each coat should be rough-finished, except the last one, which should be made even with a straight-edge, and troweled up smooth while drying out. In this way a hard finish will be secured, which can be

painted if desired. If the work is to be exposed to the weather, it should be protected with a heavy waterproof coating, or some form of heavy-bodied paint.

There should be heat on the boiler and pipes before putting on the covering as above described. If any small cracks or fissures should appear while the covering is drying, make a wash coat and fill the cracks up with a brush.

Electric Power at Joplin.

The Joplin district is now supplied with electric power from Lowell, Kansas, and it is reported that a considerable saving is resulting to the miners who have adopted it. Among these is the Thornton Mining Company, operating a 100-ton mill on the Continental tract, just west of Joplin, which is supplied at 1¼c. per h.p. hour, plus a service charge of \$50 per month. This makes the cost about \$50 per horsepower per annum of 300 days of 10 hours each for a 50-h.p. plant, which is cheaper than power can be generated by steam in a plant of that size and of the character commonly employed. The first cost of motor is also somewhat less than that of the steam plant. Electrical distribution of power in the Joplin district was proposed at least 15 years ago, but it was only recently that the idea was taken up.

Steam-Turbine Operation.

According to *Power*, July, 1905, in two instances lately reported turbines having a multiplicity of blades have lost a large quota of them without coming very seriously to grief. In one case the turbine in a cotton mill was opened every night and as many of the blades put back as possible, the case put back on and the machine put to work next day as though nothing were wanting. In another plant, it was noticed that it was necessary to cut more resistance than ordinary out of the field coils to keep up the voltage and the turbine was found to be running slow. Investigation showed that all or nearly all of the blades of the intermediate stage were in the bottom of the case. The turbine ran along in this condition until an opportunity offered to put them back and without an appreciable difference in the cost of operation.

Hollow Concrete Building Blocks.

Building construction with hollow concrete blocks is increasing in vogue. The *Engineering News* has recently offered a prize for the best paper on this new type of construction, which offers many advantages, especially cheapness. A factory, 50 by 100 ft., walls 28 ft. above foundation, recently constructed at Binghamton, New York, cost \$513 for the blocks in the wall, and only 6c. per sq. ft. for the mortar and labor of laying, making the total cost \$1,101, or approximately 13c. per sq. ft. of wall, the latter being 10 in. thick.

THE ENGINEERING AND MINING JOURNAL

Published Weekly at

505 PEARL STREET, NEW YORK

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

To Foreign Countries, including postage, \$8.00 or its equivalent, 33 shillings; 32 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.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; Palace Hotel, San Francisco, and the leading hotels in the principal cities.

Copyright, 1905, by

THE ENGINEERING AND MINING JOURNAL.

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

CONTENTS.

Editorials:	
Notes.....	65
The Importation of Zinc Ore.....	65
The Reduction of Waste.....	66
Exhaustion of the Metals.....	67
The New Nevada.....	67
Concrete Blocks.....	67
Discussion:	
Health in Mining Camps, <i>Forbes Rickard</i>	68
The Determination of Copper in Slags, <i>F. X. Mooney</i>	68
Correspondence:	
Gold in Santo Domingo, <i>D. T. O'Day</i>	69
Dredging—I. Prospecting and Historical, <i>J. P. Hutchins</i>	49
*The Utilization of Peat.....	50
*The Price-Panacoast Colliery—I, <i>Geo. W. Harris</i>	51
*Bag Houses for Saving Fume.....	55
The Correlation Committee of the United States and Canada.....	56
*The Newhouse Mine and Mill.....	57
Shot-Firers in Ohio.....	58
Bituminous Coal Production in 1904....	58
White Pine County, Nevada.....	58
Cost of the Gunnison Tunnel, <i>Lindsay Duncan</i>	59
Zinc Production at Broken Hill.....	59
Electrolytic Theory.... <i>T. Martin Lowry</i>	60
A Slag Dam..... <i>W. I. Fleck</i>	60
Re-precipitation from Cyanide Solutions, <i>A. N. Mackay</i>	61
An Ore-Sampling Device... <i>Henry Louis</i>	61
The Cost of Mining—II.... <i>W. R. Ingalls</i>	62
Electrostatic Concentration... <i>R. C. Canby</i>	64
Covering for Boilers and Steam Pipes...	64
Steam Turbine Operation.....	64
Softening Water.....	70
*Drainage of the Harlem River Tunnel.	72
Shooting Off the Solid.....	72
Safety Dogs..... <i>Special Correspondence</i>	75
*Staybolt Corrosion.....	76
New Books.....	70
Questions and Answers.....	73
Abstracts of Official Reports.....	74
Patents Relating to Mining and Metallurgy.....	76

Departments.

Chemicals and Minerals.....	92, 96
Coal Markets.....	88
Construction Notes.....	78
Dividends and Assessments.....	94
Industrial Notes and Trade Catalogues..	78
Iron and Steel Markets.....	89
Personals.....	77
Metal Markets.....	92
Mining News.....	79
Mining Stocks.....	94

EDITORIAL.

A NOTABLE anniversary passed last month without special recognition. The first small locks at the Sault Ste. Marie were completed in 1855, and on June 18 of that year—just fifty years ago—a steamer passed from Lake Huron to Lake Superior. The vessel was the side-wheel boat *Illinois*, and on the same day the *Baltimore*, from Lake Superior was locked down. The old canal was a small affair; but it was the beginning which made possible the development of the Lake Superior mining industry to its present great importance.

A NOTEWORTHY feature in the practice of smelting gold and silver ores is the increasing tendency toward the employment of copper as the collecting agent instead of lead. Smelting on the copper basis is decidedly cheaper than on the lead basis; and the former will be chosen invariably when sufficient copper ore is available. When lead ores have to be smelted, furnaces for both purposes are provided in the same plant. This is the practice at Aguascalientes, Salt Lake City, and elsewhere. In this direction, an important new undertaking is the erection of the Garfield plant by the American Smelting & Refining Company near Salt Lake City.

THE OFFICERS, alumni and friends of Lehigh University have organized a movement for the erection of a building on the campus of the University, to be called 'Drown Memorial Hall,' in honor of their late president, Thomas Messinger Drown. It is further proposed to place at the Massachusetts Institute of Technology an appropriate memorial tablet commemorative of Dr. Drown's services to technical education and scientific research, Dr. Drown having been professor of chemistry at Boston before he went to Bethlehem. Subscriptions are now invited for this purpose. The project is a fitting recognition of the eminent service rendered by this educator to science and the arts. It will doubtless receive the warm co-operation of his many friends and associates, and of the host of workers who appreciate the inspiration and labor rendered by Dr. Drown.

Concrete Blocks.

The manufacture of concrete blocks for buildings has already attained proportions so large that the makers of the machines for that purpose have become sufficiently numerous to organize an association. This was effected at a recent meeting at Chicago. It is stated that there are now about 4,000 makers of concrete blocks, and 100 makers of machines for molding them. These figures will be astonishing to those who have not followed the rapid growth of this new industry. Its development has indeed been so rapid that engineers have not yet been able to arrive at definite conclusions as to the proper composition and use of the material; and therefore they are unable to write precise specifications. As an inducement to the contribution of a literature on the subject, certain of our contemporaries have offered prizes for the best article to be published this summer. There is a general recognition of the value of the material, which is of consequence in mining and metallurgy, not only in furnishing new uses for cement and stone, in some favorable instances for the tailing from dressing works, but also in presenting a new, cheap and substantial method of building construction.

The New Nevada.

The history of Nevada mining illustrates the changing status of prospect and output which clothes the industry with more than its share of romance. Our readers of middle age remember the State as famous chiefly for the silver-gold Comstock, the silver-lead Eureka, and the smaller producers of White Pine, Pioche, the Reese river, and other districts, which were scenes of excitement about the time when the Pacific railway was building. The old Nevada was essentially a series of silver camps; it was among them that the silver-milling processes, now almost forgotten, attained their development. After a dormancy of nearly 30 years, the State reawakens in the discovery of a series of rich gold districts, with rushes and excitements that are reminiscent of 1865 to 1870, but with developments that are distinctly modern.

One of the oddest features of the new districts centering about Tonopah, Goldfield and Bullfrog is that this region is in the only part of the State the geography of which is left absolutely vacant.

by such a reputable publication as the 'Century Atlas.' It is of further interest to note that, as the mother 'propylite' of the Comstock was an altered andesite; and that of Eureka, a quartz porphyry; so the new field rests in safe neighborliness to Tertiary rhyolite and andesite. In spite of a temporary dullness at Goldfield, we predict that the advent of railroad shipping facilities, and of electric power from the mountains near the State line, together with other discoveries which are being made, will at least secure for the region full recognition by all future map-makers.

For a score of years, Nevada has figured, in public estimation, as a rotten borough politically, and economically as the home of exhausted mining camps. The present activity has already won for the State a reputation that ought to be maintained by energetic exploration and growing production. Not of least importance is the attention which the new camps will doubtless direct to some of the old ones, disregarded for many years, which may be made profitable again through the application of modern and improved methods.

The Importation of Zinc Ore.

The conditions under which zinc ore is being imported into this country are under discussion. Importations have been made, for several years back, from British Columbia and recently from Mexico. The ore has been brought in duty-free, or on payment of a merely nominal duty, and the domestic producers are objecting, especially in the Joplin district, where concerted action is being taken to secure reversing of a recent Treasury ruling.

Regardless of the question whether there ought or ought not to be a tariff on zinc ore, the law, such as it is, should be enforced. The present difficulty hinges upon the interpretation of the law. When the existing tariff schedules were enacted there was no zinc ore imported into the United States, never had been and no one expected there ever would be. The schedules covering this contingency were therefore treated carelessly. Calamine was put on the free list, and no other reference to zinc ore was made.

The term 'calamine' is in itself inexplicit, having had at different times and in different countries a different mineralogical meaning, but metallurgically and commercially it is employed to designate

all the carbonate and silicate ores of zinc, and in the tariff it should certainly be thus construed. The other class of zinc ore, the sulphide, being unscheduled in the tariff, would appear to fall under the caption of all other ores and minerals not elsewhere specified, dutiable at 20 per cent *ad valorem*.

Blende has been admitted duty-free, however, under the guise of silver-ore, as which it has been nominally purchased, and it has been recently admitted as a lead ore, duty being levied only on a small lead content at the rate of 1.5c. per lb., which the tariff prescribes shall be paid on the lead in all ores containing that metal. The Treasury has in effect ruled that an ore containing more than 1.5% lead, although it may contain 50% or more of zinc, is not a zinc ore, but, on the contrary, a lead ore.

There are few zinc ores which do not contain lead, and a silver content is of common occurrence. In their treatment, zinc, lead and silver are extracted, although there is only one smelter in the United States which aims to win the three metals, but it is the zinc which gives the ore the most value, for the recovery of which the metallurgical process is primarily designed, and of which the highest percentage is extracted. Ores of this character are metallurgically known as zinc ores, and heretofore have also been known solely as such commercially. Unless special equipment is provided in the smelter, their lead and silver contents accumulate in the residue from zinc distillation, which is thrown away.

The evasion of the tariff in the case of these ores has gone to the extent of purchasing them as silver ores, invoicing them as such, passing them through the customs duty-free, and smelting them without any effort to extract silver. Upon arrival at the smelter they became, of course, zinc ore. It is pure evasion to enter such ore as silver ore, lead ore or anything but zinc ore, and the Missouri and Colorado miners have good reason to protest, unless the zinc ore be calamine.

Exhaustion of the Metals.

Professor Shaler's paper on 'The Exhaustion of the Metals,' published in the *International Quarterly* of July, 1905, is certain to attract a good deal of attention. His thesis is that the supply of all the metals that are now commercially important will be exhausted within a com-

paratively short time, say, 100 years, the world's resources being now pretty well determined, necessitating the readjustment of commerce and industry and the mode of life. Although the paper contains numerous statements that invite adverse criticism, we think it will be agreed that its substance is suggestive and the subject treated is one that is worthy of consideration.

The theory that our supplies of the metals, as well as of coal and other minerals, will some day be exhausted must be accepted. Nothing which is incapable of reproduction can be considered inexhaustible. Even the energy of the sun will be dissipated in some unnumbered eon of time. The danger in any forecast of this nature is in setting a time limit, especially when it be so comparatively short as Professor Shaler's.

We consider that he is ultra-pessimistic in his view of the world's resources, failing to make proper allowance for the great undeveloped portions of the world, the prospect that our already known, but at present unprofitable, resources will become available through improvements in the arts, or even the latent possibilities of the territory that we now regard as well explored. Consider the case of copper, which, in company with iron, Professor Shaler holds properly to be above all other metals in industrial value. Who can say what the continents of Asia, Africa and South America may yield? What may not be expected from the metallurgists during the next 100 years, judging from their achievements in the last ten? Why should it be inferred that there are not another Cananea and another Nacozari, to mention only two recent discoveries, in regions that prospectors are supposed to know well?

Professor Shaler conveys a false impression by his statement that there are only two great copper districts in the Rocky mountain country, namely, Butte and Arizona. Arizona comprises many independent districts, rather widely separated, and Bingham, Utah, deserves to be ranked as an important copper district.

Professor Shaler sees in aluminum the probable substitute for iron and copper, when the problem of extracting it economically from clay shall have been solved. He does not regard lead, zinc and tin as indispensable metals, holding that their disappearance would cause no great inconvenience, but he is greatly con-

cerned about mercury and platinum. Gold, on the other hand, he regards as of such abundance that the supply will increase, causing rise in prices of commodities, but he does not foresee a long continuance of its use as the standard of value.

While we disagree with Professor Shaler's summary of the metal resources and his light rating of the value of lead, zinc and tin, we appreciate the suggestiveness of his paper in calling attention to the fundamental position of the metals in the arts; and its possible effect on public opinion. There was never a time when the metals were so extensively used, or when investments in metalliferous deposits could be so quickly made productive, as at present. It is a realization of the basic value, as an asset, of the possession of these raw materials that has led many of the great industrial companies to undertake the acquisition of vast natural resources. The appreciation of the same principle is, more and more, leading investors to regard good mines as the best form of industrial investment.

The Reduction of Waste.

The record of our industrial practice during the last 30 years, especially during the last 10 years, has been one of constant reduction of waste. In silver-lead smelting, for example, the loss of lead and silver 25 years ago amounted, in good practice, to 20 per cent of the content of the ore in those metals; but nowadays the loss of lead is seldom in excess of 5 per cent, while the loss of silver is even lower and of gold none at all. Immense quantities of lead and silver have been blown away in the form of smoke through pure carelessness, since even 30 years ago means for minimizing such losses were well known, although they were not so efficient as those of the present day, and their cost was, comparatively, so little that they would quickly have paid for themselves. Any waste of that character is to be condemned, but there is much apparent waste which in reality is not waste at all. For example, remark is frequently made of the immense quantity of sulphur which is thrown away in the treatment of sulphide ores; but it is not considered that the only use for such sulphur would be the manufacture of sulphuric acid, and that most of it is thrown away in parts of the country where there is no market for sulphuric acid, nor will

probably be for a time more distant than we can clearly see ahead. Obviously the throwing away of such sulphur is no industrial waste, although it would, indeed, be a waste if it were thrown away at places where sulphuric acid could profitably be made.

Many of the industrial wastes have been stopped, but a great many still remain to be considered. We venture to say without fear of contradiction that probably the greatest waste in our industrial practice is in the combustion of coal. There are few uses in which the maximum advantage is derived from this fuel. In good steam-boiler practice, as high as 80 per cent of the heat energy of the coal can be converted into the form of steam, which is a satisfactory performance, but when the steam is converted into mechanical power, the result is at best only about 15 or 20 per cent of the original potential of the coal. Gas-engine practice is, however, improving this result, as high as 30 per cent being obtained.

In furnace work the efficiency of the fuel is lower than what is obtained in bad steam-boiler practice. The employment of regenerative furnaces to obtain the maximum economy in such kind of combustion is often no economy at all, since the value of the fuel saved may be more than offset by the interest on the additional plant required. This subject was recently discussed in an article in this JOURNAL, wherein was pointed out the tendency of American practice to effect economy by the application of comparatively inexpensive means, such as the generation of steam from the waste heat of furnaces. This has been practiced at numerous works; most recently, and on the largest scale at the Washoe smelter of the Amalgamated Copper Company, where the excellent results have led to the adoption of a similar practice in other works that are being constructed. This system will soon, without doubt, become the standard practice in many branches of metallurgical work.

A more striking economy in coal is promised in the general application of the Gayley process of smelting iron ore with dry-air blast. In a recent discussion of Gayley's paper, presented to the American Institute of Mining Engineers, Professor Henry M. Howe, of Columbia University, made the remark that the value of Gayley's invention is so great that one can hardly rate it justly without danger of

seeming theatrical. Professor Howe figured a saving of 20 per cent of the 66,000,000 tons of coal required for the 46,000,000 tons of coke consumed in making the world's annual output of pig iron. Physicists and metallurgists are not yet agreed as to what will be the real result of Gayley's process in practice; but Professor Howe's estimates at least point out what they may be.

Although a high economy of coal is effected in the best boiler practice, the average is much lower, and it may be improved by simple means, without awaiting any new invention, which any expert in steam-boiler practice can point out. The combustion of the bituminous coals of the West is usually especially defective. In ordinary practice in the Western States, according to Professor Kent, an efficiency of 50 per cent or less is not uncommon. It is quite possible to raise this to 70 or even 75 per cent. An increase from 50 to 70 per cent would effect a saving of many millions of dollars per year, besides abating the smoke nuisance. Great saving in coal may even be effected by the simplest expedient of all—that is, proper management of the fire. We wonder how many large consumers of coal examine the ashes from their fires for unburned coal; yet a very large loss is suffered in that way. A recent investigation, at the Massachusetts Institute of Technology, of ashes, obtained from three industrial plants and that in one of the buildings of the Institute, showed average percentages of unburned coal of 2.49, 19.20, 6.66 and 18.60. The low results were obtained from plants of the Institute and a hotel. The high figures came from an electric-light plant and a large packing-house, in the latter a mechanical stoker being employed. Investigations were made to determine if it might not be possible to recover the unburned coal from such a clinker by washing, or other simple method, but it was decided that this was impracticable on account of the glazing of the coal with slag. It was pointed out, however, that more careful firing would certainly have decreased the carbon value in these ashes. Nevertheless, the washing or jigging of the 'gratings' from fireplaces is profitable under certain conditions, as has been demonstrated at the Washoe works at Anaconda and at several places in Europe; and it is therefore a subject which should be given further attention.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

HEALTH IN MINING CAMPS.

The Editor:

Sir—Prompted by the article entitled "Health in Mining Camps" (in your issue of June 15), it may not be inappropriate to extend the suggestions of that useful paper so as to cover Mexican experience and travel. While the article referred to takes the form of advice to students (in anticipation of their summer-school training, or their fieldwork in Western camps), there is much to be said that applies to mining travel in the American border-States of the Mexican frontier and to the Mexican republic itself. The two main considerations are: (1) Supplies and general outfit; (2) the more than ordinary care for individual health in the mining camp. To adjust the one, and to regulate the other, are essential to the success of a mining expedition of any kind.

It is a custom of the 'mining man' to proceed to a grocery and to order therefrom a long list of more or less unnecessary foodstuffs, taking suggestions from the tradesman himself. Fresh from continuous travel in mine examination in Chihuahua and Sonora, and with other Mexican experience, I would note some articles of diet which have found favor in these travels; these represent the weeding out from a much longer list. These are conveniently classified under two heads, namely:

(1) Staples and Necessities—Bacon, ham, dried beef or 'jerky,' flour, corn meal, sugar, tea, coffee, beans, Scotch oats, hard-tack biscuits; and canned articles, in tomatoes, corn, condensed milk and sardines. To which add the *et ceteras*, such as baking powder, salt, pepper, soap and matches.

(2) Extras, Luxuries—Beef tea, malted milk, prunes or dried figs, honey, maple syrup and chocolate. Fresh fruits and green vegetables will not be on the regular menu, but an active caterer will ferret these things out occasionally. Canned fruits and jams are not always wholesome, and they always add extra weight to the outfit: I think they should be left out entirely.

Packing cases which are light and durable should be used instead of boxes; such cases are now made of composition hemp-stuff, and are in every way convenient as well as serviceable. Bulk must be considered, according to the weight that it is desired to carry on the animal, and with even weight on each side of the pack-saddle. It must be borne in mind that the servant, or servants (*mozos*), must be fed from the provisions carried. Remembering also some peculiar and un-

enviable characteristics of the *mozo* in general, it is a wise precaution to keep under lock both the supplies and one's personal belongings. While on the subject of the indispensable *mozo*, drill him into washing his hands in your presence before taking any part at the camp fire in preparations for the meal, and do not let him steep your tea or coffee.

Under the next head, namely that of the general outfit, the essentials are: The broad-brimmed hat; several changes of clothes; not less than two pairs of strong mining-boots; a pommel-slicker; a roll of bedding and cot; canvas with hooks and eyes attached for tent-making, and some extra canvas sheets and strips for covering, etc.; plenty of toweling; several pairs of hobbles; a bell for pack train; and last, but not least, a revolver and rifle. Regarding the last item, fresh meat in the form of venison is frequently within reach of the traveler, while for smaller game a shot-gun will not be amiss, although it means extra trouble to carry.

Expressed in a word, the foregoing all tends to this: Keep clean; keep dry, and keep the sun off the back of the neck. Just as important is it to keep good track and good care of your animal stock. In the Mexican Sierra Madre one is seldom within reach of medical assistance; such aid is too often of the 'lick and a promise' kind, while the 'three eggs for breakfast,' of which your correspondent speaks, would, under most circumstances, be akin to an injunction to eat salamander. Cheese, according to the same authority, may be considered as contributing to 'mental force'; it may also be likened to the fine ash or volcanic dust of a tufa, a sort of binding material!

In Mexican travel it is not practicable to make much estimate of the water which one drinks; few will bother with the matter of packing a water distillery. It serves every purpose to boil the water that is slack; if its taste really needs disguising, add to it a pinch of the native *pinole*. In the same mood, it may be here suggested that 'toxic mixtures,' germicides, coefficients of fluidity, and the character of one's corpuscles might be better dealt with in popular medical literature than to be made a concern of the mining camp. The average camper knows when his digestion is out of order; he knows when he has a chill or fever, but he knows very little more. One should take the precaution to be vaccinated before crossing the Mexican line.

The matter of living sanely and soundly under camp-life conditions comes back to about the same thing as the normal instinct of self-preservation; if man would only take a lesson from the horse, the mule, the dog, or almost any animal, he will be quick to correct a tendency to sickness by common-sense abstinence or antidote. It may be granted that a certain restraint and self-denial are indispen-

sable; it may also be emphasized that the mining man in Mexico (the prospector excepted) must remember that he is not accustomed to grease, nor to coarse food, nor to the different climatic conditions which he often encounters. He should take opportunity, when that offers, to supplement his camp fare with the *tortillas* and *frijoles* of the native. In the matter of liquid stimulants, too, the product of the native plants is by nature designed for the particular climatic conditions under which they thrive, and these may be more wholesome than the 'foreign' beverage which the traveler may be carrying with him. Moderation is, of course, presumed. The ordinary medical-case of the mining engineer in Mexico carries such essentials as quinine, some liver pills, and Epsom salt or its equivalent. Without fear of trivial ailments, and with good health to begin with, a small medical supply will bring him through.

Of permanent mining camps in general, either in Mexico or in the United States (where mining life, as in parts of Idaho and Nevada, is often about as rough and as tough as it is possible to have it), it may be questioned whether there was ever a camp which, though originally unhealthy and unattractive, has been transformed to so clean a front as the camp of Cananea, in Sonora, Mexico. There was a time when pneumonia was invariably fatal in its termination, and there was, at one time, a condition bordering on pneumonia epidemic, with considerable typhoid fever. It may be fairly said, and creditably, that it is due to the energetic measures taken by the Cananea management and to the medical skill of Dr. W. J. Galbraith, the physician and surgeon in charge, that there is in the local hospital a record of 84 consecutive cures in an equal number of pneumonia cases; with a mixed mining population of 20,000, there are to-day in the hospital only 9 patients, and these are convalescing from injuries and from sundry lesser ailments which are inseparable from the hygienic conditions of any community. The wide streets and the prompt measures taken to destroy quarters fostering contagion appeal to the subject under discussion, and these things have, separately and collectively, contributed to make this an example which should be emulated by many a growing camp in the United States.

FORBES RICKARD.

Cananea, Sonora, Mex., June 29, 1905.

THE DETERMINATION OF COPPER IN SLAGS.

The Editor:

Sir—As different methods for the accurate determination of copper are receiving consideration in the columns of the JOURNAL, the practice in the laboratory of the Tennessee Copper Company will perhaps be of interest.

For ores, custom mattes and converter coppers, we have ample time to report,

and always make an electrolytic determination for copper; in fact, an electrolytic determination is always made when extreme accuracy is required. In smelting the low-grade ores of this district, slag losses are considered of such vital importance that no pains are spared to get accurate results on them, and it is to the determination of copper in slags that I will confine myself.

When we commenced pyritic smelting here about a year ago, a number of problems presented themselves that could be solved only by having very accurate slag analysis; and at that time we began to make all copper determinations on slag by electrolysis; but it soon became apparent that the hour delay, caused by that method, was too great. In searching for a method that would approach the electrolytic in accuracy, I tried all the known variations of the cyanide and iodide methods. In the course of these investigations I came to the following conclusions:

First, for a titration method, a 5-gram sample is the least that should be used; second, the end point in the cyanide titration is as definite as in that of the iodide. Some may take exceptions with me on the latter point, but I shall adhere to the position that, when proper attention is paid to the amount of reagents used, and to the time of the operation of titrating, as accurate a titration can be made with cyanide as with the iodide method.

The procedure is as follows: Weigh 5 grams of the slag into a 5-in. casserole; add 20 c.c. of hydrochloric acid, and mix well with a glass rod; add 5 c.c. of nitric acid and continue to stir until the acid is acting freely and the material is loose from the bottom. Boil, and evaporate to dryness on a sand bath. Add 10 c.c. of hydrochloric acid and stir with a glass rod; add 10 c.c. of sulphuric acid, boil and evaporate to dryness. (The first evaporation is to dehydrate the silica; the hydrochloric acid is added before the second evaporation to attack the oxides of iron, and to hasten the action of the sulphuric acid.) Take up with 40 c.c. of hot water, boil and filter with the aid of suction. A platinum cone and filter paper are more rapid than a Gooch crucible. The filtration is rapid and clean when suction is used, and unsatisfactory without it. The filtrate is made up to 200 c.c. with water, 5 c.c. of sulphuric acid added and the copper precipitated on aluminum. Insure the total precipitation of the copper by adding 30 c.c. of strong hydrogen-sulphide water after the copper is precipitated.

The brevity I will designate three beakers as *A*, *B* and *C*. *A* is the beaker in which the copper has been precipitated, and to which the hydrogen-sulphide water has been added. Decant solution from *A* to *B*, washing in as much copper as possible, but keeping the aluminum in

beaker. *A*. Filter solution from *B* through an 11-cm. filter paper, into *C* and wash with hydrogen-sulphide water. Pour 5 c.c. of nitric acid over the aluminum in *A*, to dissolve any adhering copper. Wash off the aluminum with a stream of water from wash bottle and remove it; and in the same manner wash the copper from the filter paper into *A*, and boil to insure complete solution.

Two courses may now be followed: First, add 1 c.c. of sulphuric acid and electrolyze, or, second, add 10 c.c. of ammonium hydroxide, filter and titrate with potassium cyanide. In standardizing the latter, use is made of composite slag samples upon which repeated electrolytic determinations have been made. In running the standard it is submitted to exactly the same treatment as the slag to be analyzed. In titrating with cyanide, in every case the chemist allows the cyanide to flow from the burette at such a rate that the solution is colorless in about one minute. With a little practice this is easily performed.

