

THE ENGINEERING AND MINING JOURNAL

A Large Blooming-Mill Engine.

BY C. R. KING.

The large rolling-mill engine which is shown at the Liège Exhibition in Belgium was designed by the Société Cockerill, of Seraing, near Liège, for working a blooming-mill and also for running four sets of girder-rolling cylinders. At present the largest rolling-mill engine at work at the Seraing steel works is of 1,800 h.p. The new engine