I will give only a short list of assays to show how the method checks. The following determinations of a standard slag illustrate a large number that have been made by electrolysis: First determination, 0.456% Cu; second, 0.462%; third, 0.459%; fourth, 0.462%; fifth, 0.456%.

Of course, the cyanide assay cannot be as accurate as the electrolytic. Each day two samples are tested by electrolysis to check the cyanide, and for the past six months there are very few days in which the cyanide does not check closer than 0.04%; in the large majority of cases the error is less than 0.02%. The average of the daily samples by cyanide for a month never fails to check a composite monthly sample by electrolysis to 0.01%. Of course, assays may check and still be wrong; but we have had many samples assayed by other chemists to assure us that the method is accurate.

There are methods more rapid than this; a single determination can be run in about one and a half hours.

F. X. MOONEY.

Copperhill, Tenn., June 20, 1905.

According to *Power*, July, 1905, a vertical 5-stage air compressor has recently been constructed in England by Peter Brotherhood, the inventor of the Brotherhood steam engine. At a speed of 120 r. p. m. it has a capacity of 10,000 cu. ft. of free air per hour compressed to 3,000 lb. per square inch.

A new explosive, a British patent by Roberto Imperiali, is named 'picrite' and consists of barium nitrate 2 parts; potassium nitrate, 4 parts, and picric acid, 4 parts. It withstands heat up to 250° C. (482° F.), and does not explode by the action of heat alone under 360° C. (680° F.).

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor. We do not hold ourselves responsible for the opinions expressed by correspondents.

Gold in Santo Domingo.

Sir—I employ this caption because Mr. F. Lynwood Garrison used it for his article recently published in this JOURNAL (June 15, 1905), whose conclusions agree with mine, formed during 18 months in the Cibao. He succinctly states the truth concerning the mineral wealth of Santo Domingo, but he barely mentioned the copper properties in the San Cristobal district on the Haina and Nigua rivers, on which some work has been done. In July, 1904, I saw samples of copper ore which were rich, some of them carrying free gold.

The various mining concessions on the north side of the Cibao (which Mr. Garrison mentions as having been granted) covered for the most part old Spanish workings. They include: Gold near Magua, copper near Cotui, gold near La Vega, silver and copper near Yasica. A placer at Bulla was worked for a while by an American company as the result of Gabb's survey. It gave poor results, owing to bad management. The amber deposit (included in the concessions to the same interests) is the only one of the concessions under which any development work has been done. Those concessions were granted immediately after the promulgation of a new mining law which went into effect in June, 1904. The full text of this law was published in Spanish and English in the monthly *Bulletin* of the International Bureau of the American Republics, Washington, D. C., November, 1904.

In the Cibao, from Santiago westward to the Haytien border, the country is, for the most part, an open pine land. It is well watered and is sparsely inhabited by natives of Indian extraction. I found a ledge, 40 ft. wide, of gray quartz, carrying gold and silver. Evidence of copper was found in the same region. Gold is washed in all the streams of the neighborhood by women; in fact, this can be said of every stream running out of the high timber throughout the entire Cibao. Pits (similar to those of which Mr. Garrison speaks) are found on all the rivers of any considerable size in the Cibao. The natives call them 'Indian holes.' I have seen hundreds of them on the points of the sharp bends of the rivers, where the bedrock is usually high; sometimes as many as 20 together. From their appearance and position the Indians did not work below the water level. Where found in numbers, it is proof that good-pay dirt was found; where found singly, evidently they were prospect holes. When

we take into account the vast extent of gold-bearing sands and gravel of the Cibao, and that women in Santo Domingo are experts with the 'batea,' the amount recovered annually is small. More gold is recovered between May and October than from November until March. In every town throughout the Cibao there are two or three merchants who buy gold. I judge that, in the towns of Guaraguano, San José de las Matas and Janico, and in the city of Santago the aggregate value of the gold purchased annually reaches from \$60,000 to \$75,000. The gold at present washed in Santo Domingo is coarse. The smaller streams in the high mountains, near the source of the gold, are naturally the richest and most easily worked. The large placers that will eventually be operated by extensive mechanical appliances will be found lower down on the bars of the larger rivers.

The active interference of the United States Government in the political affairs of Santo Domingo has had a very salutary effect. The eyes of many Americans have been drawn in that direction. In Santo Domingo, on all sides, in every station of life, the Dominicans are favorable to the United States. General Morales is alive to the requirements of the times. He is instilling a spirit of activity among the people, and is endeavoring, by every means, to safeguard capital by surrounding it with all the guaranty of a stable government.

D. T. O'DAY.

New York City.

Softening Water.

In a recent paper on 'the softening of well water' (Prof. Nicholas Knight, *The Chemical Engineer*, June, 1905, p. 89), the investigation turns on the effect of heating the water under normal pressure, as compared with the influence of boiling under several atmospheres. The result shows no appreciable improvement from the extra pressure, in the case of lime, but a considerable betterment in the magnesia. "Boiling for 20 min. at the normal pressure, removes 44% of the temporary hardness, that is, the calcium and magnesium carbonates. At the increased pressure, 63.5% is removed." This result is interesting as bearing on the question of softening water, not only for ordinary boilers, but also for water jackets of smelting furnaces, where hard water is a source not only of expense but of danger.

Moissanite is the name proposed by G. F. Kunz. (*American Journal of Science*, May, 1905) for the natural silicon carbide occurring in certain meteorites, and discovered by Henri Moissan (of Paris) in a 400-lb. meteorite of Cañon Diablo, Arizona. The mineral was described some time ago in this JOURNAL, and could not have come from contamination, as Prof. Moissan used no saw in the mass of iron examined by him.

New Books.

Geological Atlas of the United States. No. 121. Waynesburg Folio, Pennsylvania. Washington; engraved and printed by the United States Geological Survey. Pages, 18; with maps and illustrations.

This folio is a description of a part of Green county, Pennsylvania, which is in the extreme southwestern part of the State. It is essentially a serial continuation of the Masontown quadrangle immediately to the east, and the Brownsville to the northeast. The Waynesburg quadrangle is in the center of the great coal district just southwest of Pittsburg, and also carries some oil and much gas. There are also stone and clay, but not much iron ore. The quality of the work of mapping and describing the geology of the quadrangle is fully up to the high average of those elaborate Survey folios; and among the illustrations should be noted a valuable half-tone of a relief map of the northern Appalachian region. The Waynesburg coal is a (bituminous) hard block-coal, which averages about 50% fixed carbon; it is non-coking, and frequently runs high in ash and sulphur.

United States Geological Survey. Bulletin No. 243. Cement Materials and Industry of the United States. By Edwin C. Eckel. Washington; Government Printer. Pages, 396; with maps and illustrations.

No single branch of the mineral industry of the United States in recent years has had a growth like that in the production of portland cement. In 1890, the total was 335,500 bbl., valued at \$439,050; in 1903, the quantity exceeded 22,000,000 bbl., and the value \$27,000,000. This was due to three causes; an extraordinary increase in the uses to which cement is applied, an abundant supply of the raw materials, and the recognition by engineers and manufacturers of the growth and importance of the demand. It is only within the past ten years that engineers have come to realize the value of cement as a material of construction; the pioneers in this have found a multitude of followers, and cement is now well established as second only to steel in structural value.

The present volume is, in part, a compilation from earlier authorities; but it also contains much new information, partly gathered by the Survey and partly from other sources. After a brief explanatory introduction, it is divided into four parts. The first treats of the materials and manufacture of portland cement. Limestones, clays and shales, slate, blast-furnace slag and other materials are concisely referred to; while the methods of obtaining the raw material, and the processes of manufacturing them into cement are briefly described. The second, and longest, part describes cement resources,

treating of the deposits of material of all kinds. The descriptions are classified by States; and it is in this part that the information gathered by the Survey is utilized in a form usually convenient for reference, though the different chapters are of uneven merit. They are well illustrated by small maps, and contain a great mass of information. Part III is on the natural cement resources, as distinguished from the portland cement materials. The more important of these are found in the Hudson River valley in New York, and in the Indiana-Kentucky district. The fourth and last part is on the materials and manufacture of puzzolan cements, and the greater part of this is given up to the slag cements.

United States Geological Survey. Bulletin No. 255. The Fluorspar Deposits of Southern Illinois. By H. Foster Bain. Washington; Government Printing Office. Pages, 75; with maps and illustrations.

The Devonian and Carboniferous deposits of fluorspar of the Kentucky-Illinois district have long been known, and have been recently commercially important as a prominent domestic supply. The pamphlet in question is devoted mainly to the Illinois part, the Rosiclare and Hicks districts being described with particular care.

Mechanics of Air Machinery. By Julius Weisbach and Gustav Herrmann. Authorized Translation, with *Appendix on American Practice.* By Amasa Trowbridge. New York; the D. Van Nostrand Company. Pages, 212; illustrated. Price, \$3.75, net.

The learned treatise of Weisbach on Engineering Mechanics (a revised edition of which was edited in German by Professor Herrmann) has already served as a source from which translations of several parts have since been made. This volume contains only that portion pertaining to the 'moving of air,' and is the final portion published in English. That the translator is Adjunct-Professor of Mechanical Engineering in Columbia University is sufficient to warrant the editorial quality of the work; and he has shown his practical enthusiasm by the addition of a 50-page appendix, which is not only well illustrated, but is in somewhat striking contrast with the highly mathematical treatment of the first (German) part of the book: It is not to be implied that the first part of the book is not practical, but it bristles with formulas which are not to be trifled with. Whether it is a blowing-engine, a fan, a compressor, or a rotary blower, the mechanical theory and practice is elucidated by formula and equation. That the volume is in a class by itself is a testimony to the German writer and editor, but no

more than to the energetic and helpful translator and publisher.

United States Geological Survey. Bulletin No. 260. Contributions to Economic Geology. 1904. S. F. Emmons, C. W. Hayes, Geologists in Charge. Washington; Government Printing Office. Pages, 620; with maps and illustrations.

This convenient volume is a worthy sequel to the similar annual summaries which have appeared systematically for the last few years, and which contribute a really valuable addition to the already formidable list of the publications of our national Geological Survey. The itemized discussion of this particular book is a task that we would gladly consider if time and space allowed, and if it were not that the volume is practically within the reach of all who would take the pains to write for it. Moreover, the easy, clear condensation of statement makes this particular work perhaps more easily intelligible to the always overworked engineer than any of the Survey publications. We would note, however, with particular emphasis, the special notes on the Ouray, Colo., district, by J. D. Irving; that on Cripple Creek, Colo., by W. Lindgren and F. L. Ransome; that on Georgetown, Colo., by J. E. Spurr and G. H. Garrey; that on the Neglected Mine (Durango, Colo., quadrangle) by W. H. Emmons; the copper deposits of the eastern United States, by W. H. Weed; the iron ores of the Brookwood quadrangle, Alabama, by E. F. Burchard; the Warrior coal at the same locality, by Charles Butts; not to mention a long list of equally valuable and interesting notes on other metallic and non-metallic minerals. The volume will easily find its place among the books that the geological engineer will keep at his elbow for ready reference.

Geologic Atlas of the United States. No. 123. Elders Ridge Folio, Pennsylvania. Washington; engraved and printed by the United States Geological Survey. Three maps and 10 pages text.

This folio is essentially a contribution to the literature of coal, gas and related products. This Elders Ridge quadrangle is in central western Pennsylvania, about half in Indiana and half in Armstrong counties, with a small part in Westmoreland county. It is 30 or 40 miles north-east of Pittsburg. It is in what is called the Appalachian plateau, and the surface rocks exposed are entirely Carboniferous. In addition to this, much information has been obtained from the preserved records of gas-drilling, which seem to have been courteously and freely placed at the disposal of the Survey. There are six local gas-fields, and experience shows that the producing gas-wells are on the flanks or well up on the ridge of anticlinal folds. Natural gas is found in six horizons in this district. In addition to gas, there

are found limestone (for fertilizer), sandstone (for building), clay (for fire-clay, both hard-flint and soft-plastic) and stoneware clay. There seems to be no oil in the region covered by this Elders Ridge folio, but there is gas, as mentioned, and some coal (Freeport and Pittsburg) in the southern part.

Monograph on the Geology and Mining Features of Silver Valley. Herberton, North Queensland, Australia. Part I. By James Stirling. F. E. Clotten, Frankfurt-am-M., Germany; pages, 60; with maps and illustrations.

The demand for actual scientific fact, as the basis of large-scale mining practice, is shown by this monograph on a region which is stated to promise not only tin and copper, but also silver, bismuth and tungsten. The editor, James Stirling, was late government geologist of Victoria, Australia, and president of the Geological Society of Australia. Part I deals with the geology and mining features of Silver Valley, which is at Herberton, North Queensland. Though the commercial phase is emphasized on every page by the bold-faced type, coarse-grained illustration and isolated paragraph, yet the substance is distinctly scientific. Part II (which considers the petrographic side) is still more technical; and both parts are well illustrated. The Lancelot lode produced tin ore in 1904 to the value of £13,195.

Catalogue Officiel des Collections du Conservatoire National des Arts et Métiers. Fascicule 1.—Mécanique. Paris, France; E. Barnard. Pages, 440; illustrated.

This is the official catalogue of the mechanical department of the extensive and valuable scientific collection which gives, in epitome, an almost complete history of the progress of technology. The volume is embellished by numerous illustrations of great inventors and some of the more prominent and interesting machines. There is a partiality pervading the catalogue, which, though thoroughly French, is perhaps pardonable; for instance, the statue of Denis Papin, being labeled as the inventor of the steam engine in 1690.

Jahrbuch für das Eisenhüttenwesen. Third Year. Edited by Otto Vogel. A. Bagel, Dusseldorf, Germany. Pages, 464; illustrated.

This summary of annual progress describes with much detail the subject of fuel, refractories, slag, ore, pig iron, cast iron, weld iron, together with the properties of iron, the alloys of iron, and the testing of material. The editor has kept a cosmopolitan weather-eye on the important publications not only of Germany, but also of England, France, the United States, and other countries. The indices, both for names and subject matter, are full and satisfactory.

Geologic Atlas of the United States. No. 120. Silverton Folio. Washington; engraved and printed by the United States Geological Survey. Six plates and 36 pages text.

This folio is similar in size, design and in artistic execution to its predecessors. In detail, the 34 pages, 135 columns and, approximately, 100,000 words of letterpress constitute a treatise on the rock structure, mineral make-up and ore deposit of the region, which, down to 1900, produced \$35,000,000. The principal part of the district is an elevated, deeply scored, volcanic plateau, drained by the Gunnison on the north, by the Dolores and San Miguel on the west, by the San Juan on the south, and by the Rio Grande on the east. The Continental Divide traverses the area in a great bow, and there are hundreds of summits over 13,000 ft. in altitude. The stratigraphic list includes Archaean, pre-Cambrian (Algonkian or Uncompahgre), Cambrian, Devonian, Carboniferous, Tertiary and Quaternary. The eruptives include pre-Paleozoic (granite, diabase and meta-diabase); Tertiary (andesite, rhyolite, latite, pyroxene-andesite), etc.

The section on economic geology is by T. L. Ransome. The view presented is that "the ores (the lode and stock) of the Silverton quadrangle were deposited from aqueous solution." The mode as described enumerates: (1) The mechanical formation of the fissures; (2) the functions of heat in intensifying the chemical action of underground water; (3) vast masses of igneous rock, from which the ore minerals were largely derived.

Society for the Promotion of Engineering Education. Proceedings, Volume XII, 1904. Edited by C. Frank Allen, Fred McNair and Milo S. Ketchum, Committee. New York; The Engineering News Publishing Company. Pages, 253.

This society was organized in 1899 by men interested in the education of engineers. The membership represents a few men active in the practice of some one of the various branches of engineering, and many who are busied in the academic side. The central idea which pervades the various papers and addresses is that the engineer may be a cultured man, but he must be a technical man; and that the responsibility for the depth and thoroughness of his training rests with the respective school. The task of the society is worthy of the support of every teacher in technical schools and every engineer in practice. This volume is edited by a committee consisting of C. F. Allen, professor of Railroad Engineering at the Massachusetts Institute of Technology, at Boston; F. W. McNair, president of the Michigan College of Mines, at Houghton; and Milo S. Ketchum, professor of Civil Engineering, University of Colorado, at Boulder.

Drainage of the Harlem River Tunnel.

The two tubes, through which the rapid-transit subway trains began operating on Monday last, were constructed on a novel principle; they were built of cast iron lined with concrete above ground, and then sunk to the bottom of the river, instead of being constructed in place in the usual manner with a shield. The tubes are 641 ft. in length and 16 ft. diameter, the top of the tunnel being 20 ft. below low-water mark. The engineers devised a system for draining the seepage, or percolating water, to be used also should emergency arise from a sudden inrush in the event of a broken main. The drainage and pumping system adopted, and the precautions taken to meet these conditions, make the subject of this article.

Fig. 1 is a section of the tunnel, looking southwest; it shows the arrangement of the pumps which are located in both the tubes at the junction of the subway

three-quarters of a mile away above ground. The control is automatic by means of separate floats located in the tunnel. The automatic float for the near pump is shown along the wall on the left-hand side. The other pump has its float nearer the floor and attached to the pump. An air reservoir (16 in. diameter by 36 in. long) is arranged in the air pipe-line at the throttle of each pump. The suction piping also extends into the sump, the top of which is protected by iron grating.

Owing to the limited space allotted to them (the extreme width being only 19 in.), the water ends are, of necessity, very compact. The valves are set in removable decks, rendering them easy of access, the suction valves are placed under the water cylinder, and the discharge valves above it.

Each pump is separately and independently connected, and is designed with the suction and delivery flanges looking fore and aft, thus permitting the arrangement of the suction pipes as shown, with

the pumps were pressed into use at short notice; they were kept in operation day and night, and performed good service, the inflow of water being entirely taken care of and causing but slight interruption to the work. The working parts are not exposed, and it is claimed that, if one of these pumps should become submerged, it would keep right on pumping to the limit of its capacity until it had cleared the tunnel.

Shooting off the Solid.

The custom of shooting off the solid has little to commend it when undercutting is practicable. Chief Inspector of Mines of Ohio, George Harrison, comments on this matter as follows in his report for 1904:

In the Salem, Leetonia and Washingtonville localities the coal is mined on a run-of-mine basis (the only district in Ohio employing this method); solid shooting or blasting off the solid is the regular custom, and is practiced to the fullest extent.

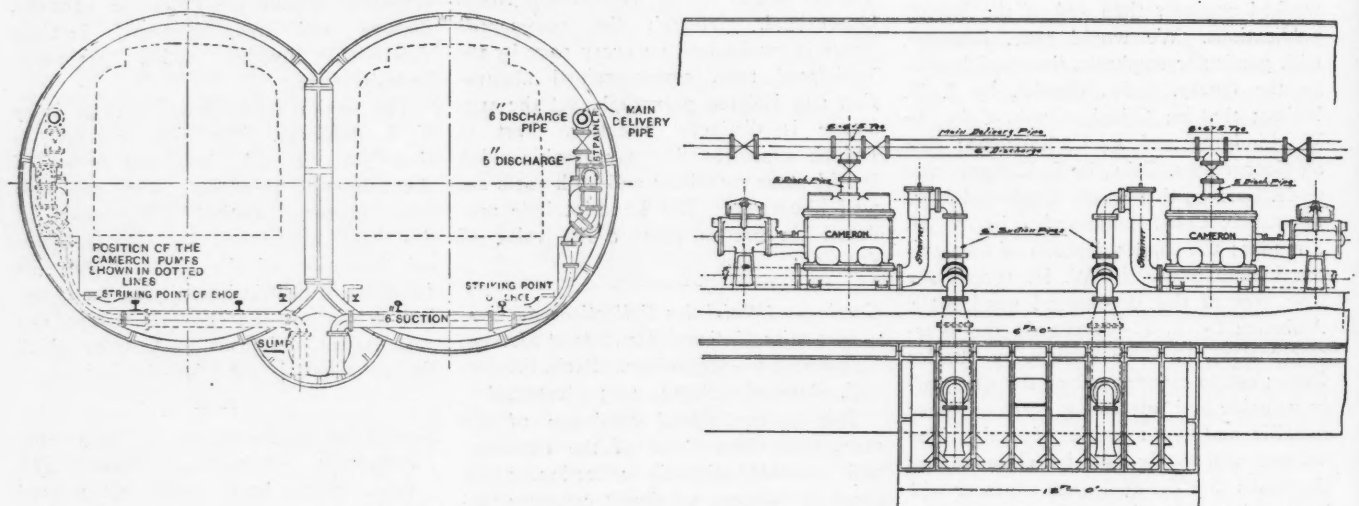


FIG. 1. CROSS AND LONGITUDINAL SECTIONS.

and tunnel. The pumps adopted for this service were especially designed, and built by the A. S. Cameron Steam Pump Works, of New York. A longitudinal arrangement of the piping and connections for the pumps is shown on the right-hand side of this illustration.

Fig. 2 is taken from a photograph, and shows the inside construction of the tunnel with the pumps in position. A portion of the end of the concrete archway is shown and this is the point where the two tubes are joined, the double tracks continuing in one tunnel.

This view shows two of the pumps in position on concrete foundations, with the arrangement of the piping system. Four pumps were installed (12 by 12 by 18); they are of the Simplex single-cylinder pattern, having the regular Cameron steam-end, arranged to be used either with compressed air or steam; the pumps will, however, be driven by compressed air. Each has its separate air line to the compressor plant, which is situated over

the pipes running under the air end. The foot under this end is made in two parts, straddling the 6-in. suction pipe, to permit its ready removal.

The capacity of each pump is 600 gal. per min. at normal speed, with pressure at the throttle of 70 lb. per sq. in., pumping against a total lift of 70 ft. The capacity could be increased to 1,000 gal. per min. in case of emergency. The water piston and rods are of composition; and, owing to the liability of the water being dirty and gritty the water cylinders are constructed with removable composition bushings. The suction pipes are supplied with gooseneck strainers to keep out the dirt and rubbish, and to insure the priming of the pumps by keeping the suction chambers filled. The cylinders being flooded with water at all times, the pumps would start as soon as the water reached the float level.

Owing to the discovery of water in the tunnel some time ago, temporary piping and connections were hurriedly made and

tent. At the time of examination we were informed by miners that it was impossible to undercut it with hand picks, and that unless they were permitted to blast off the solid it would have to stay in the ground or be cut by mining machines.

Very heavy charges of powder are used, and the blasting is done with about 4 or 5 ft. of patent fuse in order to allow the miner to get a safe distance away from the blast, the force of the concussion sometimes bursting wooden brattices, stoppings and doors from their places and tearing up roadways and doing considerable damage otherwise.

The dispute between the company and the miners at the Big Walnut mine regarding shot-firers was compromised by the miners agreeing to undercut half the coal, and the company to employ two men to do the shot-firing at night after the miners had prepared their blasts and left the mine, and the shot-firers were not to fire any shot that was not properly prepared according to agreement.

The question of solid shooting is not only becoming a very serious one in many respects to both miners and operators, but one that greatly endangers both life and property. It is, however, a two-sided question, and the blame for all the ills resulting from it does not lie at the door of the miners. Any miner of middle age can well remember the time when blasting coal off the solid was almost unknown, and even in some of the very hardest coal seams in the State, miners took great pride in undercutting and side-cutting their coal to the best advantage, so as to use the least possible amount of blasting powder and secure the greatest percentage of lump coal. Any man who was careless about preparing the coal before blasting or shattering it to pieces with an overcharge of powder was char-

acterized as a 'coal butcher,' or 'company coal digger,' all the coal going through a screen $1\frac{1}{4}$ in. between the bars being called 'company coal.' The miners were paid on a lump-coal basis, much of the fine coal at that time being hauled away and dumped in piles, there being no market for it. During the eighties, however, the finer grades of coal began to be more generally used, and the demand for it at fair prices rapidly increased, thus stimulating a disposition on the part of many mine operators to increase their percentage of fine coal. We can recall many instances where questionable methods were resorted to to increase the profit in that way, and preference was given to the unskilled and careless men who used the most blasting powder and produced the largest percentage of fine coal. Thus the operator profit-

ed in three ways, viz.: (1) On the increased sale of powder; (2) on the extra fine coal; and (3) where the coal was leased on a regular basis of lump coal, by getting an extra proportion of fine coal free of royalty. There is nothing that has been more detrimental than solid shooting to the interests of the real practical miners, and it will be to the injury of the coal trade of Ohio as long as it is practiced. However, the forced introduction and rapid increase of mining machines in the mines in this and other States is doing much to eradicate the evil by the enhanced value of their product, compared with that produced by the 'coal butchers.' As one of the most striking evidences, the year 1904 witnessed the closing of numerous mines where solid shooting was in full

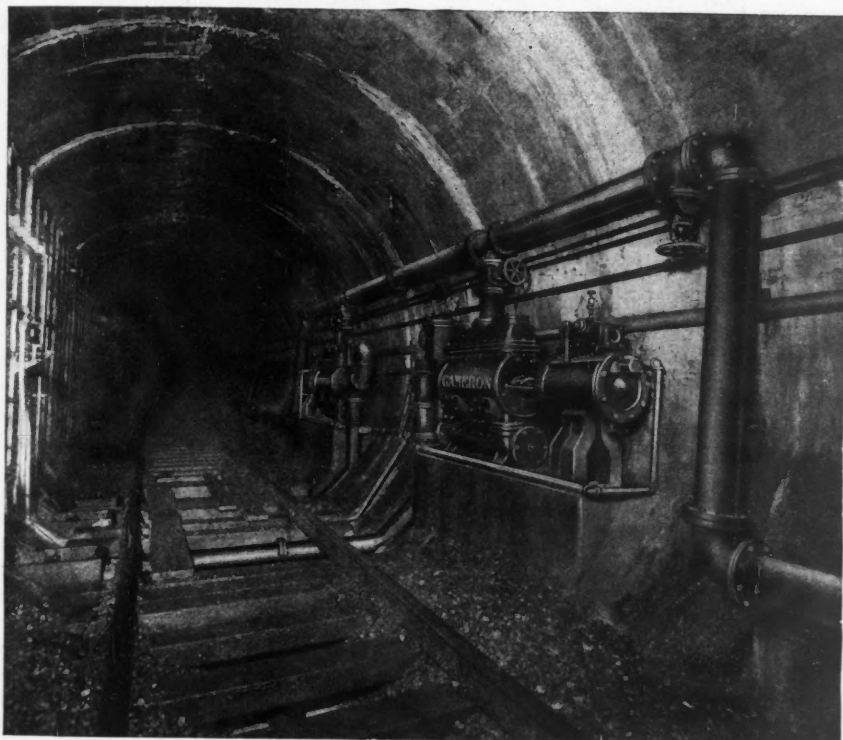


FIG. 2. VIEW FROM MOUTH OF TUNNEL.

force, because of inability to compete with the properly mined coal of other companies. All indications point to the fact that this will be one of the most burning questions of difference between the Ohio miners and operators at the expiration of the interstate agreement, April 1, 1906. There is no question that the coal in a great many mines where it is now blasted off the solid should be properly undercut, and if it can be shown that a miner cannot earn fair wages at present prices and prepare the coal properly, he is entitled to a better wage. Properly made cement pipes compare favorably with other kinds of sewer pipe in strength and durability, and there are now several methods of rendering them impervious to water.

force, because of inability to compete with the properly mined coal of other companies.

All indications point to the fact that this will be one of the most burning questions of difference between the Ohio miners and operators at the expiration of the interstate agreement, April 1, 1906. There is no question that the coal in a great many mines where it is now blasted off the solid should be properly undercut, and if it can be shown that a miner cannot earn fair wages at present prices and prepare the coal properly, he is entitled to a better wage.

Properly made cement pipes compare favorably with other kinds of sewer pipe in strength and durability, and there are now several methods of rendering them impervious to water.

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Zinc Roofing.—I understand that zinc has been extensively used for roofing in some countries. Can you give me any particulars on this point?—Z. N.

Answer.—The following summary is from Ingalls' 'Production and Properties of Zinc,' Chapter III: "In Europe the chief use of zinc is as roofing material, for which purpose it is in great favor. It was first employed for roofing in 1811, when Abbé Dony, the founder of the Belgian zinc industry, in his efforts to create a market for the consumption of his small output of spelter, then practically a new and unknown metal, roofed a house with sheet zinc. During the same year portions of the roof of the church of St. Barthelemy at Liège were covered with sheet zinc. According to W. H. Seamon, both these roofs were in good condition in 1836. In 1820 the Theatre de la Monnaie at Brussels was roofed with zinc, and up to the time of its destruction by fire, in 1855, it is authoritatively stated that no repairs had been required. Mostselman, the successor of Dony, and founder of the Société Anonyme de la Vieille Montagne, continued the experiments of his successor with marked success, and without any special effort on the part of the company many of the buildings in Belgium, France and Germany were roofed with the metal, to the extent that during the year 1836 it is said that upward of 12,000 tons of zinc were used for roofing purposes in France, while the consumption in England amounted to only between 2,000 and 3,000 tons. In 1867 the zinc producers of Europe had careful examinations made of the then existing roofs, from the observations on which conclusions as to the best method of laying such roofs were deduced, and workmen were trained to handle the metal properly. Since that time there has been a large increase in the consumption of sheet zinc for roofing material in Europe, where it is now recognized as highly desirable, because of its great durability and its economy as compared with lead and copper. Its comparatively low cost has secured its application on structures of all kinds, including many large buildings. In the United States previous to 1890 it is said that there were only three buildings roofed with sheet zinc. Probably the number of additions to the list between 1890 and 1900 was small, inasmuch as American architects and builders are still generally ignorant of the advantage of the material.

"In Europe the business of zinc roofing

is conducted partly by the manufacturers and partly by roofing companies. The sheets are commonly corrugated and stamped at the rolling mills, though some of the roofers cut and stamp their own sheets.

"Sheet zinc owes its value for roofing purposes to its durability, lightness and economy, as compared with galvanized iron, tin-plate, lead, slate and tile. Galvanized iron, being coated with zinc, should possess theoretically as much durability as sheet zinc and less weight for the same strength, together with less first cost, but, as a matter of fact, the union of the zinc and iron effected in the process of galvanizing is not sufficiently strong to withstand long the unequal expansion of the two metals, wherefore the zinc coating gradually scales off, exposing the iron, and thus creates an electrical couple, which results in the more rapid corrosion of the iron and destruction of the roof, although that may be delayed somewhat by frequent and thorough painting. With the greatest care, however, 15 years is a long life for a roof of galvanized iron. The superiority of sheet zinc over galvanized iron was shown in the case of the Northern Railway station at Birmingham, England, which was roofed in 1853 with the latter, and was carefully painted on both sides every three years and repaired whenever necessary, but at the end of 13 years was found to be so rotten that it had to be removed; it was replaced by a zinc roof, which still exists in perfect condition, and has given but little trouble or expense for repairs. The coating of basic zinc carbonate which forms on the surface of a zinc roof is practically insoluble in atmospheric water, and thoroughly protects the underlying metal from further oxidation by atmospheric agents. A zinc roof of the proper gauge weighs from 125 to 180 lb. per 100 sq. ft., against 800 lb. for lead and copper, 700 to 900 lb. for slate, and 1,500 lb. for tiles.

"Zinc should not be allowed to come in contact with iron, copper or lead, since thereby voltaic couples are established, which destroy the zinc, especially in the presence of moisture. Zinc should not be laid on wood, such as oak, which contains acid, and should not be exposed to calcareous water. Zinc laid on flat roofs to which cats can gain access is also soon corroded."

The East Indian earthquake of April 4 is said, by *Indian Engineering*, to have been recorded on the seismometer and seismograph of Professor Milne, at the Isle of Wight, simultaneously with its occurrence in the Himalayas and before its telegraphic announcement from India to the world. The statement, if true, would indicate that the sensitiveness of the earth shows it to be even more of a sympathetic unit than geologists had supposed.

Abstracts of Official Reports.

The Combination Mines Company.

The first annual report of this Goldfield (Nev.) company, under the management of Arthur Winslow, covers the period from October, 1903 (when the property was acquired), to the end of 1904. Active work was not begun until the latter part of November, 1903, when the sinking of shaft No. 1 was started. The first shipments were made in December, 1903. The property, as originally acquired, comprised ten claims and three fractions, aggregating over 200 acres. Mining operations on the claims of the company have been confined to the immediate vicinity of shaft No. 1, situated in the southern end of Combination No. 1 claim. This shaft has been sunk to a depth of a little over 300 ft., and from this shaft five different levels have been extended at intervals of approximately 50 ft. Outside of some other surface discoveries in close proximity to this shaft, no discoveries of ore-shoots have so far been made elsewhere on the property, though a large amount of prospecting, including surface trenching and shaft sinking, has been done.

The receipts and operating expenses may be grouped as herewith. General and operating expenses are based on an output of 7,954 tons (5,717 of ore and 2,237 of waste); shipping and treatment expenses on sales of 1,166 ton of ore. Chicago office expenses are not included.

Sale of ore 1,166 ton (2.68 oz. silver, 20.22 oz. gold) @ \$419.55.	\$489,210
General expenses: \$4.33 per ton—	
Management and superintendence.	\$16,015
Examinations and tests.	6,809
Taxes.	5,981
Depreciation.	2,513
Miscellaneous.	4,330
Profit and loss on property.	600
Mine operating: \$5.25 per ton—	
Superintendence.	2,823
Shaft-sinking (369 ft.).	8,750
Drifting and raising (2,131 ft.).	11,549
Stoping (5,079 sq. ft.).	4,972
Hoisting and dumping.	5,170
Tramming and mucking.	2,894
Sampling and assaying.	3,118
All other.	2,721
Shipping and treatment: \$57.24 per ton—	
Sorting and sacking (1,166 ton).	8,517
Teaming (1,166 ton).	11,131
Railroad freight (1,166 ton).	22,254
Smeiter discounts (1,166 ton).	18,067
Smeiter treatment charges (1,166 ton).	7,000

Total expenses.....\$144,314

Balance of profit.....\$344,896

The net receipts for ore, after deducting transportation and treatment charges, were thus \$362.31 per ton, or 86.3% of its gross value.

The cost of supplies was distributed as follows:

Powder.....	6,945 lb.	@ 17.4c.	\$1,210
Caps.....	128 boxes	@ 74.2c.	95
Candles.....	59 boxes	@ \$6.68	394
Fuse.....	52,000 ft.	@ \$5.86	305
Tools.....			654
Timber and lumber....			4,245
Distillate and gasoline.	2,820 gal.	@ 36.4c.	1,027
Sundries.....			1,435
Total.....			\$9,365

"The total of general expenses is a large item; but it must be remembered that there are included nearly \$7,000 for

examinations and tests, over \$5,000 for taxes, \$2,400 for depreciation, and nearly \$1,000 for exchange to the Tonopah bank, which was made necessary by the terms of the bond. The item for legal services does not include the entire expense for the year, as the attorneys of the company have not yet rendered their accounts to date.

"The mine-operating expenses are entirely reasonable, when the high costs of labor and supplies, and the small scale and the nature of operations, are considered. Considerable work in stoping was actually done, which is not included in the output, as much ore was broken in the stopes that was not hoisted. The assaying-and-sampling item is extraordinarily large, because the character of the ore makes much work of this kind necessary in order to effect a proper separation and classification of the rock hoisted. The cost of shaft-sinking includes the timbering of the shaft; and the hoisting expense includes the hoisting of water, as well as of ore and waste.

"The shipping and treatment costs are large, aggregating not very much less than half of the total operating expense. These are unavoidable, and illustrate the tax on producers by remoteness, inadequate railroad connections, and dependence upon smelters.

"The amounts of supplies used and their costs are reasonable, when the conditions are considered, though the expenditure of over \$4,000 for timber and lumber seems extreme when the small amount of timbering actually done is known.

"The shipment receipts show an average net recovery of 86.3% of the total value contained in the ore shipped. This is an interesting figure for comparison with the extraction or recovery which may be made in the mill when it is started. From the percentage of such recovery there will have to be deducted the costs of milling and transportation of mill products, in order to arrive at an exactly comparable figure.

"The operations of the past year were first directed toward proving the value of the property sufficiently to justify its purchase; second, toward developing sufficient milling ore to justify the erection of the necessarily very expensive mill; and third, toward extracting the rich shipping ore from the ground thus developed so as to strengthen the company financially and to prepare the mine for the rapid extraction of the milling ore. All of these objects have now been accomplished, including the extraction of the greater part of the proved shipping ore.

"The future production of high-grade shipping ore is at present a very uncertain quantity, dependent principally upon the discovery and development of new shoots. In the mine, as at present opened, there are still considerable blocks of such ore immediately adjacent to the shaft, which cannot be removed until the shaft

is abandoned. Southeast of this main shaft, a distance of about 200 ft., a streak of rich ore has been opened at the surface for a length of over 100 ft. Underground developments thus far made have failed to prove the presence of such ore at that depth.

"The experience in this mine, as well as in others of Goldfield, indicates much surface enrichment, and it is probable that, below the depth of two or three hundred feet, the ore-shoots will generally be of less extent and value. On the other hand, the vein in our lower levels is more persistent and regular than above, so that if orebodies of workable character are proved, their persistence at depth is less doubtful.

"With regard to milling ore, over 4,000 tons have already been hoisted and distributed to the dumps. Several times that number of tons are broken in the stopes and blocked out between the levels; much more will probably be proved with further development. Mill construction was started in September, with the hope that it might be completed within three months' time. Immediately thereafter unprecedented rains fell, causing washouts on the railway, which threw all traffic into confusion and retarded freight several months. Since then, with the development of Goldfield and other camps, the congestion of traffic has become so acute that the railroads have refused to accept more business until it should be relieved. For this reason the anticipated date of completion of the mill has been successively set back, until now we do not expect to be ready for running before April 1. In the meantime, ore shipments can be maintained, though at a reduced rate."

Pocahontas Collieries Company, of Virginia.

This company owns and operates coal mines in the Pocahontas field. It is controlled, and chiefly owned, by the Pocahontas Collieries Company, of New Jersey. The report is for the year 1904. The capital account shows \$3,000,000 in common stock, \$1,500,000 in preferred stock, and \$1,250,000 in 5% mortgage bonds.

From the company's mines during the year, there were taken 808,276 short tons of coal. Sales and shipments were 622,397 tons of coal and 106,589 tons of coke. The income account for the year is as follows:

Net earnings.....	\$289,817
Royalties, taxes, etc.....	\$86,253
Interest on bonds.....	10,417
Dividends, preferred stock.....	15,000
Sinking fund on coal mined.....	3,728
Total charges.....	\$115,398
Balance.....	\$174,419
Paid Pocahontas Co., of N. J.....	152,400
Surplus.....	\$22,019

Adding the balance brought forward made the total invested surplus \$535,004 at the close of the year.

The report says: "Negotiations with

the Norfolk & Western railway and its subsidiary land company were concluded, and agreements entered into by which this company acquired a lease of 1,348 acres additional coal land, making a total of 9,834 acres now held under lease. This additional property is located at the extreme western end of the property controlled by your company fronting on Laurel creek, and contains about 13,484,700 tons of coal. The agreements with the Norfolk & Western provide for the construction of a branch road extending about 10 miles up Laurel creek from Pocahontas, without cost to this company, and the management has commenced work on one of three new coal operations which will be installed on this road to develop the large territory now controlled. The whole acreage now leased and unmined contains about 80,000,000 tons of coal.

"When the Pocahontas Collieries Company, of New Jersey, was organized in 1902, it acquired the entire capital stock of this company, which it pledged as collateral for an issue of trust bonds, with the understanding that when it became feasible this company would retire these trust bonds by an issue of first mortgage bonds. This has now been accomplished and the securities of this company have been issued in retirement of the securities of the Pocahontas Collieries Company, of New Jersey. The annual fixed charges include \$62,500 bond interest, and, with the sinking fund and preferred stock dividend, aggregate \$173,000. The taxes and unusual legal expenses incurred in the negotiations with the railway company and in the conversion of the securities of the New Jersey company, were in addition to this amount last year, and a saving of at least \$5,000 per annum in expenses of this character will result by dispensing with the holding company.

"The prices for coal and coke were not as high as during the previous year, but, notwithstanding the competition, the management was enabled to maintain its prices on a basis that has permitted the payment of all fixed charges, of dividends on preferred stock and an increase of invested surplus. The conditions of the coal business, which have been somewhat disturbed since the middle of last year, have now become more settled, and a good demand for coal is indicated at prices in advance of those obtained for the year 1904. The steel tippie for the Baby mine has been completed, and this, with the other improvements at the Pocahontas mines, has materially added to the capacity of the plant, and will admit of handling an output in excess of 1,000,000 tons per annum as soon as the double-tracking undertaken several years ago by the Norfolk & Western railway has been completed."

Infusible materials, in descending order of refractoriness, are: Carbon, silicon carbide and siloxicon; magnesia made in electric furnace; fire and magnesia brick.

Safety Catches for Cages.

SPECIAL CORRESPONDENCE.

The series of tests made recently, throughout the anthracite coal mines, of hoisting apparatus used at the various collieries have proved on the whole satisfactory. The tests were exceptionally severe, and scientifically carried out by mine inspectors who have explicit instructions (from the Bureau of Mines) to satisfy themselves of the safety of the hoisting apparatus up to the utmost capacity that it is ever likely to be called upon to bear, even in an accident.

The official report of the experiments has not yet been published. From what can be ascertained unofficially, it appears that the type of catch in general use is not mechanically as reliable as it should be to preclude all possibility of a disaster. In some exceptional instances the catches have failed to act, when the guides were wet or greasy. It is true that (except in one instance, the very first, as it happened, in which they were experimentally tried, under direction of Inspector Moore) a catastrophe parallel to that in the Conyngham shaft, at Pittston, could scarcely have happened. Nevertheless, there have been cases in private tests when the catches were apparently in perfect order, but for some reason failed to hold the cage, owing to the play between the catches and the guides being too great. In these instances the catches did not absolutely refuse to act, but they allowed the cage, at the instant of the test, to drop to such an extent that a disaster might have happened under easily conceivable contingencies.

A mine shaft is far different from an ordinary elevator in a building. The shaft cannot be kept dry; it cannot be kept free from grease, oils or other foreign substances that make the guides slippery, and harden or polish the timber until it is as impenetrable as polished mahogany. No amount of supervision can change these characteristics of the mine shaft. Moreover, it is relatively of considerable depth; it is not built on a definite architectural plan, nor on engineering principles, but must conform largely to the geological strata through which it passes. All these facts preclude the possibility of modeling a shaft on the lines of an ordinary elevator in a protected building. But even in buildings where architectural design may be carried out with the utmost mathematical precision, elevator accidents are far more frequent than in mines.

Whether the accident in the Conyngham shaft was due to an oversight on the part of somebody, or to a defect in the rope, one thing is certain—at the critical moment the catches failed to act. The confidence of miners and operators in their efficiency was rudely shaken. The present problem is to make a catch that will act automatically, and under any and every emergency in which it may be placed. Undoubtedly it is difficult to invent such

a device; for, in the first place, it must be of extreme simplicity, no more complicated than the catch that is now in use; in the second place it must be made of copper, because any metal less flexible than copper would be likely to snap under the terrific impact of the cage in its fall with, say, twelve or fourteen men. With these two conditions satisfied, there is a fortune for the inventor who puts on the market a safety catch that is safe. The anthracite operators are anxious to find such an apparatus. The catches used in the coal mines in the country are practically of the same design, however they vary in detail. Many of the anthracite operators are encouraging their engineering staffs to put forth their best efforts to devise a catch that will have the two indispensable qualifications, namely, perfect safety and reasonable simplicity.

Stay-Bolt Corrosion.

The accompanying illustration, taken from *American Machinist*, June 22, 1905, p. 834, shows a corroded nut from a boiler stay-bolt, one of ten nuts removed from the combustion chambers of a Scotch boiler on a tramp steamer, its



position being such that the flames from the furnace struck it and burned it gradually away. If such things can happen in furnaces heated with plain coal, what might not occur in some of the boilers used to recover waste heat from reverberatory furnaces? The gases of the latter are highly charged with acid fume, and the deposit (scraped off the boilers at some smelters) will carry 20 to 30% of sulphuric anhydride.

Galalite or galalith is the name of a new electrical insulator made from the nitrogenous casein of skim-milk. It is said to be easily tooled, is more elastic than ebonite, and has an insulation value greater than porcelain and comparable with ebonite. It is reported from a current number of the *Elektro-chemische Zeitschrift*.

The steam boiler of high efficiency, under good conditions, can realize 80% of the heat units of the coal.

Hydraulic Mining in California.

Most of the more prominent hydraulic miners in the districts drained by the Sacramento and San Joaquin rivers have pretty well made up their minds that there is little prospect of ever resuming work by hydraulic process on a large scale. Of course a number of mines are being worked under the restrictions of the Camminetti law, but they have to impound and settle the tailing behind dams, and cannot "turn the water loose" as they used to. About the last to give in is Patrick Campbell, chief of the hydraulic miners for many years and a believer in the idea that something would occur to permit them to mine in the old way. Mr. Campbell still owns the immense gravel property at Smartsville, Yuba county, known sometimes as the Golden Gate, and again as the New Blue Point. It has been the dream of his later life to work that once more by hydraulic process. He owns mile after mile of ditch and flume and all the water of Wolf creek down to Smartsville for a stretch of about 12 miles, but the ditches have been allowed to fall into decay and the water rights are unused. As much of the gravel in the New Blue Point is cemented, he proposes now to put up a mill and crush it as they do at some drift mines. He cannot obtain permission to ground-sluice or hydraulic, and the ground cannot be dredged. Therefore to utilize it a mill must be used.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week ending July 4, 1905.

- 793,707. PROCESS OF ABSORBING GASES.—Adolf Wultze, Charlottenburg, Germany.
 793,720. APPARATUS FOR SEPARATING SLIMES, ETC., FROM METAL-BEARING SOLUTIONS.—Ernest L. Godbe, Salt Lake City, Utah.
 793,725.—FILTER PRESS.—Samuel H. Johnson, Stratford, London, England, assignor to S. H. Johnson & Co., Ltd., Stratford, London, England.
 793,743. PROCESS OF MAKING DIAZO COMPOUNDS.—Traugott Sandmeyer, Basel, Switzerland, assignor to Aniline Color & Extract Works, formerly John R. Geigy, Basel, Switzerland.
 793,745. MEANS FOR REMOVING DUST FROM GASES.—John Shields, Willesden Green, England.
 793,771. ARTIFICIAL FUEL AND PROCESS OF MAKING SAME.—George M. Dallas, Chicago, Ill., assignor to Richard H. Thomas, Chicago, Ill.
 793,773. GAS-RETORT-CHARGING MACHINE.—Christian Eitler, Stuttgart, Germany.
 793,795. BRIQUET AND PROCESS OF MAKING SAME.—Howard E. Marsh, Los Angeles, Cal., assignor of one-half to William P. Wagy, Los Angeles, Cal.
 793,804. OIL-WELL JACK.—James W. Rhoades, Fostoria, Ohio.
 793,806. FURNACE-CHARGING APPARATUS.—George Schuhmann, Reading, Pa., assignor to Reading Iron Company, Reading, Pa., incorporated.
 793,808. ORE CONCENTRATION.—Henry L. Sulman and Hugh F. Kirkpatrick-Picard, London, England.

- 793,813. MINE-DOOR-OPERATING DEVICE.—Samuel T. Bailey, Mount Hope, W. Va.
 793,816. ORE-TREATING FURNACE.—Aron M. Beam, Denver, Colo.
 793,838. FILTER.—Edward M. Knight, Newark, N. J., assignor to R. H. Martin, New York, N. Y.
 793,852. FURNACE-CHARGING BOX.—Cameron C. Smith, Pittsburg, Pa.
 793,877. INGOT-DELIVERY CAR.—Thomas James, Braddock, Pa.
 793,938. FURNACE.—John Kirby, Pittsburg, Pa., assignor to the Kirby Furnace, Smelting & Refining Co., Pittsburg, Pa., a corporation of South Dakota.
 793,939. ROASTING-FURNACE.—Frank Klepetko, New York, N. Y.
 793,945. GOLD SEPARATOR AND CONCENTRATOR.—Richard T. Marshall, Merion Station, Pa.
 794,000. PROCESS OF PURIFYING GAS.—Adalbert W. Fischer, Philadelphia, Pa., assignor to Schutte & Koerting Co., Philadelphia, Pa.
 794,062. BIN.—Edwin J. Walker, Philadelphia, Pa.
 794,118. ROASTING-FURNACE.—Charles H. Repath, Anaconda, Mont., and Frank E. Marcy, Chicago, Ill., assignors to Frank Klepetko, New York, N. Y.
 794,153. UTILIZATION OF FLUE-DUST.—Charles S. Price, Westmont, Pa.
 12,367. GAS-PRODUCER.—Alfred B. Duff, Pittsburg, Pa.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week ending June 17, 1905.

- 11,437 of 1904. BRIQUETTING IRON ORES.—E. Goldschmid, Frankfurt, Germany. Heating friable iron ores in a water-gas furnace in order to obtain coherent masses suitable for smelting.
 14,980 of 1904. TREATING COPPER ORES.—N. Lebedeff, St. Petersburg, Russia. Treating raw copper ores in a reverberatory furnace mixed with finely divided limestone and silica, at such a heat that the metals other than copper are oxidized and pass into the slag, so producing a concentrated matte.
 15,928 of 1904. MINE-CAR OILER.—W. David, Bridgend, Wales. An improved self-oiler for wheels of mine-cars.
 16,416 of 1904. ARRANGEMENT OF MACHINERY.—A. Raky, Erkelenz, Germany. Arranging the winding engine on the top of the pit-head frame so that the latter is not subjected to any but vertical stresses.
 16,418 of 1904. ELECTRIC HOIST.—A. Raky, Erkelenz, Germany. Improved mechanism for electromotors used as winding engines for mines.
 16,576 of 1904. IMPROVED HAULAGE-WAYS.—S. Bates, Prudhoe, England. Improved haulage-ways in the floors of coal-mine levels for use where the seam is too narrow to admit the cars along the foot-wall.
 25,851 of 1904. GOB FILLING.—F. Sommer, Essen-Ruhr, Germany. Improved method of forcing sludge by means of high-pressure water into the disused stopes of mines.

Week ending June 24, 1905.

- 13,594 of 1904. DUST COLLECTING.—B. H. Thwaite, T. J. Denny and R. E. Commins, London. Collecting the dust given off at the working faces of mines by means of powerful suction pipes.
 14,249 of 1904. ROCK DRILL.—A. H. Gibson, London. A percussive rock drill operated by compressed air, which is supplied from a small air-compressor near by, which is driven by an electromotor.
 16,754 of 1904. AMALGAMATING MACHINES.—G. P. Tyars, Cape Town. Improved shape of stirrers for amalgamating machines.
 24,199 of 1904. KAOLIN SEPARATOR.—R. Frugier, Limoges, France. Improved machinery for separating kaolin from other minerals.
 134 of 1905. SMELTING FURNACE.—H. Harris, Nelson, B. C. An arrangement of the smelting furnace so that the discharge of slag and matte is continuous and the subsequent separation of the two effected while the mass is as hot as the furnace.
 4,029 of 1905. MINE-CAR BEARINGS.—J. and C. Derbyshire, Wakefield. Improved bearings for mine cars.

Personal.

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

Mr. Erward L. Dufourcq has returned to New York from Mexico.

Mr. Percy E. Barbour, of Bland, N. M., has been in New York this week.

Mr. Benedict Crowell, of Cleveland, Ohio, was a recent visitor in New York.

Mr. Percy E. Barbour has returned to Boston, after spending three months in New Mexico.

Mr. F. Augustus Heinze, of Butte, Mont., is in New York this week, on his way to London.

Col. Ray, of Port Arthur, largely interested in iron and silver mining, was in Toronto this week.

Mr. Samuel Bassett, an old-time Winnipeg pioneer, is visiting that city in the interests of the Canadian Oil Co.

Mr. James J. Chambers, of the Alta Superior Mining Co., of Alta, Utah, is in Chicago on a brief business trip.

Mr. A. Geele, president of the Northwestern Exploration Co., arrived in New York, June 25, on his way to Alaska.

Mr. Edgar Newhouse passed through Spokane, Wash., recently on his way to Wardner, Idaho, to inspect properties there.

Mr. P. R. Forbes, of New York, arrived home from Mexico on July 6, and sailed for Europe July 8. He will return about Sept. 1 next.

Mr. J. T. Wells has resigned his position as superintendent of the Luna Lead Co.'s smelter at Deming, New Mexico, to take effect Aug. 1 next.

Mr. B. C. Mason, of Kansas City, president of the Manitoba Gypsum Co., recently visited Winnipeg and the company's works on Lake Manitoba.

Mr. James W. Malcolmsen, of El Paso, Tex., was in New York the early part of this week, to confer with clients. He has now returned to El Paso.

Mr. Norman M. Macdonald has retired from the firm of Vivian Bond & Co., of New York. Mr. Humphrey Davy Bond has become a partner in the firm.

Mr. Thomas Mack, assistant superintendent of the Lehigh & Wilkes-Barre Coal Co., has been transferred from his former position at McAdoo, Pa., to Wilkes-Barre.

Mr. Cyrus Robinson, of New York, consulting engineer to the Arizona Smelting Co., left for Prescott, Arizona, on July 8. He will be at Prescott during the next two months.

Mr. George D. Reid has resigned as superintendent for the Ladd Metals Co., of Portland, Ore., and will make a professional trip to Mexico in the interest of Denver parties.

Mr. J. R. Yeardsley has accepted the position of superintendent of the Pfau

Gold Mining & Reduction Co.'s cyanide mill at Cherry, Ariz. He left Salt Lake July 8 to assume his new duties.

Mr. Raymond Payne, of London, has recently returned from a trip to the province of Esmeraldas, Ecuador, where he went to examine the placer deposits, with a view to the employment of dredges.

Mr. James S. Nodine has resigned his position as manager of the Federal Graphite Co., at Chester Springs, Pa., and has removed to New York. He is interested in a number of graphite propositions.

Mr. W. D. Waltman, formerly of Cripple Creek and Colorado Springs, is now in the Mining Bureau of the Panama Canal Commission. His title is supervisor of mining; and his address is at Empire Canal Zone, Panama.

Capt. Fitz Horrigan, who has served five years as inspector in the Yukon territory, is spending four months' leave of absence in Eastern Canada. He reports that more gold is being taken out this season than ever before.

Mr. Hudson H. Nicholson has resigned his position as professor of chemistry and director of the School of Mines and Metallurgy at the University of Nebraska. He will hereafter devote his entire time to his business as a mining engineer.

M. Albert de Romeau, of Paris, France, is about to visit Canada, as a delegate from the French Ministry of Public Instruction. He will prepare a report on the mineral industries of Canada, with especial reference to nickel, cobalt, mica and corundum.

Mr. William A. Pomeroy, recently manager of the Great Fingall mine, in Western Australia, has been appointed manager of the Palmarejo & Mexican Goldfields, Ltd., in Chihuahua, Mexico. He succeeds Mr. T. H. Oxnam, who will, however, remain with the company as consulting engineer.

Mr. Charles Fergie, general manager of the International Co., of Westville, N. S., has accepted the position of superintendent of mines for the Dominion Coal Co., at Sydney, Cape Breton. He succeeds Austin King, who has resigned. Mr. Fergie has had a number of years' experience in the Nova Scotia coal mines. He served one term as president of the Canadian Mining Institute.

Mr. John E. Rothwell, who has been for some time on the engineering staff of the Colorado Iron Works Co., of Denver, has been transferred from the company's main office to the city sales office, in Denver, of which he will have charge hereafter. Mr. Rothwell is well known, through his work as mechanical engineer and metallurgist, chiefly in connection with the chlorination process.

Dr. William B. Phillips, for several years past the director of the University of Texas Mineral Survey, having been

released from his duties, owing to the discontinuance of the Survey by the Legislature, has engaged in general consulting work. Dr. Phillips will spend several months in examining the Terlingua quicksilver district, and other mineral deposits in Brewster county, in western Texas.

Among the new baronets and knights announced in London in the King's birthday list of honors are to be found two that are well known among mining men—Mr. Julius Wernher, of Wernher, Beit & Co., and Mr. Boverton Redwood, the authority on petroleum. Recognition of services in other branches of industrial science is to be found in the knighthood bestowed on S. A. Sadler, the chemical manufacturer of Middlesborough; A. B. W. Kennedy, professor of engineering in London, and J. Clifton Robinson, the pioneer of electric tramways in England.

Obituary.

Dr. William Thomas Blanford died at his residence in London, England, June 23, aged 72 years. He was born in London, graduated from the Royal School of Mines, and also from the Bergakademie at Freiberg, Germany. In 1855 he was appointed on the staff of the Geological Survey of India, and served there for 27 years. He made himself a considerable reputation as a careful and able geologist by his work in India.

Societies and Technical Schools.

State College of Washington.—Prof. Royal P. Jarvis and a party of students from the Washington State College, at Pullman, Washington, are spending some weeks in the Coeur d'Alenes, near Murray, Idaho, studying mining and milling methods. The practice work in mine surveying is being carried out in one of the extensively developed mines of the district.

Lawrence Scientific School, Harvard University.—During the past week the senior class in the metallurgical and mining department of this school visited the Birmingham district in Alabama, taking in the mines, furnaces and steel plants. Prof. White, who was in charge, expressed considerable surprise at what was shown him, and more than one of the students announced intentions of returning to the district after their graduation.

United Engineering Building.—The United Engineering Building Committee last week awarded a contract to Wells Brothers Co., of New York, for the construction of the United Engineering Building, on West 39th street, said contract being for the sum of \$795,000. This does not include any allowance for the steam-heating plant, electric wiring, etc., but relates simply to the general construction of the edifice. The ground is already excavated, and the work will begin forthwith. October, 1906, is mentioned as the probable date of completion and readiness.

Trade Catalogues.

'Why Use a Circuit Breaker?' is the title of the Cutter Co.'s (Philadelphia) very original flyer devoted to I-T-E circuit breakers.

The Instruction Book of the Smooth-On Mfg. Co., of Jersey City, N. J., gives suggestions for the repair of leaks with this material, and is 6 by 9 in. in size.

The Westinghouse Electric & Manufacturing Co. publishes an attractive brochure with illustrations of its exhibit at the Lewis & Clark Exposition in Portland.

'Manila Rope,' the new edition of the bulletin of that name, gives interesting matter regarding the manufacture and use of the C. W. Hunt Co.'s (New York) 'Stevadore' rope.

The Crocker-Wheeler Co., Ampere, N. J., sends us its 'Electrified Railway Shop.' The bulletin is more complete than most publications of this character, and goes into considerable detail.

Bulletin No. 2,003 of the Ingersoll-Sergeant Drill Co., New York, gives data regarding the use of the portable pneumatic tool applied to hammer-drilling in mines. It is of the standard 6 by 9 in. size.

The Edward Christman Co., of Massillon, Ohio, sends us its new catalogue of portable drilling machinery for test borings and wells. It is of standard 6 by 9 in. size, but opens from the end, instead of the side.

The Wellman-Seaver-Morgan Co., of Cleveland, Ohio, hands us its new catalogue of ore-handling machinery. It is as valuable, for the information contained, as it is attractive in typography and general excellence of make-up.

The newly revised catalogues of the Kilbourne & Jacobs Manufacturing Co., of Columbus, Ohio, show the new pressed-steel models applied to industrial and mine cars. The catalogues of most permanent value are published in the standard 6 by 9 in. size, and are well illustrated.

Industrial.

The Carnegie Steel Co. has for some time been furnishing prominent railroad companies with considerable quantities of steel cross ties.

The National Cast Steel Co., with a capital of \$3,000,000, has been incorporated at Dover, Del. The incorporators are all residents of Allegheny, Pa.

The Nordberg Manufacturing Co. has secured the building of two large hoisting engines, each to be 32 by 72 in., one for the Leonard shaft of the Boston & Montana, the other for the Speculator shaft of the North Butte Copper Company.

A Washington dispatch says that the Camden Iron Works, at Camden, N. J., have obtained a contract for supplying cast-iron pipes for water works at Panama. The contract was obtained from the Panama Canal Commission and amounts to \$115,000.

Smooth-On Elastic cement is the latest preparation of the Smooth-On Manufacturing Co. This is an iron elastic cement prepared in paste form, ready for use. Its advantages are that it is metallic and can also be applied to hot iron, the heat causing it to metallize instantly, making it invaluable for stopping leaks.

The variety in the applications of blowers and heaters for drying purposes is legion. Somewhat of a novelty in this line was recently supplied by the B. F. Sturtevant Co., of Boston, Mass., for use in connection with match machinery built by the Kent Machine Co., of Toledo, Ohio. The apparatus consists of three special heaters used in conjunction with independent fan-wheels, by means of which the heated air is positively forced to do its duty.

Mr. L. Vogelstein, of New York, gives notice that he has admitted Mr. E. G. Hothorn, for years his assistant, as a partner, and continues to do business under the firm name of L. Vogelstein & Co., the new firm having taken over all the assets and liabilities, as well as all the contracts of the old concern. Mr. Benjamin Hirsch, senior member of the firm of Aron Hirsch & Sohn, of Halberstadt, Germany, has become a special partner with a capital of \$100,000.

The many advantages possessed by Jefferson, Tex., as a site for an iron and steel cotton-tie mill are set forth in a circular recently issued by W. T. Atkins, secretary of the Jefferson Iron Co., which operates a charcoal blast-furnace at Jefferson. Mr. Atkins says that one-half of the cotton annually grown in the South comes from the States west of the Mississippi river. To bale this cotton requires annually about 27,500 tons of cotton-ties. At the present time there is not a rolling mill in the cotton-growing States west of the Mississippi which is equipped for the manufacture of cotton-ties.

Mr. Ernst Wiener has severed his relations with the house of Arthur Koppel, with whom he has been connected, and has opened offices at 68 Broad street, New York city, under the firm name of the Ernst Wiener Company. The new company will make a specialty of railroads and railroad materials for all industries, of both narrow and standard gauge. A special factory equipped with all modern machinery has been built in Youngstown, Ohio, for the purpose of building the specialties of the new firm. Associated with Mr. Wiener in his new enterprise is Mr. Carl Koch. The new company is ready for business.

Construction News.

Nevada City, Cal.—The Buckeye Mining Co. intends to build a 10-stamp mill.

Salt Lake City, Utah.—The Utah Copper Co. is to build a large concentrating mill.

Humburg, Siskiyou Co., Cal.—The Mono Mining Co. intends to erect a cyanide plant.

Randsburg, Cal.—The Yellow Aster mine has decided to increase the capacity of its mill to 300 stamps.

Georgetown, Colo.—The Waldorf Mining & Milling Co. is to build a concentrating mill and power plant.

Nespelem, Wash.—The Multnomah Mining, Milling & Development Co. will erect a new power-house and smelter at this place. D. W. Peabody is secretary.

Prescott, Ariz.—New concentrating mills are to be built by interests connected with the Bradshaw Mountain Co. Cyrus Robinson, Prescott, Ariz., is the engineer in charge.

Lamberts, Wash.—A series of ore bunkers of large size is to be built here to store material handled by the Great Northern and the Spokane & British Columbia railroads.

Helena, Mont.—A Cleveland syndicate will erect an electric reduction and refining plant at this place, at a cost of \$250,000, and will give employment to a large number of men.

Kendall, Mont.—F. S. Wiedenborner, of the Queen Mining Co., will shortly contract for sinking a shaft and opening new mine workings. The company is planning the erection of a large plant.

Dedrick, Chihuahua.—Col. W. C. Greene will erect a 200-ton smelter near Dedrick, Chihuahua. The smelter will handle the output of the mines being developed by the Greene Gold-Silver Company.

Imuris, Sonora.—The Cerro Azul Mining Co., west of Imuris, Sonora, now operated by the Providence Mining Co., is planning the erection of smelting and concentrating plants in the immediate future. A. F. Hazeltine, of Imuris, is the manager.

Grants Pass, Ore.—Carlyle Norwood Jones, engineer for the Rogue River Mining, Smelting & Power Co., of Grants Pass, Ore., is in Spokane superintending the construction of a smelter for his company. He is having constructed at the Union Iron Works a furnace of 100 tons capacity. The present furnace will be started and the plant increased to treat 500 tons daily. The company has secured the water rights of Rogue river, and is now constructing wing dams and will build a permanent 20-ft. dam from the slag. The construction of the dam is under the supervision of H. A. Cortiss.

Special Correspondence.**San Francisco.** July 5.

At a recent meeting of the Anti-Débris Association, the attorneys reported that the hearing of the case of the county of Sutter vs. George C. Sargent, at the request of the attorneys for the defendant, has been continued until the October term. The mine involved in this case is shut down, and the injunction is in full force and effect, but the defendant desired to present to the court a subsequent motion made by him at the same time as the main question was considered. In the case of the county of Sutter vs. William Nichols and others, involving the Polar Star mine, the correspondence was submitted showing that Solinsky & Wehe, attorneys for the California Miners' Association, are taking steps to take the case before the supreme court for the purpose of having a decision upon the question of the effect of a permit granted by the California Débris Commission. It is claimed by the Anti-Débris Association that such a permit has no effect where damage is actually being done by hydraulic mining, and such was the view taken by the court below when the case was tried.

Producers and consumers of California oil do not look with any favor on the recent consolidation of the pipe-line interests of the Upper San Joaquin and Santa Marie valley oilfields, as it is expected that the new deal will bring about an advance in price of fuel oil in this city of about 20c. per barrel. The Associated Oil Co., which has acquired the principal interest in the Coalinga pipe line and the ocean oil-carriers, is an off-shoot of the Southern Pacific Co. So these companies, with the Standard Oil Co., can dictate terms to the owners and to the consumers. California produced about 29,000,000 bbl. of oil in 1904 and will produce more this year, if the 'combine' permits, but it may, for its own purposes, restrict the output.

During the past year the United States Tin Mining Co. has been working upon the tailing left over by the former Temescal Tin Mining Co. in Riverside county. They have installed four new Standard concentrators and rebuilt the old smelter. They have also erected a new, but smaller, one, which was required by their inability to profitably smelt the concentrates in the large smelter. From lack of funds, operations have been to some extent curtailed, and, in attempting to smelt, after a few hundred pounds of tin were run off, the furnace would freeze. Several tons have been produced in this way, but recently they have been able to run off all these concentrates in buttons of from 10 to 14 oz. Now Colorado and Chicago men are looking into the matter with a view to furnishing \$75,000 to \$100,000 to remodel the reduction works, and work the mines in a modern and business-like manner.

It looks as if the agricultural section around Chico, Butte county, would soon have several gold-mining dredges. Los Angeles men have been prospecting ground on Butte creek, four miles from Chico. The property under bond, which seems to include all the dredging land in the section, comprises about 1,000 acres of creek bottom, some of which is under cultivation. Much of this has never been worked and, in addition to its original deposit, has been enriched by the flow of tailings from the Butte creek mines for many years. It is understood that, should the sale be made, three dredges will be put in operation.

The rumor that the North California Mining Co. had turned over its 800 mining claims in Butte and Plumas counties to the Western Pacific Railway Co. proves untrue. The roads and telephone lines have been transferred, but not the mining ground.

The Pacific Portland Cement Co., whose works are located near Suisun, in Solano county, intends to enlarge its plant. With the completion of the latest addition, the daily output will be 2,500 bbl. Arrangements will be made to build a new mill of 2,500 bbl. capacity, in order to make the output 5,000 bbl. daily.

The North Star Mines Co., of Grass Valley, has declared another dividend of 30c., for six months, that last December being 35c. This is a good showing for a property which was shut down more than once, declared worked out years ago, when its stock was considered hardly worth the paper on which it was printed. Today the company owns one of the largest and best equipped mining properties in the West, employing the largest number of men in the district.

Denver. July 5.

The differences between the mill-owners and their employes in Gilpin county were amicably adjusted, the former granting a working day of less than twelve hours, some working eight and some ten. All work has been resumed.

General Manager Guiterman, of the American Smelting & Refining Co., has received \$30,000 from the New York offices to be distributed among certain employes of the company in this State as their share in the profits during the year ending April 1 last.

The sheriff of El Paso county levied on the store of the Western Federation of Miners, where business is carried on under the name of the Interstate Mercantile Co., at Victor, a few days ago, for county taxes to the amount of \$761 and took possession of the same. John Harper, the manager, paid the sum and the costs, which amounted to \$103, under protest and will bring suit for at least part of the claim.

Stratton's Independence Co., which paid a dividend of \$125,000 last May, has a reserve in its treasury of more than \$200,

000, and will probably pay a similar one before long.

During the month of June the Cripple Creek district dividends amounted to nearly \$120,000, bringing the total for the first half of the year up to over \$1,600,000. These figures do not include the profits of lessees, nor of a number of close corporations.

The Creede United Mines Co., of this city, has just paid the second quarterly dividend, amounting to \$32,500, the same as before.

The receipts of gold bullion at the United States branch mint in this city for the year ending June 30 were \$22,252,205, against \$13,283,764 during the preceding year, showing an increase of \$8,968,441. The coining machinery is commencing to arrive. It has not yet been positively settled when coining will commence.

A preliminary survey is being made for a railroad line from Cañon City to Beulah, which ultimately will mean a new eastern outlet for the coal of Fremont county. The Great Western Coal Co., which owns quite an amount of undeveloped coal land east of Cañon City, is said to be interested in the plan.

The Frenzel Rare Minerals Co. will shortly be incorporated and extensive operations will soon be commenced under the direction of A. B. Frenzel and Henry E. Wood.

Scranton. July 8.

Operations at the Lance and Washington collieries of the Lehigh & Wilkes-Barre Coal Co. have been suspended until July 10 in order that necessary repairs may be made. A new pipe line will be placed in the Lance fan shaft, and the slope of the Washington will be re-timbered. Work at the Nottingham will be continued as usual until July 15, when work will be suspended until the old breaker has been torn down and rail connections made with the new breaker. This will mean an idleness of at least six weeks.

The Pennsylvania Coal Co. has now in course of erection a new washery at the Ewen breaker, which will be equipped with the latest improved machinery for the cleaning of coal. The capacity of the Ewen is large, and with the waste of culm every day the banks will be utilized with great success. For several years this breaker has been piling up culm. The new structure is connected with the breaker, and in the course of a few weeks they expect to have it in operation.

The coal operators and companies in the neighborhood of Wilkes-Barre are going to take action to prevent the promiscuous peddling of liquor among their employes, on the ground that many accidents are due to over-indulgence in cheap liquor. The peddlers bring it right to the houses and sell it on the instalment plan,

or else peddle it from door to door. The companies are determined to put a stop to it, if they can; but owing to the secrecy with which it is sold, it is not an easy matter to prohibit entirely this vicious custom.

The announcement is made that the grievances pertaining to the checkweighmen and docking bosses are all to be withdrawn from the consideration of the Anthracite Conciliation Board, and that all the companies will comply with this phase of the award of the Strike Commission. This action will relieve the board of much contentious investigation and will aid materially in keeping the work of the board up to date.

Notices have been posted at the Boston colliery of the Delaware & Hudson that there will be no work there until further notice, as extensive repairs are to be carried out at that shaft. About 600 men and boys will be thrown out of employment, until the mine reopens, although a number of them will be drafted to other mines.

Mine inspectors who must go before the people for re-election next November are anxious to hear the result of the examinations recently conducted. Six inspectors are to be elected this fall in Luzerne county. The delay in giving out the list of persons who passed the examinations is causing the old inspectors a great deal of uneasiness. The salary of the office is \$3,000 per year, and the term is three years. The inspectors feel that if they are compelled to enter upon an expensive political campaign the position would be hardly worth the expenditure. The inspectors whose terms expire within the next twelve months are: H. McDonald, of Pittston; P. M. Boyl, of Kingston; D. T. Davis, of Plymouth; D. Roderick, of Hazelton, and J. Martin, of Plains township. The act passed by the Legislature this year created one more place, so that six inspectors will be elected next November. The inspectors of Lackawanna county now in office have passed their examinations, and there is not likely to be a contest.

Practically all the mines in this section were shut down from three to four days last week. The Fourth of July being on Tuesday, it was considered by the operators that it would be disadvantageous to call in the miners on Monday, only to suspend operations on Tuesday again. Moreover, the mines having worked uninterruptedly during the year, many minor repairs were necessary which took a few days to complete.

Great activity is shown by the miners' organizations of the Lackawanna and Wyoming valleys at the present moment. It is said that the miners will not only formulate a demand for an eight-hour day, but that they will insist on the weighing of coal at the breakers, and a joint conference with the operators. Of course these demands will not be formu-

lated immediately, but it is evident that the officials of the union are desirous that the coal workers should be familiar with the demands that the organization will seek to enforce when the present agreements expire in April next.

A peculiar accident occurred at No. 5 shaft at Dunmore on Wednesday. A miner engaged in robbing pillars discharged a heavy blast and was about to return to the scene when the bottom of the gallery gave way, and he was precipitated over 30 ft.

Salt Lake City. July 3.

The mines of Utah paid out in dividends during the month of June the sum of \$320,500. Seven companies participated in the distribution, the Silver King with \$100,000; Daly-West, \$108,000; Gemini, \$50,000; Consolidated Mercur, \$25,000; Grand Central, \$12,500; Horn Silver, \$20,000; Uncle Sam Consolidated, \$5,000. Two Bingham companies, the Utah Consolidated and the United States, posted dividends for payment in July. The former will divide \$2 a share, or \$600,000, among its shareholders, while the latter will distribute 75c. a share among holders of the 486,000 shares of issued stock, or \$364,500. With the participation of other mines the July dividend record will exceed \$1,000,000.

The plans for the Utah Copper Co.'s new concentrating mill, a site for which was selected several months ago at a spot about fifteen miles west of Salt Lake City and near the old Garfield resort on the great Salt Lake, have been completed and as soon as the matter of transportation is settled Manager D. C. Jackling will order the breaking of ground. The initial plant, according to the plans which were drawn under the supervision of Chief Engineer George O. Bradley, will consist of two 1,250-ton units, but with power facilities for several additional units; it being the intention, eventually to bring the capacity up to at least 6,000 tons a day. The San Pedro, Los Angeles & Salt Lake Railroad is seeking an entrance into the camp, the traffic now being controlled wholly by the Denver & Rio Grande. Both roads are said to be bidding for the Utah Company's business.

The Bingham Consolidated is contemplating the equipment of its smelter at Bingham Junction with an Edwards' roasting furnace. Captain Duncan McVichie is general manager of the company, with headquarters at Salt Lake.

The New Red Wing Co. is carrying on a campaign of development at its Bingham mines. The new air compressor is in operation and, in addition to supplying its own mines, is also supplying the needs of adjoining mines.

The compressor plant, recently built by the Utah Apex Co. at Bingham, is in successful commission and the driving of the adit which is to open the mine at depth is being pushed.

The management of the Utah Consolidated Mining Co. announces that the experimental plant with which it is hoped to demonstrate that the arsenical fumes can be successfully controlled without doing damage to vegetable or animal life in the vicinity of the smelter, will go into commission in about a week. The construction of the plant is practically finished.

Leadville. July 8.

In June, 1903, the output from the camp reached 79,000 tons, which included a large quantity of manganese. The tonnage for June of the present year reached 72,000, without the manganese. For the first six months of the present year the camp has produced 420,000 tons of all classes of ore. The increase is from the large producers, notably the Coronado-Penrose, Moyer and Yak tunnel. At the Penrose the connection will be made with the Coronado before September, opening the ore-shoot to the south. From the old Moyer shaft in California gulch a little better than 10,000 tons a month are being shipped, principally zinc, and when there is a more active demand for iron and sulphides, the mine will produce both. From the North Moyer shaft nothing but copper-sulphide is being shipped at present, and the tonnage amounts to 3,000 per month; the same conditions prevail here as at the old Moyer, the iron and sulphides being left standing. The Yak mill will be in full running order by the middle of the present month and will be turning out 250 tons of concentrate daily. By September the orebody in the Tuscan should be reached, and a large tonnage should be shipped from this property.

The camp was never in a more prosperous condition than it is today, and there is plenty of ore in sight in all of the large producers. The opening up of an orebody in the Reindeer, Rock hill, has brought that section of the camp prominently to the front, and has been the means of adding three shippers already to the list—the Dome, the Murphy shaft and the Lacompton. Before long the Bessie Wilgus will be on the list. About one mile below the Reindeer the Nil Desperandum is in mineralized matter in both drifts. The development work on the hill, north and south, consists of eight new shafts being sunk, with several more in view, and before the end of the year some of them will be shipping. Other sections of the camp, such as Big and Little Evans gulches, Breece and Fryer hills, are all active, and producing a good tonnage, while the downtown section has taken on a new lease of life since it was drained by the Penrose. Considerable work is being carried on in the outlying sections, such as Mosquito, Alicante, Bird's-eye, Sugar Loaf and St. Kevin.

The Great Hopes mine, on the flat in

Big Evans gulch, was last worked in 1892, when some very good silicious ore running \$20 in gold was shipped from the 350-ft. level; a few years later some work was done with the diamond drill, but nothing of a satisfactory character was found. The property is now leased to local people and it is the intention to sink the shaft to the lower zone and prospect the ground thoroughly. The ore-shoot of the Big Six trends in this direction from Breece hill and every effort will be made to catch it.

The ore that was recently opened in the Favorite by Green Brothers is proving to be a bonanza, as the body is now 12 ft. high and 30 ft. wide, and nets the lessees \$30 per ton. The same character of ore was opened at the surface, but sufficient work has not yet been done on the body underground to prove whether the two are the same shoot.

A drift is being run from the bottom of the Ben Burb shaft toward the Great O'Sullivan, Rock hill, for a double purpose, that of catching the Reindeer shoot to the north and of opening up a body of ore that is known to lie at the bottom of the O'Sullivan shaft. This shaft was sunk 15 years ago and had to be abandoned on account of water just as it had reached the ore; the dilapidated condition of the shaft now prevents it from being worked, and the easiest way to reach the ore is by running a drift from the Burb. J. W. Weir has a lease on both properties.

Butte. July 4.

The Raven Co., operating the Raven and Snoozer claims in the copper belt, has crosscut its veins at a depth of 800 and 1,200 ft. The openings were made from the shaft of the Buffalo, an Amalgamated property. The one from the 800 cut two veins, one 7 ft. wide and the other 4 ft. The one on the 1,200 has not been opened between walls and its entire width is not yet known. It carries 6% copper. The percentage of the ore on the 800 is about 4. From the surface to the 600 the ore carried silver and gold. Knowing the veins would merge into copper and silver at depth, the company entered into an arrangement with the Anaconda Co. by which it could tap the veins within the copper zone by way of the Buffalo, and the strike is the result.

Operations on the property of the Southern Cross Co. have been suspended pending the settlement of a difference that has arisen among the lessees and majority stockholders—ex-Senator Mantle, H. L. Frank and Lucian Eaves. The latter and Mantle are the lessees. The property is a gold producer and has yielded \$250,000 during the last two years.

During the year ending June 1 the companies comprising the Amalgamated extracted from their mines 3,293,584 tons of ore, an average of 9,023½ tons per day. From this, values amounting to \$33,749,397.16 were taken. The output was 747,

998 tons greater than during the year preceding, and its yield was \$5,803,859 greater. The five companies comprising the United Copper mined 413,470 tons during the year, an average of 1,132⅔ tons per day. Net proceeds from it aggregated \$606,951 (an increase of \$77,725 over the year before. Of this sum the Hypocka and Guardian Copper, both working the Minnie Healey mine, supplied \$214,734. Last year no net proceeds were reported from the Minnie Healey; but the Johnstown Co. reported net earnings aggregating \$90,113, while this year it reported nothing. The Speculator, which transferred its property to the North Butte for \$5,000,000 recently, has reported a total output of 112,940 tons for the year. It yielded \$952,084, and net earnings amounting to \$291,385, an increase of \$57,647 over the year previous. The North Butte is operating on a more extensive scale, its output at present being between 700 and 800 tons per day. It has arranged with the Anaconda for the use of the connections between the High ore and Speculator for extracting its ore while its new hoisting engine is being installed. The Original Co., controlled by Senator Clark, mined from the West Steward and Original mines during the year 343,850 tons, an average of 942 tons per day. The net proceeds of this ore aggregated \$349,587, which is \$104,593 in excess of net proceeds reported for the year before. In addition, Mr. Clark received \$1,388 in royalties on ore mined by lessees from his other claims. The Alice Co. reports a loss of \$5,308 during the year. Its total receipts were \$36,178, and its expenses \$41,486.

The Montana Zinc Co. is installing a new dryer and expects to have it in place within two weeks. In the meantime it will continue the treatment of zinkiferous ores from the Alice mines.

The Reins Copper has completed its new station north of the old one on the 800, and is about ready to begin sinking to the 1,200. It will also add one more compartment between the 800 and surface, making it three.

All of the shafts of the Amalgamated mines are being sunk, with the exception of the Mountain View, on which a new hoisting engine is being installed. The shaft of the Anaconda has reached a depth of 2,400 ft., and as soon as a station is cut at the bottom, sinking will be resumed. Ben B. Thayer, who looks after the mining work in the interest of H. H. Rogers, finished an inspection of the mines last week and left for New York Saturday night.

The Pittsburg & Montana Copper will start its smelter next week. It was the intention of the company to have it in operation several months ago, but a heavy flow of water in the workings of the mines retarded the development of the orebodies. The plant has a capacity of from 300 to 400 tons of ore per day.

Manager Ralph Baggaley is now sure that the mine work has progressed far enough to warrant the firing of the plant. He is extracting considerable ore each day, and has several thousand tons in the bins. He did his first stoping in the orebodies June 27, but has several long levels driven west of the crosscut that connects shafts 2 and 3 at a depth of 1,200 ft. The process to be used in the smelter is different to that used in other smelting plants, being one of Mr. Baggaley's own invention.

Goldfield. July 1.

The New Western Reduction Co. is operating a sampler and a 5-stamp mill at Goldfield, relying upon custom ores to supply both. The greater part of the value is saved on the plates, sulphides being recovered on tables and vanners. This mill is chiefly of interest as showing the character of ores produced in the district. Ores coming from workings near the surface consist of oxidized material in a silicified rhyolite gangue; those from deeper levels consist of iron pyrite and chalcopyrite, accompanied by some free gold. There also comes to this mill some bornite and gray copper. Todd C. Woodworth and F. A. Thompson are manager and superintendent, respectively, of this company.

The Sandstorm is in the hands of several groups of lessees; one of the principal operators being the concern of Loftus, Davis & Mayne. They are opening two parallel veins, having a northwest and southeast strike, with a dip eastward. The veins are 10 to 20 ft. in width, between porphyry walls. The gangue is quartz, carrying free gold. The sorted ore as shipped ran \$200 to \$800 per ton. The Kendall, on the same lode, is leased to Oddie & Gardner, whose workings have reached a depth of 250 ft. No sulphide ore has been met within this depth.

The Desert Rose (700 ft. west of the Sandstorm) has a 20-ft. vein, from which high-grade ore has been shipped. The Mayne-Oldfield group is being developed in the same locality.

The Combination Mines Co., E. A. Collins, manager, has the most thoroughly developed and best-equipped property in Goldfield district. The work here shows two main parallel veins, striking north and south through a rhyolite belt. The oxidized ores extend to 140 ft. in depth on one vein, and to 200 ft. in depth on the other. The gangue is a quartz and altered silicified rhyolite, with some kaolin. The value in oxidized ore, as shown by mill work, is half in the form of free gold, and the other half in finely divided particles, not amalgamable. One shoot of ore merges into a sulphide at 140 ft. in depth. In other shoots the sulphide is reached at greater depths. The bases of the sulphides are iron and copper, with

usually a promising percentage of the latter. The lowest level in the mine is 280 ft. below the surface. Hoisting is done by a gasoline engine, but the mill is operated by steam power. Later, electric power will probably be used for both. The mill has 10 rapid-drop stamps, with 10 additional stamps to be installed later. The pulp passes from batteries and over plates to Huntington mills; then to concentrating tables. The tailing then passes to cyanide vats, where it is agitated during the leaching process, with subsequent settling, and a filter press. The mill operates on ore from the oxidized stratum. The concentrate recovered comprises oxide of iron, hematite and pyrite, carrying some gold. The water supply is piped from Hot Springs, 18 miles away. All ore carrying over \$200 per ton is sacked and shipped.

The Nevada Power, Mining & Milling Co., has installed an electric power plant on Bishop creek, just over the State line (Inyo county, Cal.), and is putting up a transmission line from the plant to Goldfield and Tonopah, for all purposes. The distance of transmission is about 100 miles. Among those concerned in the enterprise are F. J. Campbell, C. M. Hobbs, R. Curtis, G. S. Wood, of Colorado, with C. O. Poole and R. M. Jones as consulting engineers.

The high-grade ore of the district has made property prices high; it is difficult to obtain bond and lease of ground on satisfactory terms, the holders often insisting on practically a cash sale. This has occasioned a temporary dullness at Goldfield. Development work is not progressing as vigorously as it might. Hardly 300 men are employed in the mines and prospects of the camp.

Duluth. July 8.

The most important exploration for iron ore in the entire Lake Superior region just now is that under way by the Onondaga Iron Co. on the N.W. $\frac{1}{2}$ of 27-58-20 and in the N. $\frac{1}{2}$ of 22, same town. The drill work is in charge of E. J. Longyear, and on 27 he is finding a large body of ore. It is probable that this 40-acre tract may prove up better than 10,000,000 tons before the work is completed. On 22 they have not yet found ore, but the location is one of the best on the Mesabi range not yet explored. It is surrounded by mines, some of them among the best in the district. It is said that the work on 27 is showing more ore than any other exploration on the range, and that the drill records from that small tract are just now bringing better returns than all the remaining drills of Mr. Longyear, all through the range, numbering from 40 to 50.

There has been serious trouble from water in open-pit mines the past week, and the shipments of early July will be considerably impeded. At most of the mines the schedule has been fairly well

maintained, at the cost of extra labor and great exertion, but at some it has been utterly impossible to keep up. At Leetonia, for example, the pit was so filled with waste and sand on the ore that it has to be cleaned off, and this is a job of many days. The mine is losing from ten days' to two weeks' time, at the very period of the year when large shipments are expected. This mine is so located that it is very difficult to guard against unusual water, though now they are putting in a new system of drainage mains, and hope to avert trouble in future.

The enormous shipments of June, from all ports, especially those of Minnesota, have been remarked generally. The Duluth, Missabe & Northern road moved an average for each day of the month of 45,000 gross tons, and the Duluth & Iron Range about 200,000 tons less for the 30 days. This is far above all preceding records, and indicates what the year will accomplish. Shipments from Lake Superior ports for the season, not including Escanaba nor Wells, have now amounted to 8,040,360 gross tons, compared with 1,385,854 for the corresponding period last year. As the total excess of all ports for the year over 1904 has been 8,724,124 tons, it is seen that the bulk of the increase is from the western part of the region. It is an interesting fact that this excess for the year to July 1 is just about what is required to bring the year's total up to 30,000,000 tons, providing there is no increase from now on over last season.

A complication suggested in this correspondence some time ago has now become a fact. That is the question of the constitutionality of the act under which State mineral leases have been issued. It is the intention of the State, as now announced by its attorney, and as said some time ago in this column to be likely, to contest this matter. It grows out of the fight raised over the insignificant strip of land north of Virginia, which has been in the courts between the State and the United States government and claimants holding from either, for some years. The merits of this new question, as briefly condensed, are as follows: That the State constitution requires that all its lands, if sold, shall be sold at public auction, and that the act permitting the leasing of mineral rights does not so require; and in fact, that there has never been such public auction except in cases where there have been two or more simultaneous claimants for the tract. If the iron ores that are mined beneath the surface are 'land,' then the State may be right in its contention. If it does win, there will be a large amount to be repaid present holders of leases, and there will be several valuable mines free for new entry, which can bring the State a very large amount of money. But it is hardly likely that the courts will dispossess innocent purchasers of the State itself, who have bought under the very conditions the State has pre-

scribed and have lived up to its requirements. The important State mines include the Oliver, Minnewas, in 58-17, the Leonidas in 57-18, a tract in 5-57-20, the Pool in 58-21, the Carson Lake in 57-21, all held by the United States Steel Corporation; the Frantz and Yates in 58-19 by the Consumers Ore Co. (M. A. Hanna & Co.); the Scranton in 57-21 by the Lackawanna Steel Co.; the Grant in 58-19 by the Jones & Laughlins Steel Co.; the Waucouta in 58-18 by the Pitt Iron Co.; the Woodbridge and Wanless in 58-19, one held by the Lake Superior Co., and the other by the Steel Corporation, and some others. There are numerous leases held for speculation and which either have small amounts of ore or have not yet been shown to have any at all, but which are placed at a considerable valuation by their holders and have in many cases brought much money.

A computation of the number of steam shovels employed on the Mesabi range at present shows that there are about 80 of them, nearly half of which are working in stripping and development and the rest in mining ore *in situ* or loading stocks from surface. Their average amount of earth and overburden removed per 10 hours by the shovels working in overburden cannot be far from 100,000 tons.

Some diamond drilling is beginning on the Vermilion range, in fulfilment of the prediction recently made in this correspondence as to increased activity there. The Oliver Iron Mining Co. has begun work on section 5-62-14, where there are excellent indications and some ore. At Robinson Lake, a township further east, the old Bisbee property is under exploration. Still further east the White Iron Lake Iron Co. has resumed after a long cessation. Work is soon to start on Pine island, north of the Soudan mines, and there are deals in progress for other drill-work along the range. The resumption of work in such a costly region is a pretty good indication of the strength of the present inquiry for ore.

Bisbee. July 8.

By resolution of the directors of the Calumet & Arizona Mining Co., the matter of consolidation of the various "steel crowd" copper mines in the Warren district is announced as deferred to some later period, as the conditions at some of the mines are such as to make it difficult to determine any proper basis for consolidation at this time, and probably for some time to come. The company has determined to apply for listing on the Boston stock exchange, and will take the necessary steps at once. This company has some 1,700 stockholders; the majority of its 200,000 shares is in the hands of a very few men, one estate, that of the late H. W. Oliver, holding more than any other owner.

It was decided by the board of direc-

tors of the Calumet & Pittsburg Mining Co., an affiliated concern, that the stock remaining in its treasury, amounting to 50,000 shares of a par value of \$10 each, shall be issued at once to holders of the present stock, at the rate of one new share for every four now held, and at par, half to be paid August 1 and the balance in November. The company has been at enormous expense pumping the water of the Bisbee camp, and has incurred a debt of about \$200,000; in addition to pumping from the depth of 1,055 ft. it is sinking two large shafts, one to go immediately some 50 ft. more to the 1,100 ft. level, and the other from surface to 1,000 feet.

The directors of the Junction Development Co., another affiliated company, decided to form the company into a mining corporation, and to increase the stock from \$750,000 to \$3,000,000, of which all but \$500,000 shall be issued to present stockholders, three-fifths in return for their present holdings and two-fifths for cash at par.

Spokane. July 8.

Charles Moyer, president of the Western Federation of Miners, is expected soon in the Coeur d'Alene district, and the mine operators fear that he will try to stir up troubles with the unions. Since the riots of 1899 there has been little trouble with the Western Federation. The Mine Owners' Association installed an employment agency system, with offices at Wallace and Wardner. There is an agent at each place, who receives applications and who sends miners to the works to fill orders from the companies. It is the prime duty of the employment officials to see that agitators and rabid union men are not given work. The system has worked to the great satisfaction of the companies, who point out that it not only keeps the dynamite element out of the crews, but saves time of the foremen who formerly were besieged with men wanting work. However, the unions have been growing steadily, and after six years they are expected to become restive with the appearance of Moyer. He is expected to make a particular fight against the employment agency system.

F. W. Bradley, president of the Bunker Hill & Sullivan Co., at Wardner, Idaho, who was named as general manager of the Federal Mining & Smelting Co., has refused to accept the position. His refusal is based upon the suits just started by the Federal Co., against the Bunker Hill, to recover about \$1,000,000 claimed as the value of the Republican fraction vein, and of ores extracted. The Republican fraction, which is owned by the Federal, is between its properties and the Bunker Hill group. There is some question as to whether it has a vein. The Federal asserts that it has a true apex,

and although the ore in the upper levels is claimed by the Bunker Hill Co. through extra-lateral rights, yet the Federal sets up title to ore on the 2,000-ft. level of the Bunker Hill, by virtue of the Republican fraction. The case is an intricate one, and marks the resumption of litigation between the two companies.

Boise, Idaho. June 30.

In the Pearl district, the Lincoln, Checkmate, Black Pearl, Whitman, Granite State, I. X. L. and others are considerably developed, all having a good showing of low-grade gold ore in a system of veins running through a granite country. The ore is chiefly a sulphide of iron and zinc, carrying gold partially free. The grade is not high enough to stand the necessary wagon haul of 10 miles to the railroad and subsequent freight to smelters and treatment charges, though some shipments of sorted ores have been made. The success of the mines, therefore, depends upon profitable and effective milling practice in the district. What the Lincoln mine is preparing to do in the milling line will therefore serve as a demonstrator for all the mines of the district. Geo. Z. Edwards, formerly superintendent of the Mercur mine, Utah, is manager of the Lincoln. He is reconstructing the old mill and equipping it for amalgamation and cyanide work. The ore will pass through a crusher, Cornish rolls and Trent Chilean mills, amalgamating plates to follow the last named. The pulp then passes to a sump, from which it is raised 35 ft. to a distributing tank, situated above six 34-ft. leaching vats. It passes from distributing tank through launders to a system of cones that discharge into the leaching vats. These cones, four in number, are on a traveling frame that moves from one vat to another. The overflow from the cone settlers, consisting of slime and sand, passes to the slime pond. It is proposed to carry out most of the zinc in this slime. The heavier iron sulphide carrying the gold, discharges into the leaching vats. The cone sizers are those designed by J. B. Eldredge, of Boise. The value of the ore in the Lincoln, according to much sampling, averages about \$8 per ton. The ore in the vein averages 4.4 ft. in width. It is claimed 33,000 tons are blocked out in the mine. The old shaft is an incline, but since the first of the year a three-compartment vertical shaft has been sunk to a depth of 340 ft., and levels were driven from it to the old workings. Pumps were installed in the new shaft by which the workings were unwatered.

The Whitman, of which W. T. Nasauer is superintendent, has been developed by 3,500 ft. of work, opening ore-bodies in two parallel veins. The Black Pearl, managed by R. B. Anderson, has a 414-ft. shaft, with 1,000 ft. of work on the 400-ft. level, 400 ft. on 300-ft. level

and 600 ft. on the 200-level. The erection of a mill for amalgamating and cyaniding is in progress. Two Elspass mills are to be put in here. The Granite State Mines Co., managed by C. C. Stinson, has been developed by an 1,860-ft. crosscut which has intersected fine veins. Not much drifting has been done as yet.

Toronto. July 6.

Continued activity in mining and prospecting operations is reported from the Cobalt silver region. M. T. Culbert, superintendent of the M. J. O'Brien mines, who was in Toronto recently, states that a shipment of 21 tons, averaging in value \$2,000 per ton, has just been made to New York for treatment. This consignment was taken out in three weeks by eight men. The Canadian Pacific Railway is likely to become interested in this field and it is anticipated that Mr. Aldridge, superintendent of the Trail, B. C., smelter, will shortly visit Cobalt to look over the field and make experiments in the treatment of the ore, in order to test the feasibility of smelting it in Canada. Thomas J. Drummond, vice-president of the Drummond Mines, Ltd., which is operating a mine in the Cobalt area was in Toronto this week.

A petition has been filed here asking for the winding up of the North Shore Copper & Smelting Co., organized in 1903, with a capital of \$250,000, of which \$113,000 was paid up. G. P. Crittisinger, Buffalo, is president, and A. T. E. Horner, Toronto, secretary. Most of the stock is held by Pennsylvania shareholders, on behalf of some of whom the application is made. It is stated that the only known assets are mining properties in the Sudbury district worth about \$5,000, and mortgaged for \$3,500.

J. P. Langley has been appointed liquidator of the New York-Lake Erie Oil & Gas Co., Windsor.

The gold dredge built by Dr. Roughsedge at Golden City near Prince Albert, N. W. T., with all its machinery installed, was successfully launched June 26, and operations on the Saskatchewan river will be begun without delay.

The Williams Quarry Co., of Winnipeg, Manitoba, having completed the new branch line of railway to the stone beds, about 12 miles north of the city, has received the first shipment comprising 14 cars of rubble stone, which is in good demand by contractors.

Victoria, B. C. July 3.

It has been announced that the annual convention of the Provincial Mining Association of British Columbia, which was to be held at Vancouver about July 25, has been postponed. It was expected that, by that date, the members of the American Institute of Mining Engineers would have returned to British Columbia

from the Yukon. The itinerary of the excursionist party, as finally arranged, provides for only a few hours' stay at Vancouver before taking the train for Banff, in the Rocky mountains, instead of two or three days, as had been expected. The date of the convention will be arranged when the executive of the provincial association meets in the autumn. The visiting mining engineers have arranged to spend Thursday, July 6, in Vancouver, before going north to Alaska.

The total lead product of Kootenay during 11 months, to May 31, of the fiscal year 1904-5, is placed at about 25,000 tons, and the June output is estimated at 2,000 tons, making the year's total, 27,000 tons. Of this quantity some 16,000 tons have been produced from ores smelted in the province, and 11,000 tons from St. Eugene ore shipped to Europe. The bounty on the former, at \$15 per ton, totals \$240,000, and on the latter at \$10 per ton, \$110,000; together, \$350,000. As, however, during part of the year the London price of lead was higher than £12 10s. per ton, which is the highest price at which the full bounty is payable, a reduction in the bounty of about \$25,000 will have been made, this bringing the total amount earned during the fiscal year down to about \$325,000. The lead bounty act provides for payment on any quantity up to 33,333 tons per year, so that the total amount earned falls short of that available.

East Kootenay.—It is reported from Fernie, where the head offices in British Columbia of the Crow's Nest Pass Coal Co. are situated, that an agreement has been entered into providing that the Granby Consolidated Mining, Smelting & Power Co. shall again take all its supply of coke from the Crow's Nest Pass Co. The quantity required by the smelting company is about 300 tons per day, and the term over which the agreement is to extend is one year. For some months the Granby Co. has been obtaining part of its coke from the International Coal & Coke Co.'s colliery, at Coleman, Alberta. The Fernie coke is generally long, lustrous, and firm, containing up to 94% fixed carbon, 4.5% ash, and 0.75% sulphur. The Crow's Nest Pass Co. has at its three collieries a total of 1,128 beehive ovens, equal to a maximum daily production of about 1,500 tons of coke. Of these ovens, 424 are at Fernie, 404 at Michel, and 240 at Carbonado.

Rossland.—Press despatches from Toronto, Ontario, advise the sale to an Eastern Canadian syndicate of the late Geo. Gooderham's interest in the Centre Star and War Eagle mines, Rossland, and the St. Eugene, at Moyie, East Kootenay. The deceased millionaire, was president of all three companies, and, with his son-in-law, T. G. Blackstock, also of Toronto, held a controlling interest. The aggregate capitalization of the three com-

panies is \$9,000,000, as follows: Centre Star, \$3,500,000; St. Eugene, \$3,500,000; War Eagle, \$2,000,000. The Centre Star Co. is in a satisfactory financial condition; the St. Eugene, which is the largest lead-silver mine in Canada, has been making considerable profits during the last six months, but the War Eagle has been heavily in debt, and the grade of the ore it has shipped has steadily lowered during the last 10 years. The price paid for the Gooderham and Blackstock interests is stated to have been \$825,000 in all.

Cariboo.—The manager of La Fontaine mine, at Lightning creek, Cariboo, owned by the Cariboo Consolidated (1904), Ltd., of London, England, is at last able to work the bedrock gold gravels, to reach which deep drifting has been in progress for some time. At a general meeting of shareholders in the company, held in London last February, the chairman said: "If all goes well, and there is no setback, we should break into the old shaft toward the end of June and gain complete mastery over the water and begin to work the gravel."

London. July 1.

The report of the Montana Mining Co. for the year 1904 has just been published. Briefly, it shows that the tailing plant at Drumlummon mine is making a profit, and that no other property of value has yet been obtained. At the Drumlummon 6,096 tons of ore were picked out of various parts of the mine, which contained 4,712 oz. of gold and 57,033 oz. of silver, realizing \$110,000. The expenses, however amounted to \$12,000 more than this. The tailing plant was in operation from the middle of April to the beginning of December, and produced cyanide precipitates containing 7,102 oz. of gold and 88,931 oz. of silver, realizing 190,000. The expenses amounted to \$114,000, leaving a profit of \$76,000. The Lucky Girl mines, at Edgemont, Nevada, which were acquired a few years back, do not develop well, though since the period of the present report, cable advices are rather more hopeful. During the year 11,000 tons of ore were extracted, milled and cyanided, yielding altogether bullion bars estimated to be worth \$70,000. The expenses of extraction were \$65,000, and the expenses of development \$27,000, so that the net results have been a loss. Another property that the company tried was the Silver Bell, in Montana. This has turned out so badly that the bond has been abandoned. Mr. Burrell has examined a great many other mines during the past winter, but nothing suitable for the resources of the company has so far been obtained. After charging to revenue account all the expenditure of every kind, there remains a profit on the year's work of about \$20,000, a fact which is due to the profitable nature of the cyaniding of the tailing at Drumlummon. The company, though one can hardly call

it prosperous, is in a thoroughly sound condition, and is well administered. Nearly a year ago the nominal capital was drastically reduced so as to bring it down to the present actual value of the properties. The assets consist approximately of \$200,000 in mines, machinery and stores and \$150,000 in hard cash. In addition to these assets there is uncalled capital amounting to about \$150,000, which would be available if a new property of promising nature was obtained.

The Delamar Co., operating the mine of that name in Idaho, has a history and present condition very similar to the Montana Co. Both in the old days paid handsome dividends, and have, in recent years, obtained profits on reduced capital from mines that were supposed to be worked out. It is now just four years since the capital of the Delamar Co. was reduced from £400,000 to £85,000, the idea being to bring down the nominal capital to the actual value of the assets, so that if another property was acquired the company would not be over-weighted with capital. Since then the profits and dividends have been most regular, amounting in all to 87½% on the £80,000 capital, a performance which is highly satisfactory to the shareholders. During the year ended March 31 the rate of dividends was 25%. During the year, 37,408 tons of ore were treated, yielding 16,687 oz. of gold and 39,231 oz. of silver, realizing \$366,000. The total costs at the mine were about \$250,000, and after deducting London expenses and taxes, a net profit remained of approximately \$100,000. The percentage of extraction is about 85% gold and 45% silver. The way that the mine has continued to live after reduction of capital reflects much credit on the ability of Mr. Orford in following stringers and opening up old filled stopes. The company is looking after new properties, but the only one acquired, The Afterthought, did not turn out well and the cost has been written off. The cash resources of the company are £75,000.

Laurium, Greece. June 5.

The most important company operating in the ancient mining district of Laurium is the Compagnie Française de Mines du Laurium. It is an interesting fact that this company has lately come to the United States for a new furnace to smelt its silver-lead ores. This furnace is 48 by 160 in. It was built by the Colorado Iron Works Co. at its plant in Denver, Colo. This furnace embodies the latest improvements in the modern silver-lead furnace. It has a capacity of about 200 tons of ore per day. The mines of Laurium are about 50 miles from Athens, with which they are connected by rail through the port of Laurium or Ergasteria, which has a good harbor and a population of about 20,000 people.

General Mining News.

Sault Ste. Marie Canal.—The freight movement through the canals at the Sault Ste. Marie in June was the heaviest ever reported in a single month. The total for the month was 6,057,491 tons. For the season up to July 1 the total movement was : Eastbound, 10,995,233; westbound, 2,138,211; total, 13,133,444 net tons. In 1904 the opening of the canals was delayed by the strike of the masters and pilots, and practically no traffic passed the locks until June. The total to July 1 was only 3,589,124 tons. Under the circumstances, no comparison is of value. In 1903, the total up to July 1 was 11,944,934 tons; the increase this year was 1,188,510 tons. The mineral freights included in the total were as follows, in net tons, except salt, which is in barrels:

	1904.	1905.
Anthracite.....	219,941	294,337
Bituminous.....	947,946	1,572,717
Total coal.....	1,167,887	1,867,054
Iron ore.....	1,385,054	9,812,941
Pig and manuf. iron...	30,762	59,255
Copper.....	12,081	35,679
Building stone.....	2,850	4,638
Salt, bbl.....	84,931	169,729

The iron-ore movement has been heavy this year, but the coal traffic shows less increase than expected. This is due partly to the fact that in 1904 the coal docks in the Northwest were bare at the opening of the season, and, when navigation did open, coal was rushed up as fast as possible; partly to the disagreements which delayed coal shipments in the early part of the present season.

ALABAMA.

SHELBY COUNTY.

The Montevallo coal mines, operated heretofore by W. F. Aldrich and associates, have been purchased by T. H. Aldrich and P. B. Thomas, who intend not only to develop the present seam of coal, but expect to work another seam under the present one. It is likely that in the next day or two new arrangements, in regards to labor, will be made. W. F. Aldrich and associates operated the mines on the 'open-shop' plan.

ARIZONA.

COCHISE COUNTY.

The camp of which Paradise is the center is making substantial progress.

Cochise Consolidated Copper Co.—Copper ore has been encountered in the main shaft, and makes a promising show. The shaft is now all in ore.

Copper Range Group.—Work has been started on the high-grade orebody in the Tucson claim, and shipments will be made this month.

Manhattan Development Co.—Work is progressing well in the adit; also in the winze, which is showing some good sulphide ore.

Savage Gold & Copper Co.—Machinery has arrived for the smelter, which will be erected at once. They are making good

progress in the tunnel, which has its face now all in ore. They are making connections between their two shafts, for air; as soon as connected, they will continue sinking the main shaft.

The completion of the Savage smelter means much to the many prospectors who own ground in the district, as they will then be able to ship by burro and wagon their small lots of ore and get sufficient returns to pay them a profit.

CALIFORNIA.

AMADOR COUNTY.

Riverside.—On this mine, near Defender, the six-stamp mill is being put in readiness and the property is showing good profits.

CALAVERAS COUNTY.

Gray.—At this gravel mine on the Hagerman ranch, Calaveras river, good prospects are shown in several different lesser channels. Considerable prospecting is being done to develop the main channel and the force of men is being gradually increased.

Dredging Ground.—Prospecting dredging ground is going on near Petersburg in the lands of the Calaveras river bottom. This section yielded large amounts of gold in early days and it is believed there is still considerable virgin ground.

EL DORADO COUNTY.

Good Luck Gold Mining Co.—This company has been organized in Manchester, England, to work the Good Luck, or Deposit mine, near Diamond Springs.

Thelma Co.—This company has been organized to open the gravel mine formerly owned by the Andreason Brothers, at Indian Diggings. The directors are O. Halden, of Duluth, Minn.; H. R. King, of Grand Rapids; James & Billings, of Placerville, and C. & H. Andreason, of Indian Diggings.

INYO COUNTY.

Chicago District.—At this place, about 25 miles northeast of Bishop, the Cerro Gordo mine is turning out some rich specimen ore. The owners are sinking on the claim. Other claims in the vicinity are being developed, and King Brothers have done some 2,000 ft. of work. They have a two-stamp mill on their mine.

KERN COUNTY.

Piute.—At this mine, Daniel Tressle, superintendent, owned by Barlow & Hill, of Bakersfield, a good pay shoot has been struck. The ore is free milling.

NEVADA COUNTY.

Banner Hill Mining Co.—This company has been organized to unwater and reopen the old Banner mine, Nevada City district. Senator C. M. Belshaw, E. C. Voorheis and J. J. Crawford, all interested in the famous Gwin mine, J. R. Phillips, of Stockton, and Howard S. Smith, of San Francisco, are the incorporators. A new pumping and hoisting plant will be put in the mine. The 670-ft. shaft will be sunk 600 ft. deeper and levels driven

from it. The mine has been idle a number of years, but was many years ago a large producer. The gentlemen who have organized the company have had successful experience in re-opening other gold mines in this State.

Lion.—In this claim, Deadman's Flat, Dennis Donovan has made a strike near the surface and is taking out good ore.

Ironclad.—Operations will commence at this mine, near Rough & Ready, as soon as the electric hoisting and pumping machinery ordered is ready. The mine will soon be unwatered. Superintendent Skewes has recently uncovered some good ore.

Copper.—At Iron Mountain, southwest of Grass Valley, machinery for boring has been put in place and the ground will be prospected for copper ore.

PLACER COUNTY.

Lost Emigrant.—This mine has been bonded to W. H. Bray and associates, of Salt Lake City, who have overhauled the machinery and installed two new concentrators. The mine is 12 miles south of Donner.

SHASTA COUNTY.

Original Quartz Hill Mining Co.—This company has recently acquired three additional quartz claims in Quartz Hill district, known as the Never Broke, Oak Grove and Golden Jubilee.

COLORADO.

GILPIN COUNTY.

Wire Gold Mining, Milling & Investment Co.—Articles of incorporation have been filed, showing capital stock to be \$500,000, with St. Joseph, Mo., and Chicago parties interested. They own a group of lode and placer claims and mill-site in Black cañon section of Pine district, and are preparing to work quite a force of men, and later will put on machinery. S. W. Wornwood, Tolland, Colo., is manager.

Elkhorn.—Denver parties have taken an option on this group in Pleasant Valley district, and are preparing to work both with shaft and through the Newhouse tunnel, and they will instal machinery at an early date. A company is to be organized, and J. C. Nixon, 505 Mack Block, Denver, is in charge.

Cashier.—Shipments from the east 500-ft. level by Jordan & Co. brought returns of 30.35 oz. gold, 26.25 oz. silver and 15.80% copper, or net value of \$625 per ton for first-class ore; the second-class values being 11.72 oz. gold, 16.30 oz. silver and 8.05% copper, or net value of \$240 per ton. Western New York and Pennsylvania parties are interested. Monthly dividends are paid, with the leasing system in vogue, and B. L. Campbell, Central City, is superintendent.

Perrin.—Property is leased by J. W. Jones and others, of Russell Gulch, and they are installing machinery and erecting a larger shaft house. They have been

shipping a good grade of mill and smelting ores.

Gem.—J. Mellow & Co., of Russell Gulch, are installing machinery on their lease, having opened up some good grade lead and gold ores in sinking the shaft, both of the milling and smelting kinds.

John L.—Eastern parties are reported to be about to take hold of this group in Russell district, owned by Denver parties, the property being equipped with first-class machinery and buildings; its main shaft is down over 200 feet.

Banzai Mining Co.—Missouri and Denver capital is interested in the After Supper property at Black Hawk and in sinking the shaft a good body of free-milling ores from 4 to 5 ft. wide has been opened up.

Mill Charges.—The demand of the millmen at work in the stamp mills and concentrators for an eight-hour day at \$2.50 per day, where it was formerly 12 hours for \$3 per day, has been granted by the millmen, and the mills are all under the eight-hour system. On account of the increase in wages, the mill owners raised the price of milling about 12c. per ton, or about \$1 per cord, which makes the burden fall on the mine operators.

TELLER COUNTY—CRIPPLE CREEK.

Cripple Creek Homestake Gold Mining Co.—This property has closed down for the present. It is said that it is only temporary, but it is a question whether it will resume operations again. It is known that the ore is low grade and it is supposed that this had something to do with the closing. The company has also been in financial difficulties.

Isabella Gold Mining Co.—Sinking is in progress on the old Empire State shaft of this property on company account. It is intended to deepen the shaft considerably from its present depth, which is about 800 ft. On the old Isabella workings ore is being taken out by lessees Murphy, Hamlin and associates.

Stratton's Independence Ltd.—This property, which is being worked by a number of lessees, is making a production, given as about 4,000 tons per month of fair-grade ore. The leasing system on this property has resulted well, most of the lessees making money.

Findley Consolidated.—The blowing-up of the powder warmer on this property a week ago caused some damage, which has now been repaired. About 300 lb. of powder were in the warmer and it was first reported that it was the magazine that had exploded. Considerable damage was done to the surface plant.

Most of the mines were closed down for July 4 and 5, but are now working again. A few of them, however, continued operations on a small scale over the Fourth.

National Gold Mining Co.—A reorganization of this company has been effected

and its indebtedness taken care of. A new leasing company, headed by J. S. Murphy, has taken hold of the property and work will be pushed.

Forest Queen.—A small amount of ore is being hoisted at this property from several of the levels. The outlook for the property is much improved.

Beacon Hill-Ajax.—This property is being worked under lease by the Equitable Finance & Development Co., and some good looking veins have been encountered. So far no ore has been shipped. The property is located in a very good neighborhood, being between the Mary McKinney and El Paso.

Granite Gold Mining Co.—Considerable work is being done through the Gold Coin shaft in this property. It is understood that the Granite shaft is to be sunk to connect with this shaft. In the meantime, a fair output is being maintained.

Ajax Gold Mining Co.—A number of lessees are engaged in exploiting this property, both from the surface and in the main workings. Most of these lessees are selling some ore.

IDAHO.

OWYHEE COUNTY.

Trade Dollar Extension.—A. F. Stevens has sold his interest in this property and in the Addie, at Silver City, to A. J. Orem & Co., of Salt Lake City. Mr. Stevens will give his attention to the development of a property on the west slope of Florida mountain.

IDAHO COUNTY.

State Road.—The State is constructing a wagon road from Meadows, on the Little Salmon river, to Smith creek, in the Thunder Mountain country, which will go by way of Payette Lake, Warren and Elk Summit. The distance is over 100 miles.

Werdenhoff.—This mine is on Smith creek. It has been opened by a crosscut 1,000 ft. long that strikes through a system of veins. The ore carries gold, silver, lead and some copper. It is believed much of it can be cyanided at a profit. A mill was purchased last season but was not erected. If the State road to Smith creek is finished in time, the mill will be erected this fall. In the meantime development at the mine continues.

SHOSHONE COUNTY.

Bunker Hill & Sullivan.—A despatch from Nampa, Idaho, July 12, says: "The Bunker Hill Co. wins today in its suit against the Federal Mining & Smelting Co., in the matter of the application of that company for an order authorizing it to inspect and survey the Bunker Hill mines. The court decides that the Federal Co. has no rights as claimed."

ILLINOIS.

The State Board of Labor Statistics met in Springfield last week, and arranged the new mine inspection districts under

the law passed last winter, which increased the number from seven to ten. The new districts are composed of the counties named below: First district—Grundy, Kankakee, La Salle, Will; second district—Bureau, Henry, Knox, Mercer, Rock Island, Warren; third district—Livingston, Marshall, Peoria, Putnam, Stark, Woodford; fourth district—Fulton, Hancock, McDonough, McLean, Tazewell; fifth district—Edgar, Macon, Vermillion; sixth district—Brown, Cass, Logan, Menard, Sangamon, Schuyler; seventh district—Calhoun, Christian, Green, Jersey, Macoupin, Montgomery, Morgan, Scott, Shelby; eighth district—Bond, Madison, St. Clair; ninth district—Clinton, Franklin, Hamilton, Jefferson, Marion, Perry, Randolph, Washington; tenth district—Gallatin, Jackson, Johnson, Saline, Williamson.

The arbitration agreement made by the committees of the Coal Operators' Association and the United Mine Workers was embodied in the following agreement:

"Upon condition that the United Mine Workers of Illinois agree to continue to assume all responsibility heretofore resting upon them for the care of the working places and the proper character and placing of the blasting shots; and that at the small mines where this law makes it necessary to employ an additional engineer, it will be the privilege of the operator to put on a man to act as such engineer, who shall fire, or watch the plant, or do such other work as is now being done by the fireman or night watchman at the wages of third engineer; and that any shot-firer can be appointed bottom bell man to bell away shot-firers; and that in case of wet holes that will not stand if charged and tamped by the miner, the shot-firer will attend to charging and tamping said holes; it is agreed by the parties hereto to submit the following to arbitration:

"Under the terms of our joint agreements, should or should not the miners reimburse the operators for the amount necessary to pay the wages of shot-firers who shall inspect and shoot the shots in accordance with the State law effective July 1, 1905?"

"The board of arbitration to be fully constituted before the foregoing is submitted, and the submission to be made as above and decision rendered thereon before July 15, 1905."

The four arbitrators appointed were Harry N. Taylor, of Chicago, general manager of the General Wilmington Coal Co., and A. J. Moorshead, of St. Louis, general manager of the Madison Coal Co., in behalf of the operators, and H. C. Perry, president, and W. D. Ryan, secretary of the United Mine Workers of Illinois, in behalf of that organization. These selected as the fifth member Judge George Gray, of Wilmington, Del., who was chairman of the anthracite strike commission.

The decision was announced July 12,

and is to the effect that the operators and miners shall divide the cost of the shot-firers, each bearing one-half. This does not terminate the lock-out, however, as the schedule for shot-firers' wages has not yet been settled. It is now in the hands of a joint committee for discussion.

KANSAS.

A number of Kansas coal operators talk of testing the constitutionality of the double-entry law recently enacted. Some of the mines, which are known as single-entry workings, are now being developed by an entry and what is known as a 'smoke-room,' or air-course. It is maintained by the operators that this smoke-room provides good ventilation and complies with the State law, a view not held by the State mine inspectors. The only large company involved is the Western Coal & Mining Co., all of whose mines, with the exception of those most recently opened, are worked single-entry. The operators of the smaller mines claim that the cost of a literal compliance with the demands of this law would be prohibitive. Double-entry has advantages over single-entry mining, but a too literal enforcement of this law might cause hardship. Future development is another matter.

MICHIGAN.

SAGINAW COUNTY.

The miners at the Riverside, Valley and Central coal mines, near Saginaw, have struck, and the mines are idle. The strike was caused by the appointment of a docking-boss at the Riverside, which the miners claim is contrary to the agreement, which provides only for the appointment of a weighing master by the company, and a check-weighman by the miners.

NEW MEXICO.

LUNA COUNTY.

Phoenix Prospecting Co.—This company has let a contract for an adit, 250 ft. long, on the Dewey claim, at Cooks. It is expected to tap the orebody at a depth of 680 ft. from the surface.

SIERRA COUNTY.

Black Peak Mining Co.—Work has been resumed on this mine near Shandon. The company is adding to the length of its cross-cuts, and has purchased a 10-stamp mill, with a gasoline engine and gasoline hoist. W. W. Williams is manager.

VALENCIA COUNTY.

New Mexico Pumice Co.—This company, which has been taking out pumice stone and limestone, at Toltec, is going to add a lime-kiln to its works. There is a large quantity of limestone on the property.

OHIO.

JEFFERSON COUNTY.

Eastern Ohio Coal & Coke Co.—This new company has bought 2,000 acres of

coal land in the Yellow Creek valley. It has been organized by Pittsburg and Cleveland parties.

Columbus & Hocking Coal & Iron Co.—This company is considering the construction of extensive plant for making refractory brick from the fire-clay found in several of its coal properties.

OREGON.

BAKER COUNTY.

Prairie Diggings.—Manager Joe Waddell, of this mine, at Prairie City, about 60 miles southwest of Baker City, reports that development work is progressing rapidly, and that he is driving a 150-ft. tunnel and will then drift on the various levels in order to thoroughly test the ground. The ore-shoots now show up well.

Chloride.—The development work now in progress at this mine, about 12 miles west of Baker City, in the Rock creek district, has just uncovered a new body of ore. The vein is 4 ft. wide, and the ore is free gold. The discovery has awakened new interest in this camp.

Lew & McDaniel.—A special message from the Greenhorn announces the opening of a body of rich ore in this property near the Gilkey & Kershaw strike. The face of the vein in the tunnel shows free gold. The news of the strike has caused a rush to that portion of the Greenhorn camp.

Coal Strike.—The contractors completing the extension of the Sumpter Valley railway from Tipton south have struck a vein of coal about a mile from Tipton. The discovery is located in the forest reserve and has caused a great deal of interest, as fuel in this country is scarce and there is no coal of any value anywhere in eastern Oregon.

PENNSYLVANIA.

ANTHRACITE COAL.

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

	May.	11 Months.
Earnings....	\$3,642,047	\$33,363,717
Expenses....	3,316,584	30,984,605
Net earnings.....	\$325,463	\$2,379,112

Expenses for the 11 months were 92.9% of gross earnings. As compared with the previous year, there was an increase of \$1,138,699 in earnings; an increase of \$1,622,105 in expenses; and a decrease of \$483,406, or 20.3%, in net earnings.

BITUMINOUS COAL.

Taylor Coal & Coke Co.—A singular explosion occurred at the Taylor shaft of this company, near Uniontown, July 6, by which five laborers were killed, the foreman in charge of the work was fatally injured, and three others were seriously hurt. The shaft is a new one, which is down 94 ft., and was not expected to reach

coal at a less depth than 200 ft. The cause of the explosion is not fully ascertained. All the indications are that it was the result of gas leaking into the shaft. Whether this gas came from the coal vein below is yet to be ascertained, but men working in the shaft have stated that at different times they have observed gas coming from fissures in the rock.

BERKS COUNTY.

Columbia Graphite Co.—This company, which was recently organized in Philadelphia, with a capital of \$750,000, has purchased the property formerly worked for graphite, near Gabelsville, and proposes to re-open the old mine. Several slopes have been run, and the indications are said to be sufficient to warrant further work.

ALASKA.

PORT CLARENCE DISTRICT.

In this district during the past winter, a number of mining parties have been at work. The Bartels Tin Mining Co., at Cape Prince of Wales, is prospecting principally by running tunnels in search of the ledge tin. Reports are favorable so far. Messrs. Crim, Randt & O'Brien are working on their tin properties at Lost river. Their latest reports are that prospects are improving.

On Rapid river, a tributary of Lost river, C. T. Russell and F. L. Bones, connected with the Alaska Chief Mining Co., are at work on their mining property, and report good prospects. It is a lead proposition.

Over the head of the divide from American river, on the Serpentine slope, Thomas Ward, Peter Barry, and some others are prospecting on a copper property. The Arctic Mining & Trading Co. is doing some work on Sunset creek, which runs into Grantley harbor. They are getting some placer gold, and are using steam thawing apparatus. This company has built about 17 miles of ditch, and has still 10 miles more to complete. Sam Doran and associates are prospecting on Iglo creek, also a tributary of Grantley harbor. They are using steam thawers. Several prospectors are at work on other creeks running into Grantley harbor, chiefly on Offield, Dewey and Eileen creeks. A number of prospectors are also on Dick creek, a tributary of the Serpentine river. Messrs. Galen & Sullivan have been at work through the winter on Gold Run creek, a tributary of the Bluestone, and have large dumps ready for treatment this season. There are a number of other prospectors on Gold Run, and several of them have found pay on the benches on both sides of the creek.

A new development is the use of powder, which has been tried successfully in blasting out frozen muck and gravel on several of the creeks.

NEW ZEALAND.

The Mines Department reports the exports of gold from the colony as follows, for March and the three months ending March 31, in ounces of bullion:

	1904.	1905.	Changes.
March.....	45,064	34,024	D. 11,040
Three months.....	125,083	123,975	D. 1,108

The bullion reported for the three months this year was equal to 117,768 oz. fine gold, or \$2,434,353. Exports of silver for March and the three months were as follows, in ounces:

	1904.	1905.	Changes.
March.....	87,256	70,973	D. 16,283
Three months.....	265,195	194,800	D. 70,395

The greater portion of the silver was obtained from the gold-mines in Ohinemuri county, in the Hauraki mining district.

Coal Trade Review.

NEW YORK, July 12.

ANTHRACITE.

The hard-coal market is exceedingly dull, as would naturally be expected at this time. The 20c. discount has small influence in persuading local dealers to lay in large supplies. Another reason for the dullness is that householders have either filled their bins for the coming winter, or else are out of town and unable to attend to the matter. The retailers advanced their prices on domestic sizes at the first of the month by 10c. per ton, and a further advance may be looked for by the time the wholesale prices have resumed their normal level.

Prices f.o.b. New York harbor shipping ports during July will remain as follows: Domestic sizes, \$4.55 for broken and \$4.80 for egg, stove and chestnut. Steam sizes remain at the same figures as last week: \$3 for pea; \$2.25@\$2.50 for buckwheat; \$1.45@\$1.50 for rice, and \$1.30@\$1.35 for barley.

BITUMINOUS.

The Atlantic seaboard soft-coal trade is dull, a condition looked for at this season. Shippers appear to be able, however, to secure orders in sufficient numbers to keep a slightly reduced output from the mines on the road to tidewater points. They report considerable difficulty in procuring orders, consumers requiring a good deal of urging. The inducement by which orders are obtained is the promise of low freight rates. Coastwise rates are below normal, and it would not be surprising to see an advance of 25c. per ton by the autumn. For this reason, the more experienced consumers are anxious to get their supplies forward at this time, provided they have sufficient storage room.

Trade in the far East is quiet. There are, however, no large quantities of coal in that territory awaiting consignment. Trade along the Sound is slowing up gradually. This territory always seems to postpone its orders from the summer, when they are readily filled, and at low freight rates, until autumn, when condi-

tions are the reverse, thus losing a large margin of advantage. Trade in New York harbor is quiet; prices on fair grades average around \$2.35@\$2.40 f.o.b. shipping points. All-rail trade remains unchanged; if a reduction occurs at one point, it is compensated by an increase somewhere else. Car supply is up to demand, and transportation is excellent.

Vessels in the coastwise market are in good supply, and rates are weak. Philadelphia quotes as follows: To Boston, Salem and Portland, 80c.; to Portsmouth and Bath, 65@70c.; to Saco and Gardner, 90c. and towage; to the Sound, 55 cents. Rates from New York harbor are 50c. to around the Capes.

COAL TRAFFIC NOTES.

Anthracite coal shipments in June were 161,100 tons less than the extraordinary record of May, but were still very large for a summer month. The total was 5,844,052 long tons, which compares with 5,728,795 tons in June, 1904; showing an increase of 115,257 tons, or 2% this year. For the half-year ending June 30 the shipments were as follows, in long tons:

	—1904—		—1905—	
	Tons.	Per ct.	Tons.	Per ct.
Reading.....	5,668,798	19.4	6,187,544	20.1
Lehigh Valley....	4,824,482	16.5	5,037,052	16.4
N. J. Central....	3,697,244	12.6	3,922,054	12.8
Del., Lacka. & W.	4,704,541	16.1	4,749,632	15.5
Del. & Hudson....	2,912,103	9.9	2,933,882	9.5
Pennsylvania....	2,371,959	8.1	2,507,932	8.2
Erie.....	3,007,893	10.3	3,142,581	10.2
N. Y. Ont. & W....	1,322,039	4.6	1,447,942	4.7
Del., Sus. & Schuylkill....	738,148	2.5	788,678	2.6
Totals.....	29,257,207	100.0	30,716,997	100.0

Every company showed an increase this year. The gains were not equally divided, however. Five companies—Reading, New Jersey Central, Pennsylvania, Ontario & Western and Delaware, Susquehanna & Schuylkill—made gains in their proportions of the total; while four—Lehigh Valley, Lackawanna, Delaware & Hudson and Erie—lost. The changes were not large in any case.

The coal and coke tonnage originating on the Pennsylvania Railroad lines east of Pittsburg and Erie for the half-year ending July 1 is reported as below, in short tons:

	1904.	1905.	Changes.
Anthracite.....	2,233,037	2,359,843	I. 126,806
Bituminous.....	13,412,197	13,934,944	I. 522,747
Coke.....	4,295,947	5,480,985	I. 1,185,038
Totals.....	19,941,181	21,775,772	I. 1,834,591

The gain in anthracite coal was 5.7%, and in bituminous, 3.9%, comparatively small changes. The increase in coke was more important, being 27.6%. There was an increase of 9.2% in the total tonnage.

Birmingham. July 10.

The importation of labor from Pennsylvania, and even foreign labor is rapidly filling the mines in this district, taking places left by the union miners on strike. The production at the furnace companies' mines is almost back to the normal condition, and there is very little inconvenience felt now on account of the strike. A large number of the union men on

strike have sought positions elsewhere. The commercial coal company mines, which shut down July 1 for a temporary rest, will resume operation this week. Several small batteries of coke ovens will be started in the next few weeks in this State. The Sheffield Coal & Iron Co. will again begin making coke at Jasper, in Walker county.

Chicago. July 10.

By the resumption of work at the Illinois coal mines today, the condition of the market for Western coals becomes easier, though the new supplies will not be plentiful enough for a few days at least to depress the market. The mines have been closed for a week pending the arbitration of who should bear the increased cost of mining, due to the shot-firers' law, and coal from Indiana has in consequence been 10 to 20c. above normal prices, due to the increased demand. For the Indiana operators the last week has been one of excellent business.

Judge Gray's award in the shot-firers' dispute puts half the cost of the shot firers on the operators and half on the miners. It will increase the price of Illinois coal slightly—perhaps, 5c. a ton. This award of the arbitrator will stand until a new contract is made between the operators and the miners, or until next April.

There has been practically no Illinois coal in the market in the last week. Indiana supplies have kept the market going, and contract requirements have been met by coal reserved at the Illinois mines. The result of this condition has been a cleaning-up of Western coal on tracks that will be beneficial for several weeks. Indiana steam lump was sold at \$1.70@\$2.10; run-of-mine at \$1.60@\$1.80 and screenings at \$1.40@\$1.50.

Eastern coals have not benefited greatly out of the closing of Western mines, but doubtless would have done so, had the condition in Illinois continued longer. Smokeless is quiet and steady, Pocahontas and New River bringing close to the circular prices of \$3.05@\$3.15, if not the full price. Hocking is also quiet, and prices are somewhat under the standard price of \$3. Youghiogeny is in very light demand, at \$2.90 for three-quarter.

Very light sales are reported by dealers in anthracite, who say the business this year is duller than it was last year, for the corresponding period.

Cleveland. July 11.

The coal trade through this territory is strictly in the dumps. There is a fairly good movement up the lakes, but it is nothing out of the common run. There is a steady demand for steam coal locally, but there is constantly a question of overproduction. There is a good demand for slack, but the supply is increasing. Lake shippers are meeting renewed and vigorous opposition from the Illinois mines

and, while prices have not been cut, there is a question whether it will not be necessary a little later on. The three-quarter lake coal is selling at \$1.90, f. o. b. boat, at Lake Erie docks. Lake rates are not changed from 40c. to Lake Michigan and 30c. to Lake Superior. Steam prices in this locality have not changed, holding at 90c. at mines, for the run-of-mine grade. The supply is in excess of the demand. There is a good call for slack, but the increase in the movement of Lake three-quarter coal is increasing the supply and the prices are a little easier, although holding at 60c. at the mines. The coke market is about at the bottom, with prices holding about as they have been, at \$2.50 for 72-hour foundry coke and \$2 for furnace coke, both prices being at the oven. The supply of high-grade coke is a little better than it has been.

Pittsburg. July 11.

Coal.—There is but little change in the coal situation. Most of the railroad mines and all of the river mines are in full operation. The bulk of the product is going to Lake ports and there is no complaint as to the railroad car supply. Prices are unchanged, run-of-mine being quoted at \$1@\$.10 a ton at the mine. The rivers were navigable on Sunday and nearly 3,000,000 bush. of coal were shipped to southern ports. The shipments stopped yesterday, as the waters receded, causing great disappointment to operators who have accumulated large stocks.

CConnellsville Coke.—Both production and shipments fell off somewhat last week, but better business is evidently anticipated, as work on new ovens is being rushed. Prices are about the same as last week, furnace coke being quoted at \$1.75@\$.1.90, and foundry at \$2.35@\$.2.50. The production for the week amounted to 245,599 tons. The shipments aggregated 10,842 cars distributed as follows: To Pittsburg and river points, 4,159 cars; to points west of Pittsburg, 5,465 cars; to points east of Everson, 1,218 cars.

San Francisco. July 6.

Business remains quiet. Supplies are good, except in some grades of Australian, which are scarce. Prices are unchanged. Business in fuel oil is good, but there is some discussion over recent changes in pipe-line charges and deliveries.

For Coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, \$8; Roslyn, \$7; Seattle and Bryant, \$6.50; Beaver Hill and Coos Bay, \$5.50; White Ash, \$5.25. For Rocky Mountain coals, in car lots, quotations are: Colorado anthracite, \$14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, \$8.50. Eastern coals are nominal at \$14 for Pennsylvania anthracite, and \$13 for Cumberland. For

foreign coal quotations are, ex-ship: Welsh anthracite, \$13; cannel, \$8.50; Wallsend and Brymbo, \$7.50 per ton.

Foreign Coal Trade.

July 12.

Imports of fuel into Belgium for the five months ending May 31 were as follows, in metric tons:

	1904.	1905.	Changes.
Coal.....	1,533,474	1,634,101	I. 100,627
Coke.....	147,226	152,944	I. 5,718
Total.....	1,680,700	1,787,045	I. 106,345

The chief imports were from Germany. The exports of fuel for the five months were as follows:

	1904.	1905.	Changes.
Coal.....	1,972,202	1,850,685	D. 121,517
Coke.....	369,855	425,401	I. 55,546
Total.....	2,342,057	2,276,086	D. 65,971

The largest exports, both of coal and coke, were to France.

The Government mining engineer reports that in the month of April the coal output from all mines in the Transvaal was 256,735 tons; coal sold, 203,991 tons. For the four months ending April 30, the total coal sales were 754,445 tons in 1904, and 807,851 tons in 1905; an increase of 53,406 tons. The average price reported this year was equivalent to \$1.67 per ton at mine.

Iron Trade Review.

NEW YORK, July 12.

The iron market, while showing little change from the conditions reported last week, has a somewhat stronger feeling, and there is more confidence in the future than has been the case for some time. In pig iron, this is shown by an increase in the number of inquiries for third- and fourth quarter delivery. The immediate effect is that the independent producers in the Mahoning and Shenango valleys are holding out for the present basis of prices on future deliveries. It is understood that several offers for bessemer iron have been refused. They have taken this action, notwithstanding the fact that the United States Steel Corporation has bought no outside iron for July or August, and is not expected to be in the market for material until late in the fall, if then. In foundry iron, current business is limited too small contracts for near delivery; but large consumers are making inquiries for later business, which has encouraged makers to hold out for present prices. The weakest part of the market is for Southern iron, which has been selling on a basis of \$11 Birmingham for No. 2 foundry. There has been a slight accumulation of iron at the Alabama furnaces, but not sufficient to cause any apprehension.

In finished material, conditions are about the same, although there is a good

deal of activity still in plates, principally for ship-building and car-building interests. Structural material is selling largely in small lots to builders, while the bridge-men continue to take considerable quantities. Quite a number of rail orders of moderate size have been placed, bringing work of this class up to a large total. A number of orders for trolley rails are also in evidence. The agricultural-implement makers are beginning to inquire for their fall supplies of bars, though little actual business has yet been done.

There is further talk about the reported international rail agreement, and there seems to be little doubt that some form of agreement has been reached between the rail pool in this country on the one hand, and the British-German-Belgian combination on the other. Naturally, such an agreement can hardly be reduced to the form of a contract which will be published; and none of the parties to it is willing to give out precise information. The fact seems to be, however, that the United States makers will withdraw from competition for European and African orders, while foreign makers will put in no bids for business on the American continent. Whether the agreement covers business for China and Japan is uncertain. There is a report also that the producers of bessemer rails in this country, who are not in the pool—the Lackawanna Steel Co. and the Republic Iron & Steel Co.—will not be bound by this agreement. The Tennessee Coal, Iron & Railway Co., which is making basic open-hearth steel rails at its Ensley plant, is also outside the pool; but this company's production for the current year is all contracted for, and it is not in a position to compete for any new business.

Lake Iron Ore Shipments.—Iron ore shipments by ports from the Lake Superior region are reported as follows for June and for the season up to June 30, in long tons:

	June	Season
Escanaba.....	781,280	1,737,372
Marquette.....	419,955	1,017,933
Ashland.....	549,493	1,122,251
Superior.....	730,435	1,634,403
Duluth.....	1,879,491	2,747,018
Two Harbors.....	1,138,796	2,173,724
Total.....	4,999,450	10,432,701

Last year there were no shipments before June, and the total for that month was only 1,708,577 tons. The increase this season is 8,724,124 tons.

Birmingham. July 10.

The Southern pig-iron market is still dull, though recent happenings give much encouragement as to the future. A number of small sales are being made, and immediate delivery is requested. There is a steady inquiry for iron. Quotations are still weak. Rumors prevail that less than \$11.25 has been offered for No. 2 foundry, and the business was accepted. It is esti-

mated that not more than 100,000 tons of iron have accumulated in this district this summer. The Sloss-Sheffield Steel & Iron Co. has the largest amount of iron on hand, but inquiry in the general offices of that company elicits the information that there is no alarm felt at the accumulation. The officials appear to be sanguine that the market will shortly improve.

The Tennessee Coal, Iron & Railroad Co. has started up No. 1 and 2 furnaces at Bessemer, after an idleness of eleven months. The company now has five furnaces at Bessemer in operation, with five furnaces at Ensley manufacturing basic iron. Hungarians are being placed in the work around the furnaces, doing the work heretofore done by the negroes.

It is not believed that the quotations will go below \$11 base. More than one company in this district declines to book any big business at the low price.

The following quotations are given: No. 1, foundry, \$11.50@12; No. 2 foundry, \$11@11.50; No. 3 foundry, \$10.75@11; No. 4 foundry, \$10.50@10.75; gray forge, \$10@10.50; No. 1 soft, \$11.50@12; No. 2 soft, \$11@11.50.

The rolling mills in operation are doing nicely, considering the hot weather. A report is current that orders on hand will keep the mills which have been in operation for the past few months busy for quite a while. The employees of the Republic Iron & Steel Co.'s mills at Gate City expect more work this summer than last year. There is not much finished iron being stored. This company has three blast-furnaces in operation.

The Tennessee Coal, Iron & Railroad Co. continues to break records at ore mines, the improvements introduced by President Bacon now making a good showing.

Chicago. July 10.

To all appearances the turning point in the market for iron may be near at hand, despite the fact that summer dullness is in order for two months. Buying has improved, and lots are becoming heavier. For finished products the market has been active. Agents for furnace products see a hopeful tone in the market, that is based upon a feeling that the bottom has been reached, and the tendency is upward again, or will soon be upward.

There is no lowering of prices, at any rate; rather, the tendency is toward stiffening. Southern is selling at \$11.50 for most sales; occasionally, \$11.25 may have been named and accepted, but this was on large contracts, and most contracts are still for small lots, though the average size is increasing. The price of \$11.50 Birmingham means \$15.15 Chicago.

Northern iron is growing stronger, and there is no cutting of the \$16 minimum that has prevailed for several weeks. The representatives of Northern furnaces profess unshaken confidence that the market will not go lower, so far as their

product is concerned, and very probably will go higher. Everybody is counting upon a strong business as soon as the upward tendency begins, midsummer or no midsummer. The foundries need the iron, and they will buy freely, once they start, the prophets of repute say.

Coke is dull, the demand being light for all grades; Connellsville 72-hour brings about \$5.15 per ton here.

Cleveland. July 11.

Iron Ore.—The movement is still heavy, with some talk of new buying orders, but they have not appeared so far and seem to be held up for the time being. The prices have not changed from \$3.75 for bessemer Old Range; \$3.50 for bessemer Mesabi; \$3.25 for non-bessemer Old Range, and \$3 for non-bessemer Mesabi. The lake rates have not changed, being based on 75c. from the head of the lakes to Ohio ports.

Pig Iron.—The smaller foundry producers are getting hungry for business and are beginning to look for orders which they are willing to accept at \$14 in the Valleys for No. 2. The general market quotation is \$14.50, with one or two of the producers holding for higher figures, which they are not getting. The buying is extremely light. The strong tone continues to the bessemer, basic and malleable trades, especially the latter. The prices hold about as they have been at between \$14.50 and \$14.75. The buying movement of large proportions, however, is still in the future in both the foundry and the basic trades.

Finished Material.—The market has been strong, with some grades so scarce, especially structural, plates and bars, that there has been talk of a general advance of \$2 a ton. This has not been agreed to by the larger interests. In the meantime there is a struggle on the part of consumers to get their material, with increasing indications that the ship-builders and some local contractors may possibly have to wait for needed material until after the first of the year unless they pay premium prices. The agricultural implement works are beginning to inquire for their year's supply of iron and a good buying movement in that quarter may be expected. The price holds at 1.50c. Pittsburgh for both bessemer and open-hearth bars. Sheets are fairly active, although not buoyant, and billets are strong at a premium, the forging quality being most in demand.

New York. July 12.

Pig Iron.—The market has been dull, but there has been more inquiry, chiefly for small lots for near deliveries. Large buyers are still holding back. Prices are nominally unchanged, but sales are nearer the lower than the higher range, for the most part. Southern iron has been inclined to weakness, and there are reports

of sales on a basis under \$11, Birmingham, for No. 2 foundry. Representatives of the large companies, however, say that nothing has been done under \$11.25.

For Northern iron in large lots we quote: No. 1X foundry, \$16.50@17; No. 2X, \$16@16.50; No. 2 plain, \$15.75@16; gray forge, \$14.25@14.75. Virginia foundry is held at \$17.15, but the price is altogether nominal. Southern iron has been selling on basis of \$11.25@11.50 Birmingham, for No. 2 foundry. For large lots on dock here we quote: No. 1 foundry, \$15.75@16.25; No. 2, \$15.25@15.75; No. 3, \$14.75@15.25; No. 4, \$14.50@14.75; No. 1 soft, \$15.75@16.25; No. 2 soft, \$15.25@15.75; gray forge, \$14.25@14.50.

Sales of warrants on the Produce Exchange have been almost too light to note. Latest sales have been about \$13.80 bid, \$14 asked for August, regular warrants; \$14.25 bid, \$14.75 asked, August, foundry warrants.

Bars.—Bar iron is selling in a small way only. Quotations are nominally the same, 1.595@1.645c., large lots on dock. Steel bars are 1.645c. Store trade is fair, with quotations 1.75@2c. delivered. The Bar Iron Association has decided to make no change in base prices.

Structural Material.—Considerable business is going, and many small orders are coming to jobbers. There is no quotable change. Beams under 15-in. are 1.745c. for large lots; over 15-in., 1.845c.; angles and channels, 1.745c., tidewater delivery.

Plates.—Plates are still in demand, but generally in small lots. Tank plates are 1.745@1.795c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.645c. up, according to width.

Steel Rails.—No change in standard sections. Several orders for trolley rails are noted. Light rails are quiet, prices ranging from \$20.50 for 35-lb., up to \$24.50 for 12-lb rails.

Old Material.—The market is a little more active, but prices are weak, under large offerings. No. 1 railroad wrought can be had for \$15.50@16; No. 1 yard wrought, \$14@14.50; machinery cast, \$13@13.50. There is some demand for heavy steel melting scrap, and sales are made at \$13.50@14. These prices are on cars, Jersey City, or other terminal delivery.

Philadelphia. July 11.

After a lull of two or three weeks in the pig-iron market, symptoms are once more presenting themselves which lead our brokers and makers to think that a revival of demand is in sight. The lethargy which was anticipated promises to be of very short duration. The inquiries which have arrived during the past week are from large buyers who have suddenly appeared in the market, showing a disposition to buy still more for late autumn delivery. This is some-

thing of a surprise to our people, but the explanation of it is that the large foundries and consuming interests have secured a lot of work and they are making provision for it. As a result of this a number of contracts have already been placed, not very large in each case, but sufficient to create confidence in a growth of demand during the summer. The tone of the foundry iron market has improved within the past week; several lots of Southern foundry have been contracted for. Some of our brokers are inclined to doubt the present improvement, and incline to the belief that it will disappear as soon as a dozen or two consumers of iron have bought supplies. Quotations remain just where they were a week ago and there is not any modification of quotations probable as producing capacity is too well sold up.

Steel Billets.—Very heavy deliveries were made during June on steel billets, and although consumption is even greater than it was earlier in the season, the efforts of the billet manufacturers have been such that the strain has been overcome and billets can now be delivered promptly. The result is that billets are at least \$1 per ton below the premium quotation.

Merchant Bar.—A number of our mills have been making very little iron since the first of July, owing to repairs in progress. The bar-iron people report no material change in the situation; the car-builders are not very urgent just at present. Steel bars are selling from stores in a satisfactory way.

Sheets.—The sheet market is quiet; orders at mill being few and far between, though the mill people say that this is natural and indicates nothing. The distribution from stores at present is rather light.

Merchant Steel.—The merchant-steel market is quiet, but the consumption is as heavy as usual and the supplies on hand are sufficient for the present.

Pipes and Tubes.—The pipe market is quiet, though the industry itself is in a most prosperous condition. The distribution of tubes continues as it has been for months past, and all kinds of work calling for tubes are urgent.

Plates.—Deliveries of plate are now made more promptly and arrivals for summer construction are being reported almost every day. Only a moderate amount of new work has gone to the mills this week, but our plate-iron people give the same confident talk regarding the prospects for the industry for the rest of the year.

Structural Material.—The American Bridge Co. continues to place large orders for material; the orders for the past week having reached a little above the usual average. Bridge material is badly wanted; steel plates are active and all matter going through structural mills is wanted

as fast as it can be had. A great deal of work is being rushed through on Middle States and New England railroads.

Steel Rails.—A good week's business has been done in steel rails; orders aggregating some 30,000 tons in all, divided between Eastern and Western roads. Rails for trolley-line work are being inquired for.

Scrap.—Several of our Eastern railroads are now offering accumulations of scrap, and these are already being picked up, the aggregate offerings being reported as high as 25,000 tons in the East. These supplies have been anticipated and the effect on the market as well. The material will change hands rapidly, for choice railroad scrap is badly wanted.

Pittsburg. July 11.

While there has been no buying of any consequence in the iron and steel markets during the week, the general sentiment shows an improvement. The repairs to idle plants are being made as rapidly as possible, and it is expected that all the iron mills will be in full operation before the end of the week. Some of the plants in the Pittsburg district were closed but one week, and there was practically a general resumption here yesterday. It is reported from Youngstown that all the plants in that district will be running in a few days. The Republic Iron & Steel Co. will put its new bessemer steel plant with its rail mill in operation next Tuesday. So far the company has orders for more than 60,000 tons of steel rails. The markets are filled with inquiries for pig iron and different lines of finished steel products, and it now seems certain that the present dull period will give way within a month or six weeks to a very active season. The belief was expressed today by several leading men in the iron and steel business that next year will be a record-breaker. Despite the falling off in the demand for pig iron, the reduction in output has not been as great as was anticipated a few weeks ago. Stocks are being piled and offers of less than \$15 at furnace have been turned down by some producers, all which indicates that a strong market is not far away. The Carnegie Steel Co. is operating all of its furnaces in the Edgar Thomson, Carrie and Duquesne groups in this district, and last week the furnaces at Youngstown were started. The three furnaces at New Castle, which were banked, are scheduled to start this week and the steel plant at that place will be put in operation early next week. The plate and structural mills continue in full operation, and none in this district has closed for repairs, all orders being urgent. The plate mills are sold up to the end of the year and have actual specifications that will keep them running steadily for at least three months. Some mills are forced to decline new business. The structural plants are equally well situated and new orders are being

placed almost every day. Wire production is being restricted and prices are firmly maintained. The steel billet and sheet-bar markets are quiet and it is probable that for extended delivery the pool price of \$21 for billets and \$23 for sheet-bars could be done. For immediate shipment premiums of about \$1 are asked. Heavy specifications are being received for merchant steel bars and new contracts are being booked.

The American Sheet & Tin Plate Co., it was officially announced to-day, will have all of its mills in operation soon. A number on which repairs have been completed were started yesterday, when it developed that the wage settlement with the Amalgamated Association of Iron, Steel & Tin Workers was more unfavorable for the association than was admitted when an agreement was reached last week. The company did not sign the scales for some of its mills, which are now added to the non-union list. Last year 70% of the tin-plate mills of the leading producer were union and about 30% of the sheet mills were on the union list. How heavy the loss has been to the Amalgamated Association is not announced, but so far it is known that the two tin-plate plants at New Kensington and the sheet plants at Dresden and Canton, Ohio, will be operated on a non-union basis. The mills of the big company have been operated steadily since the first of the year, and extensive repairs are being made. As soon as they are completed there will be a general resumption, which indicates that the company has great confidence in the future of the sheet and tin-plate trade. It was announced yesterday by a newspaper here that the American Co. was about to close negotiations with the Standard Oil Co. for 2,000,000 boxes of rebate tin-plate. President John A. Topping promptly denied the report. It is admitted, however, that the company will greatly increase its rebate business, and that the Standard and other packing interests will be heavy buyers. The trouble over the sale of the tin-plate plant at Morgantown has been settled in the United States Circuit Court of Appeals in favor of George C. Sturgiss, and the real purchaser of the valuable property is known to be the American Sheet & Tin Plate Co. The property has been in litigation for nearly two years, and a few months ago it was sold at auction to John G. Frazer, who is connected with a large corporation law firm, for \$154,000. Sturgiss filed an upset bid of \$200,000, and when the property was put up for sale again Frazer bought it for \$220,000, but Sturgiss took an appeal and won. The site for the plant was donated and about \$250,000 was spent on it. There are six mills and foundations for four more, which will be built at once. The works will be put in full operation at an early date.

Pig Iron.—Sales were confined to a few small lots and prices seem to be a trifle

firmer this week. Quotations remain nominally as follows: Bessemer, \$14.50@ \$15, Valley furnaces; foundry No. 2, \$15.35@ \$15.85, Pittsburg; gray forge, \$14.85@ \$15, Pittsburg.

Steel.—Premiums on billets and sheet-bars for extended delivery have disappeared, but for immediate shipment about \$1 above the pool price of \$21 for bessemer and open-hearth billets and \$23 for sheet-bars is demanded. Merchant steel bars are firm at 1.50c. and plates at 1.60c.

Sheets.—The market is quiet and prices are a trifle weaker. It is possible to do 2.35c. for black and 3.40c. on galvanized sheets No. 28 gage.

Ferro-Manganese.—There is no change in the market and 80% domestic continues to be quoted at \$49@ \$50 per ton.

Cartagena, Spain. June 24.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that shipments for the week were one cargo, 5,400 tons magnetic ore, to Rotterdam. The consumption continues good, and production is large. Freight rates are a trifle harder, having advanced about 3d. per ton.

Quotations are a little higher: Ordinary 50% ore is 6s. 4d.@6s. 7d.; special low phosphorus, 6s. 10d.@7s. 6d.; specular ore, 58%, 9s. 6d.; S. P. Campanil, 9s. All prices are f. o. b. shipping port.

Pyrites.—Iron pyrites, 40% iron and 43% sulphur, are quoted at 10s. per ton. Shipments for the week were 220 tons iron pyrites to Marseilles.

Chemicals and Minerals.

NEW YORK, July 12.

(For other prices of chemicals and minerals, see large table on page 96.)

Trade conditions remain unchanged, with the market fairly active.

Copper Sulphate.—Price remains at \$4.80 for large lots, with slightly more for smaller quantities.

Acids.—The market continues strong.

Nitric acid, 36%, 100 lb.....	\$4.75
38%, 100 lb.....	5.25
40%, 100 lb.....	5.50
42%, 100 lb.....	5.75
Oxalic acid, com ¹ , 100 lb.....	\$5.00@ 5.25
Sulphuric acid, 50%, bulk, ton.....	13.50@14.50
60%, 100 lb. in carboys..	1.05
60%, bulk, ton.....	18.00@20.00
66%, 100 lb. in carboys..	1.20
66%, bulk, ton.....	21.00@23.00

Sulphur and Pyrite.—Prime sulphur is quoted in New York, Boston and Portland at \$20.50; in Philadelphia and Baltimore at \$20.75. Pyrite continues unchanged at 10@11c. per unit of sulphur for lump ore, with 25c. additional for breaking to furnace size; 9.5@10.5c. for fines f.o.b. Atlantic ports. Domestic pyrite sells at 11c. per unit for furnace size, and 10c. for fines, f.o.b. shipping point.

Messrs Ladenburg, Thalman & Co. report the arrivals of iron and copper pyrite in the United States, for the six months ending June 30, at 241,565 tons, from Europe and Newfoundland.

Nitrate of Soda.—Spot is quoted at \$2.41@ \$2.50 for 96%, and \$2.35 for 95 per cent.

Sulphate of Ammonia.—Gas liquor is quoted at \$3.10@ \$3.15 per 100 lb., with slightly less for large orders.

Phosphates.—Prices hold about the same, with a suggestion of strength, in anticipation of better foreign demand.

Phosphates.	F. o. b.	C. I. F. Gt. Britain or Europe.
*Fla., hard rock.....	\$7.25@7.50	\$10.67@11.85
land pebble.....	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%.....	4.35@4.40	10.27@10.67
78%.....	3.75@4.00	
75%.....	3.40@3.50	
68@72%.....	3.00@3.25	
‡So. Car. land rock.....	3.75@4.00	
river rock.....	3.50@3.75	6.33@ 6.61
Algerian, 63@70%.....		7.04@ 7.71
58@63%.....		6.15@ 6.60
Tunis (Gafsa).....		6.00@ 6.60
Christmas Isle.....		13.28@14.11
Ocean Isle.....		13.60@14.45
Somme, Fr.....		11.39

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Metal Market.

New York, July 12.

Gold and Silver Exports and Imports.

At all United States Ports in May and Year.

Metal.	May.		Year.	
	1904.	1905.	1904.	1905.
G ^{ld} Exp	\$43,069,053	\$ 481,570	\$66,926,849	\$35,809,708
Imp	10,472,582	2,656,803	42,877,493	14,460,062
Exc Silv.	E.\$32,596,471	I. \$2,175,233	E.\$24,949,356	E. 21,340,646
Exp	5,098,013	5,426,590	21,967,065	20,336,641
Imp	1,983,260	3,757,169	11,023,199	12,842,401
Exc	E. \$3,114,853	E. \$1,659,421	E. \$10,933,866	\$7,494,240

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending July 8, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$1,033,099	\$145,019	\$664,054	\$46,236
1905.....	37,912,098	635,085	16,658,324	1,902,933
1904.....	63,679,962	3,563,629	21,291,094	471,564
1903.....	23,943,989	3,538,821	9,917,481	1,167,488

Imports, both of gold and silver, were from Mexico and the West Indies. Exports of gold were chiefly to France; of silver to Great Britain.

An additional gold shipment was made last week, amounting to \$2,000,000; but no further gold exports are looked for at present.

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending July 8 gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discount....	\$1,078,294,800	\$1,116,458,500
Deposits.....	1,158,150,300	1,158,305,100
Circulation.....	39,168,400	48,859,900
Specie.....	243,093,900	210,971,300
Legal tenders.....	82,461,400	86,562,800
Total reserve.....	\$325,555,300	\$297,534,100
Legal requirements.....	289,537,575	289,875,275
Balance surplus.....	\$36,017,725	\$7,957,825

Changes for the week this year were

an increase of \$323,100 in circulation; decreases of \$4,410,500 in loans, \$3,772,800 in specie, \$1,861,700 in legal tenders, \$7,733,800 in deposits and \$3,701,050 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.
New York Associated.....	\$210,971,200	.....
England.....	192,308,915	.....
France.....	577,917,600	\$222,163,260
Germany.....	128,275,000	59,425,000
Spain.....	74,195,000	112,405,000
Netherlands.....	31,916,000	31,257,000
Belgium.....	15,763,335	7,881,665
Italy.....	111,400,000	18,290,000
Russia.....	527,480,000	32,000,000
Austria.....	234,240,000	65,365,000

The returns of the Associated Banks of New York are of date July 8 and the others July 6. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York.

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

	1904.	1905.	Changes.
India.....	£5,320,923	£3,544,741	D. £1,776,182
China.....	343,091	638,396	I. 295,305
Straits.....	58,103	2,800	D. 55,303
Totals.....	£5,722,117	£4,185,937	D. £1,536,180

Receipts for the week were £127,000 from New York and £19,000 from the West Indies; £146,000 in all. Exports were £83,070 to India and £95,214 to China; a total of £178,284, all bar silver.

Indian exchange has been steady, and the Council bills offered in London were all taken at an average of 16.03d. per rupee. Demand for silver for India continues moderate only, but there has been some buying in London on Chinese account.

The silver market has ruled firm, with advancing tendency on buying orders for account of the India mint.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars.....	\$0.45½	\$0.47½
Peruvian soles and Chilean pesos..	.42	.45
Victoria sovereigns.....	4.86	4.87½
Twenty francs.....	3.87	3.90
Spanish 25 pesetas.....	4.78	4.82

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver.		July.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
6	4.8690	58½	27	10	4.86½	58½	27½
7	4.86½	58½	27	11	4.86½	58½	27½
8	4.8690	58½	27½	12	4.86½	59½	27½

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine

Other Metals.

Daily Prices of Metals in New York.

July.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Tin, Cts. per lb.	Lead, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
6	14½ @15	14½ @14½	66	30½	4.50	5.30	5.15
7	14½ @15	14½ @14½	66	30½	4.50	5.30	5.15
8	14½ @15	14½ @14½	....	30½	4.50	5.30	5.15
10	14½ @15	14½ @14½	66½	31½	4.50	5.30	5.15
11	14½ @15	14½ @14½	66½	31½	4.50	5.30	5.15
12	14½ @15	14½ @14½	66½	31½	4.50	5.30	5.15

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. Cathodes are usually 0.25c. below the price of electrolytic copper.

Copper.—The market continues active and there is a good demand, both for home trade and for export. Manufacturers are busy and orders are coming in to them in good volume. Producers appear to be well sold, and it is reported that there is not much copper available for early delivery. Prices are about the same, being 14½@15c. for Lake; 14¾@14½c. for electrolytic in cakes, wirebars or ingots; 14½@14½c. for cathodes and 14¾@14½c. for casting copper.

The standard market has been fairly active, but has also shown little fluctuation, holding around £66 for spot and £66 2s. 6d. for three months; refined and manufactured sorts we quote: English tough, £69@£69 10s.; best selected, £71; strong sheets, £78 10s.; India sheets, £74 10s.; yellow metal, 6½ pence.

Exports of copper from Baltimore for the week were 1,190 long tons.

Reports from the Lake Superior region give the total production of copper at 18,281,980 lb. in June; and the total output of Lake copper for the six months ending June 30 at 109,008,560 lb. These statements are subject to revision.

This report shows, however, that production in the region has been large throughout the present year. The active working of older mines, with the larger output of the newer South Range mines, shows results in the production of 48,665 long tons of copper in the half-year.

Tin.—The London market experienced a sharp advance on Monday. It had closed on Friday at £140 12s. 6d. for spot and £139 7s. 6d. for three months, and on Monday it opened at £142 10s., and advanced on Tuesday further 5s. It closes at £142 15s. for spot and £141 5s. for three months.

The American market followed the London advance, tin selling from 30¾ up to 31¾.

Lead.—The market continues firm. The

prices are unchanged at 4.42½ St. Louis and 4.50c. New York.

The London market has advanced to £13 11s. 3d. for Spanish and £13 12s. 6d. for English lead, and it is reported that the available supply for early delivery is small.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is firm and fairly active. Missouri brands are selling at 4.50@4.57½c., East St. Louis, according to brand and delivery.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 24, that silver has been 14.25 reales per oz. Exchange has been 33.21 pesetas to £1. Local quotation for pig lead has been 70.75 reales per quintal, which, on current exchange, is equal to £11 18s. 6d. per long ton, f.o.b. Cartagena. Shipments for the week were 500 tons desilverized lead to Amsterdam, 228 tons argentiferous and 150 tons desilverized lead to Marseilles.

Spelter.—A fair business has been done in this article and at slightly higher prices, St. Louis being quoted at 5.15 and New York at 5.30 cents.

The London market has advanced to £24 2s. 6d. for ordinary and £24 7s. 6d. for specials.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is very sensitive, but demand is reasonably good. The latest sales have been on the basis of 5.17½c. East St. Louis.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 24, that local prices continue steady, the figures being nominally 75 fr. for blende, 35% zinc, and 55 fr. for calamine, 30% zinc. Local operators are not inclined to commit themselves by acceding to the demands of mine owners. Shipments for the week were 1,450 tons blende to Antwerp.

Antimony.—The market has again experienced an advance, prices now ruling about 12 to 13c., depending upon brands and delivery.

Nickel.—The large producers quote nickel at 40@47c. per lb., for lots of one ton or over, according to size and conditions of order. For small quantities as high as 60c. is named.

Platinum.—Quotations are firm at \$20.50 per oz. Gas-engine sparking points vary from 87c. for "A," to \$1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c.; and cones, \$1 per gram.

Quicksilver.—Quicksilver is again

stronger, chiefly on account of light offerings, \$41.50 per flask—75 lb.—being asked for large orders; while small quantities bring \$42. San Francisco prices are unchanged, \$39 being asked for domestic orders. Export business can be placed at \$37.50@38 per flask. The London price is steady at £7 7s. 6d. per flask, from both first hands and jobbers.

Cadmium.—Metallic cadmium, guaranteed 99.5%, in lots of 100 kg. or over, brings 7.10 marks per kg., net cash, f.o.b. Hamburg, in shipping packages. This is equal to 76.65c. per pound.

Thallium.—Thallium is quoted at 60@65 marks per kg.—equal to 64.8@70c. per lb.—at Breslau, Germany.

Manganese Alloys.—Prices for manganese alloys in Germany are given by Herr Paul Speier as below. The prices are for orders of not less than 500 kg., delivered in Bremen, and are as follows, per 100 kg.: Manganese copper, No. 1, guaranteed 30% manganese, 265 marks; No. 2, 28 to 30% manganese, for bronze, etc., 175 marks; No. 3, 25 to 20% manganese with 2 to 4% iron, 165 marks. Manganese tin, No. 1, free of iron and guaranteed 55% manganese, 365 marks; No. 2, 55% manganese, with some iron, 225 marks. Manganese nickel, No. 1, free of iron, 450 marks; No. 2, carrying some iron, 270 marks.

Manganese metal is quoted at 3.60 marks per kg.—38.8c. per lb.—delivered in Bremen.

Minor Metals.—For minor metals and their alloys, wholesale prices are f. o. b. works:

	Per lb.
Aluminum.	
No. 1, 99% ingots.....	33@37c.
No. 2, 99% ingots.....	31@34c.
Rolled Sheets.....	4c. up.
Aluminum-Bronze.....	20@23c.
Nickel-alum....	33@39c.
Bismuth.....	\$2.10
Chromium, pure (N. Y.).....	80c.
Copper, red oxide.....	50c.
Ferro-Molybdenum (50%).....	\$1.00
Ferro-Titanium (20@25% N. Y.)...	75c.
Ferro-Chrom. (74%).....	12½c.
Ferro-Tungsten (37%).....	45c.
Magnesium, pure (N. Y.).....	\$1.60
Manganese (98@99% N. Y.).....	75c.
Manganese Cu. (30@70% N. Y.)...	40c.
Molybdenum (98@99% N. Y.).....	\$2.75
Tantalic acid (N. Y.).....	50c.
Phosphorus, foreign.....	45c.
Phosphorus, American.....	70c.
Tungsten (best).....	\$1.25

Variations in prices depend chiefly upon the size and conditions of orders.

Missouri Ore Market.

JOPLIN, July 8.

The highest price paid for zinc ore was \$46 per ton, the same as last week, but several bins that sold then at \$45@45.50 were advanced to a level with the choicest ore in price. The assay basis price was \$1 stronger on nearly all grades, ranging from \$42 to \$44 per ton of 60%

zinc. The shipment was 1,000 tons less than last week, and the bulk of it was made from advance purchases. Buying was not begun this week until Thursday, and nearly all the loading was done the last three days of the week, the first half of the week being generally observed as a holiday, while a number of the larger mines were closed down all week in deference to the desire of their employees for a lay-off.

The high price of lead was unchanged at \$60.50 per ton, but 70% grades were advanced to \$60 by local smelters, the advance driving the St. Louis Smelting & Refining Co. from the market. The latter company has been paying premiums for choice grades of this ore for several weeks, but the several advances made have put the market above the figures of the company's buyer here.

Following are the shipments of zinc and lead from the various camps of the district for the week ending July 8:

	Zinc, lb.	Lead, lb.	Value.
Carterville-Webb City.	2,241,410	577,300	\$65,510
Joplin.....	2,257,520	188,630	55,325
Duenweg.....	560,970	203,930	30,240
Galena-Empire.....	845,970	73,400	19,890
Aurora.....	1,008,080	12,500	16,820
Oronogo.....	433,560	45,700	10,055
Alba.....	421,760	13,430	9,680
Badger.....	351,500	6,420	7,920
Neck City.....	320,950	.....	7,060
Carthage.....	192,510	.....	4,235
Granby.....	230,000	18,500	3,450
Prosperity.....	74,000	52,280	3,150
Baxter Springs.....	97,840	58,820	3,100
Central City.....	69,570	.....	1,460
Diamond.....	49,160	.....	1,030
Zincite.....	30,410	1,870	700
Totals.....	9,186,180	1,252,730	\$239,715
27 weeks.....	260,851,860	31,278,740	\$6,692,140

Zinc value, the week, \$202,205; 27 weeks, \$6,794,970.
Lead value, the week, 37,510; 27 weeks, \$897,220.

The average value of zinc ore for the week was \$44.02 per ton; for the year, \$44.50. The average value of lead ore was \$59.92; for the year, \$57.37 per ton.

Mining Stocks.

(See quotations on page 95.)

New York. July 12.

The stock market generally has been irregular and rather narrow. Dealings in mining stocks have been light. The industrials have shown little change. Amalgamated Copper closes around 82½; United States Steel at 34½, with the preferred at 102.

The outside market has amused itself with the statements and counter-statements about the Greene companies. The net result is shown in our news columns, and is simply the election of a new treasurer and several new directors, with the appointment of committees to report on the condition of the Greene Gold Co. The fluctuations of these stocks have furnished some occupation to the market, but have not been important.

United Copper has declared the first dividend—1% in all—on its common stock. This had very little effect on the price.

It is announced that the 25,000 shares of the treasury stock of the Tennessee Copper Co. offered at par, which is \$25, have been over-subscribed about 200%, and the books have been closed. The proceeds from the sale of the new stock will be used for betterments and improvements.

Boston. July 11.

The mining stock market has been somewhat mixed the last week. Some shares are on a higher level, while others show declines. United States has been conspicuous, having risen \$3.50 to \$32.50, while the rights have doubled in value by touching \$1 today. There seems to be an increasing demand for this stock and the new issue will undoubtedly be taken by the present large owners. As showing the company's broadening scope, it is learned that an option has been secured on a Mexican property, in which case a new smelter will be erected. Allouez has also been in excellent demand, rising almost \$1 to \$28.25. It yielded, on profit-taking, to \$26, recovering \$1. Centennial took a \$2.50 spurt to \$20.50 on buying, said to be for Lake account. The mine continues to show marked improvement in rock content, which accounts for the advance.

Greene Consolidated has been under considerable pressure, touching \$21.62½. It is felt here that an effort is being made to get control of the company, which accounts for the action of the stock. Parrot spurted \$1.50 to \$23.50 on comparatively light trading. The initial dividend of ½% and ½% extra on United Copper common has resulted in a \$2 advance in the price of the stock to \$25. Tecumseh has settled a fraction of a dollar to \$4, having discounted, in a measure, the fact that the Kearsarge lode has been proven. The company will now sink a pit to test its value. Osceola sold at from \$92 @ \$91.50 ex-dividend, and Tamarack at \$118 @ \$117 ex-dividend. There has been very little doing in Utah Consolidated, and the stock is off fractionally to \$43. Adventure is stronger, selling at \$4.75. Amalgamated touched \$84.25, but reacted \$2.

The Consolidated Mercur mine had \$70,000 cash on hand June 15, after paying the dividend, together with \$42,000 worth of mill supplies, according to President Dern. A year ago the company had but \$2,000 cash on hand.

On the curb Majestic has been selling around \$1.50 and Arizona Commercial has risen \$5 to \$20. Ahmeek sold at \$50 today and North Butte has varied from \$28.25 to \$29.50 per share.

Colorado Springs. July 7.

Trading in the majority of Cripple Creek stocks has been rather inactive during the past week, and the only exception has been El Paso, which has been active, but at lower prices. This stock reached the low mark of \$1.30 during the week, with heavy sales. It closed to-day at

\$1.31. There seems to be no good explanation for the sudden drop in this stock, unless it should have been knowledge of the directors' intentions of reducing the monthly dividend to 2c., which they did at a meeting to-day. It is claimed that the reason for this was the fact they had pledged \$100,000 toward the new drainage tunnel, together with other heavy expenses. It has been the enigma of the exchange.

Salt Lake City. July 8.

Owing to the Fourth of July the Salt Lake Stock & Mining Exchange held no sessions during two days of the present week. This, coupled with the indifference usually displayed in this market at the beginning of the heated season, was not conducive to lively trading. The market was dull and stocks, with very few exceptions, sought a lower level. This was particularly true of Tintics. There was very little call for the higher-priced stocks. Daly Judge, of Park City, stiffened, while New York Bonanza came down.

San Francisco. July 6.

There is very little to be said about the Comstocks this week, the San Francisco Stock Exchange having adjourned over the whole week, on account of the Fourth of July holiday. Business was done on the San Francisco & Tonopah Exchange, except on Tuesday. Matters were very quiet, however, and very little trading was recorded, quotations showing hardly any change. In oil shares practically nothing was done through the week.

Assessments.

Company.	Delinq.	Sale.	Am.
Apollo, Alaska.....	July 8	.....	.20
Beet & Belcher, Cal.....	July 7	July 28	.10
Caledonia Silver.....	July 7	July 28	.10
Centennial Copper, Mich.....	Aug. 10	.....	2.00
Exchequer, Nev.....	July 7	July 28	.05
Jenny Lind, Cal.....	July 17	.....	.02
Mohican, Cal.....	July 10	.....	.10
New Almaden, Mex.....	July 20	.....	.00½
Savage, Nev.....	July 11	Aug. 1	.10
Yellow Jacket.....	June 27	Aug. 1	.10

Dividends.

Company.	Payable.	Rate.	Amount.
†American Cement.....	July 20	\$0.30	\$60,000
Am. S. & R. pfd.....	July 1	1.75	875,000
" " com.....	" 15	1.25	625,000
Bunker Hill & Sullivan.....	July 5	.50	150,000
†Central C. & C., pfd.....	July 15	1.25	23,437
†Central C. & C., com.....	July 15	1.50	76,875
Creede United Mines Co.....	July 1	.06½	32,500
El Paso.....	.....	.03	75,000
Kendall Gold.....	July 22	.05	25,000
North Star Mines.....	July 15	.30	75,000
Osceola.....	July 25	2.00	192,300
Tamarack.....	July 29	2.00	120,000
†Tennessee C. & I. pfd.....	Aug. 1	2.00	4,960
†Tennessee C., I. & R., pfd.....	July 1	3.00	8,520
†Tennessee C., I. & R., com.....	Aug. 1	1.00	225,536
Tonopah.....	July 23	.25	250,000
Uncle Sam.....	June 24	.01	5,000
United Copper.....	July 31	1.00	450,000
United States.....	July 15	.75	360,000
†Utah Consolidated.....	July 15	2.00	600,000
†Virginia-Carolina.....	July 15	2.00	360,000

*Monthly. †Bi-monthly. ‡Quarterly. †Semi-Annually.

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January.....	57.005	60.690	26.423	27.930
February.....	57.592	61.023	26.665	28.047
March.....	56.741	58.046	26.164	26.794
April.....	54.202	56.600	24.974	26.108
May.....	55.430	57.832	25.578	26.664
June.....	55.673	58.428	25.644	26.910
July.....	58.095	.....	26.760	.....
August.....	57.806	.....	26.591	.....
September.....	57.120	.....	26.349	.....
October.....	57.923	.....	26.700	.....
November.....	58.453	.....	26.952	.....
December.....	60.563	.....	27.930	.....
Year.....	57.221	.....	26.399	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.		1904.	1905.
	1904.	1905.	1904.	1905.		
Jan.....	12.410	15.008	12.553	15.128	57.500	68.262
Feb.....	12.063	15.011	12.245	15.136	56.500	67.963
March.....	12.299	15.125	12.551	15.250	57.321	68.174
April.....	12.923	14.920	13.120	15.045	58.247	67.017
May.....	12.758	14.627	13.000	14.820	57.321	64.875
June.....	12.269	14.673	12.399	14.813	56.398	65.881
July.....	12.380	.....	12.505	.....	57.256	.....
Aug.....	12.343	.....	12.468	.....	56.952	.....
Sept.....	12.495	.....	12.620	.....	57.445	.....
Oct.....	12.993	.....	13.118	.....	60.012	.....
Nov.....	14.284	.....	14.456	.....	65.085	.....
Dec.....	14.661	.....	14.849	.....	66.384	.....
Year.....	12.823	.....	12.990	.....	58.587	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.		1905.	
	1904.	1905.	1904.	1905.
Jan.....	28.845	29.325	July.....	26.573
Feb.....	28.087	29.262	August.....	27.012
Mar.....	28.317	29.523	Sept.....	27.780
April.....	28.132	30.525	Oct.....	28.596
May.....	27.718	30.049	Nov.....	29.185
June.....	26.325	30.329	Dec.....	29.286
			Av., year.	27.986

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1904.		1905.	
	1904.	1905.	1904.	1905.
Jan.....	4.347	4.552	July.....	4.192
Feb.....	4.375	4.450	Aug.....	4.111
Mar.....	4.475	4.470	Sept.....	4.200
April.....	4.475	4.500	Oct.....	4.200
May.....	4.423	4.500	Nov.....	4.200
June.....	4.496	4.500	Dec.....	4.600
			Av., year.	4.309

Prices are in cents per pound.

SPELTER.

Month.	New York.		St. Louis.		L'nd'n
	1904.	1905.	1904.	1905.	
January.....	4.863	6.190	4.673	6.032	25.063
February.....	4.916	6.139	4.717	5.989	24.594
March.....	5.057	6.067	4.841	5.917	23.825
April.....	5.219	5.817	5.038	5.667	23.813
May.....	5.031	5.434	4.853	5.284	23.594
June.....	4.760	5.190	4.596	5.040	23.875
July.....	4.873	.....	4.723	.....	.....
August.....	4.866	.....	4.716	.....	.....
September.....	5.046	.....	4.896	.....	.....
October.....	5.181	.....	5.033	.....	.....
November.....	5.513	.....	5.363	.....	.....
December.....	5.872	.....	5.720	.....	.....
Year.....	5.100	.....	4.931	.....	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.

STOCK QUOTATIONS.

NEW YORK.

Week July 11.

Name of Company.	High	Low	Clg.	Sales	Name of Company.	High	Low	Clg.	Sales
Amalgamated.....	84	82	82½	245,550	La France Copper.....	19½	18½	.....	.....
Anaconda.....	108½	106	106½	5,250	Mitchell.....	7½	6	.....	10,500
Arizona Consolidated.....	30	29	29	2,350	Montreal & Boston.....	29	25	25	2,900
British Col. Copper.....	7½	6½	6½	2,350	Tennessee Copper.....	29	25	25	7,660
Federal Min. & Smelt.....	.....	.....	.....	.....	Union Copper.....	1	.....	.....	.....
Federal Preferred.....	96½	95	95	2,100	United Copper.....	25½	22	25	20,910
Greene Copper.....	23½	21	21	66,000	United Copper, Pref.....	72	70	71	2,670
Greene Gold.....	5½	5	5	71,110	White Knob Cop.....	1½	1½	1½	15,920
Isabella.....	.....	.....	.....	.....	White Knob, Pref.....	2½	1½	.....	1,300

Total Sales, 455,470.

BOSTON.

Week July 11.

Name of Company.	High	Low	Clg.	Sales	Name of Company.	High	Low	Clg.	Sales
Allouez.....	28	26½	26½	5,267	Mayflower.....	.85	.75	.75	.....
Amalgamated.....	84½	82	82½	16,735	Michigan.....	14	13½	13½	620
Atlantic.....	14½	13½	14	247	Mohawk.....	51	49	49	634
Bingham.....	29	28	28½	1,560	Old Dominion.....	24½	24½	24½	755
Bonanza.....	.60	.50	.55	.....	*Osceola.....	93½	90	90	347
Boston Consolidated.....	8½	8½	8½	2,350	Parrot.....	23½	22	22½	1,546
Calumet & Hecla.....	645	635	644	2	Phoenix.....	.75	.50	.60	.....
Centennial.....	20½	18	19½	2,915	Quincy.....	105	99	101	18
Mercur.....	.58	.52	.55	2,755	Shannon.....	7½	7½	7½	2,568
Copper Range.....	69½	69½	69½	2,643	*Tamarack.....	120	115	116	536
Daly-West.....	14	13	13½	225	Tecumseh.....	4½	4	.....	1,570
Elm River.....	2½	2½	2½	120	Tennessee.....	.....	.....	.....	.....
Franklin.....	10	9	9	587	United Copper, com.....	25½	22½	25	5,515
Granby.....	6½	6	6	2,425	*United States.....	32½	28½	32½	12,701
Green Con. Copper.....	22½	21½	21½	8,363	United States Coal & Oil.....	10½	10	10	375
Guanajuato.....	5	4½	4½	173	*Utah.....	42½	42½	42½	2,310
Isle Royale.....	21	19½	19½	2,085	Wolverine.....	111	109	110	265
Mass.....	8	7½	7½	420					

Total Sales, 78,632 shares.

* Ex-dividend. † 1st Installment Paid. ‡ Assessment Paid. § Ex. Rights.

LONDON.

June 30.

Company.	Buyers.		Sellers.		Company.	Buyers.		Sellers.					
	£	s. d.	£	s. d.		£	s. d.	£	s. d.				
American:					Indian:								
*Alaska Treadwell.....	5	6	3	5	8	9	Champion Reef.....	1	11	10½	1	13	1½
Anaconda.....	5	7	6	5	10	0	Mysore.....	6	17	6	7	0	0
Camp Bird.....	1	12	6	1	13	9	Nundydroog.....	1	11	10½	1	13	1½
El Oro.....	1	1	3	1	2	6	South African:						
Le Roi.....	0	15	0	0	17	6	Angelo.....	5	12	6	5	17	.....
Le Roi No. 2.....	0	13	9	0	16	3	British So. Africa.....	1	16	10½	1	18	1½
Montana.....	0	1	3	0	1	9	City & Suburban.....	5	5	0	5	10	0
Stratton's Ind.....	0	9	0	0	9	6	Consol. Gold-Fields.....	6	3	9	6	5	0
Tomboy.....	1	0	0	1	2	6	*Crown Reef.....	12	15	0	13	5	.....
Tyee.....	1	7	6	1	10	0	De Beers, preferred.....	17	8	9	17	11	3
Utah Con.....	8	15	0	9	0	0	De Beers, deferred.....	16	1	3	16	3	9
Ymir.....	0	1	3	0	3	9	East Rand.....	7	8	9	7	11	3
European:							Forreina.....	19	0	0	20	0	0
Linares.....	3	15	0	4	0	0	Goldenhuis.....	4	8	9	4	11	3
*Mason & Barry.....	2	17	6	3	2	6	Geduld.....	6	0	0	6	2	6
Rio Tinto.....	61	7	6	61	12	6	Henry Nourse.....	7	5	0	7	10	0
Rio Tinto, pf.....	6	2	6	6	7	6	Knights.....	4	5	0	4	10	0
*Tharsis.....	5	15	0	6	0	0	Langlaagte.....	3	1	3	3	3	9
West Australian:							Modderfontein.....	9	1	3	9	3	9
Associated.....	1	16	3	1	17	6	New Kleinfontein.....	1	18	9	2	1	3
Golden Horseshoe.....	6	13	9	6	16	3	New Primrose.....	2	10	0	2	12	6
Great Boulder.....	1	3	0	1	3	6	Premier, def.....	13	17	6	14	2	6
Gt. Bldr. Perseverance.....	0	11	3	0	11	9	Premier, pf.....	8	16	3	8	18	9
Great Fingall.....	6	17	6	7	0	0	Rand.....	9	0	0	9	2	6
Ivanhoe.....	7	11	3	7	13	9	Randfontein.....	2	8	1½	2	9	4½
Kalgurli.....	7	8	9	7	11	3	Robinson.....	8	17	6	9	2	6
Lake View.....	0	17	6	0	19	9	Robinson Deep.....	5	5	0	5	7	6
Oroya-Brownhill.....	3	1	3	3	2	6	Rose Deep.....	6	15	0	7	0	0
Miscellaneous:							Simmer & Jack.....	1	10	0	1	12	6
Broken Hill Prop.....	2	11	0	2	11	6	Village Main Reef.....	5	2	6	5	7	6
Mt. Lyell.....	2	16	6	3	17	6	Wemmer.....	5	15	0	6	5	0
Mt. Morgan.....	2	17	6	3	0	0							
Walh.....	5	15	0	5	17	6							

* Ex-dividend.

LONDON (By Cable*)

Company.	July 12.		Company.	July 12.			
	£	s. d.		£	s. d.		
Camp Bird.....	1	14	0	Esperanza.....	1	18	0
Consolidated Gold Fields.....	6	1	10½	Modderfontein.....	9	1	3
De Beers.....	16	12	6	Rand Mines.....	9	1	3
Dolores.....	1	9	0	Rio Tinto.....	63	7	6
East Rand.....	7	7	6	Simmer and Jack.....	1	11	10½
El Oro.....	1	1	0	Fomboy.....	1	2	6

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

ABRASIVES—		COPPERAS—Bulk.....100 lb.	\$0.47½	POTASSIUM—	
Bort as to size.....carat	\$10.00@18.00	In bbls....."	.52½	Bicarbonate crystal..... lb.	\$0.08½
Carborundum, f.o.b. Niagara Falls, powd..... lb.	.08	CRYOLITE lb.	.06½	Powdered or granulated.. "	.14
Grains....."	.10	EXPLOSIVES—		Bichromate, Am..... "	.08½@.084
Corundum, N. C....."	.07@.10	Blasting powder, A.....25-lb. keg	.65	Scotch..... "	.08½@.08½
Chester, Mass....."	.04½@.05	" Blasting powder, B....."	1.40	Bromide..... "	.15
Craigmont, Ont....."	.05½@.06½	" "Rackarock," A..... lb.	.25	Carbonate (80@85%)..... "	3.50@4.00
Mont. f.o.b. Chicago....."	.07@.07½	" "Rackarock," B..... "	.18	Caustic, ordinary..... "	.04½
Crushed Steel, f.o.b. Pittsburgh....."	.05½	Judson R.R. powder..... "	.10	Elect. (90%)..... "	.06½
Emery, in kegs: Turkish flour....."	.03½	Dynamite (20% nitro-glycerine)..... "	.13	Chlorate, powder d..... "	.08½@.084
Grains....."	.05@.05½	(30% nitro-glycerine)..... "	.14	Crystals..... "	.08½@.084
Naxos flour....."	.03½	(40% nitro-glycerine)..... "	.15	Cyanide (98@99%)..... "	.18@.19
Grains....."	.05@.05½	(50% nitro-glycerine)..... "	.16½	Kaimit (bulk).....lg. ton.	8.50
Chester flour....."	.03½	(60% nitro-glycerine)..... "	.18	Manure salt 20%..... "	14.75@15.75
Grains....."	.05@.05½	(75% nitro-glycerine)..... "	.21	Double Manure Salt, 48@53%.....100 lb.	1.16½@1.19½
Peekskill, f.o.b. Easton, Pa., flour....."	.01½	Glycerine for nitro..... "	.11@.11½	Muriate..... "	1.90@1.95
Grains, in kegs....."	.02½	FELDSPAR—Ground.....sh. ton.	9.75@10.00	Permanganate..... lb.	.09½@.09
Garnet, per quality, sh. ton	25.00@35.00	FLUORSPAR—		Prussiate, yellow..... "	.13½@.13
Pumice Stone, Am. Powd. lb.	.01 3-5@.02	Domestic f.o.b. shipping port:		Red..... "	.35
Italian, powdered....."	.01½@.01½	Lump.....sh. ton.	8.00@10.00	Sulphate.....100 lb.	2.18½@2.21½
Lump, per quality....."	.04	Ground....."	11.50@13.50	SALT—N. Y. com. fine 280 lb. bbl.	.72@1.18
Rotenstone, ground....."	.02½@.04½	Gravel....."	4.25@4.50	N. Y. agricultural.....sh. ton.	4.40
Lump, per quality....."	.06@.20	FULLER'S EARTH—Lump.....100 lb.	.80	SALTPETER—Crude.....100 lb.	4.00@4.25
Rouge, per quality....."	.10@.30	Powdered....."	.85	Refined....."	4.25@4.75
Steel Emery, f.o.b. Pittsburgh....."	.07	GRAPHITE—		SILICA—	
ACIDS—		Am. pulverized....."	45.00	Ground quartz, ord'ry.....sh. ton	9.00@10.00
Boracic, crystals....."	.10	Best flake....."	150.00	Best....."	12.00@13.00
Powdered....."	.10½	Ceylon, common pul....."	.02½@.03½	Lump Quartz....."	2.50@4.00
Carbonic, liquid gas....."	.12½	Best, pulverized....."	.04@.08	Glass sand....."	2.75
Hydrofluoric, 30%....."	.03	German, c-m. pulv....."	.01½@.01½	SILVER—Nitrate, crystals oz.	.36½
48%....."	.05	Best, pulverized....."	.01½@.02	SODIUM—	
60%....."	.11	Italian, pulverized....."	.01½	Bicarb., ord., bulk, f.o.b. works.....100 lb.	1.30
ALCOHOL—Grain.....gal.	2.38	GYPNUM—Ground.....sh. ton.	8.00@8.50	Extra domes, f.o.b. works..... "	3.50
Refined w.od, 95@97%....."	.70@.75	Fertilizer....."	7.00	Bichromate..... lb.	.06½
Purified....."	1.25@1.30	Rock.....lg. ton.	4.00	Bromide..... "	.20
ALUM—Lump.....100 lb.	1.75	English and French....."	14.00@16.00	Carbonated ash, high test, in bags, f.o.b. works.....100 lb.	.75@.77½
Ground....."	1.85	INFUSORIAL EARTH—		Foreign, f.o.b. N. Y..... "	.85@.87½
ALUMINIUM—Sulphate, com'l. "	75@1.25	Ground Am. best....."	20.00	Caustic, 60@78% f o b., works..... "	1.75@1.85
AMMONIUM—		French....."	37.50	Foreign, f.o.b. N. Y..... "	1.90@1.95
Bromide..... lb.	.22	German....."	40.00	Chlorate, com'l..... "	.08½@.084
Carbonate..... "	.08	LEAD—Acetate, white lb.	.09@.09½	Hyposulphite, Am..... "	1.60@1.60
Muriate grain..... "	.05½@.05½	Brown..... "	.07@.07½	German..... "	1.75@2.00
Lump..... "	.09½	Nitrate, com'l..... "	.06½	Phosphate..... lb.	1.02½@.02½
ARSENIC—White "	.02½@.03	" granular..... "	.08½	Prussiate..... "	.09½@.09½
Red..... "	.06½@.06½	MAGNESITE—Greece.		Sal soda, f.o.b. works.....100 lb.	.60
ASPHALTUM—		Crude (95%).....lg. ton.	6.50@7.00	Foreign, f.o.b. N. Y..... "	.85
Barbadoes..... "	.02½@.03	Calcined.....sh. ton.	16.50@17.00	Silicate, concentrated..... lb.	.05
Cuban..... "	.01½@.03½	Bricks, domes, per qual.		Com'l..... "	.01
Egyptian, crude..... "	.06@.07	f.o.b. Pittsburgh..... M.	160@200	Sulphate, com'l.....100 lb.	.65
Gilsonite, Utah ordinary..... "	.03@.03½	MAGNESIUM—		SULPHUR—Best seconds, per ton,	21.00
Trinidad..... "	35.00	Chloride, com'l..... lb.	.01½	Roll..... lb.	1.85
BARIUM—		Sulphate.....100 lb.	.50@1.25	Flour..... "	1.90
Carb. Lump, 80@90%.....sh. ton.	25.00@27.00	MANGANESE—		Flowers, sublimed..... "	2.20
92@98%....."	28.00@29.00	Crude powdered:		TALC—North Carolina.....sh. ton.	15.50@23.50
Powdered, 80@90%..... lb.	.01½@.02	70@75% binoxide..... lb.	.01½@.01½	N. Y. Fibrous best..... "	10.25
Chloride com'l.....100 lb.	1.35@1.50	75@85% binoxide..... "	.01½@.02	French, best..... "	20.00
Chem. pure cryst..... lb.	.05	85@90% binoxide..... "	.02½@.03	Italian, best..... "	30.00
Nitrite, powdered..... "	.05	90@95% binoxide..... "	.03½@.05	TAR—Oil bbl. (50 gal.) bbl.	5.40
Sulphate (Blanc Fixe)..... "	.02	Ore.....unit.	.18@.20	TIN—Crystals lb.	.22
BARYTES—		MARBLE—Flour.....sh. ton.	6.00@7.00	URANIUM—Oxide "	2.25@3.00
Am. Crude No. 1.....sh. ton.	9.75	MINERAL WOOL—		ZINC—Metallic ch. pure "	.07@.09½
Crude No. 2..... "	8.00	Slag, ordinary..... "	19.00	Chloride solution, com'l..... "	.02
Crude No. 3..... "	7.00	Selected..... "	25.00	Chloride, granular..... "	.04½@.04
Floated..... "	16.75@18.00	Rock, ordinary..... "	32.00	Dust..... "	.05½@.05
Foreign floated..... "	18.75@20.50	Selected..... "	40.00	Sulphate..... "	.02@.02
Snow-white..... "	17.25@18.75	OZOKERITE lb.	11½	The Rare Earths.	
BAUXITE—Ga. or Ala. Mines:		PAINTS AND COLORS—		BORON—Nitrate lb.	\$1.50
First grade.....lg. ton.	5.25@5.50	Litharge, Am. powdered..... "	.05½@.06½	CERIUM—Nitrate "	12.00
Second grade.....lg. ton.	4.50@4.75	English glassmakers..... "	.08½@.08½	DIDYMIUM—Nitrate "	45.00
Arkansas, first grade.....lg. "	5.00@5.50	Lithophone..... "	.03½@.06	ERBIUM—Nitrate "	67.50
Second grade.....lg. "	4.50@4.75	Metallic, brown.....sh. ton.	19.00	GLUCINIUM—Nitrate "	13.50
Washed ore..... "	6.00@7.00	Red..... "	16.00	LANTHANUM—Nitrate "	56.00
BONE ASH.....100 lb.	.02½@.02½	Ocher, Am. common..... "	8.50@9.00	LITHIUM—Carbonate "	1.50
BORAX "	.07½@.07½	Best..... "	16.00	LITHIUM—Nitrate oz.	.60
CADMIUM—Metallic "	1.40	Dutch, washed..... lb.	.02	STRONTIUM—Nitrate lb.	.07@.07½
CALCIUM—Acetate, gray "	2.30	French, washed..... "	.01½@.01½	THORIUM—Nit. 49@50% "	4.50
Acetate, brown..... "	1.55	Paris green, pure, bulk..... "	.12	URANIUM—Nitrate oz.	.25
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.....sh. ton.	65.00	Red lead, American..... "	.06½@.06½	ZIRCONIUM—Nitrate lb.	10.00
Chloride, f.o.b. works..... "	9.00@10.00	Foreign..... "	.07@.08½		
CEMENT—		Turpentine, spirits.....gal.	.64		
Portland, Am. 400 lb..... bbl.	.90@1.25	White lead, Am., dry..... lb.	.05½@.05½		
Foreign..... "	1.25@1.75	American, in oil..... "	.06½@.06		
" Rosendale," 300 lb..... "	.80	Foreign, in oil..... "	.09@.09		
Slag cement..... "	.75@1.25	Zinc white, Am. extra dry..... "	.04½@.04		
CHLORINE—Liquid "	.30	Foreign, red seal, dry..... "	.06@.08		
Water..... "	.10	Green seal, dry..... "	.06½@.09		
CHROME ORE—					
(50%) ex-ship N. Y.....lg. ton.	18.50@19.00				
Bricks, f.o.b. Pittsburgh, M..... "	175.00				
CLAY, CHINA—Am. common ex-dock, N. Y. "	7.75@8.00				
Am. best ex-dock, N. Y..... "	9.00@9.25				
English, common..... "	11.00@11.25				
Best..... "	16.75				

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.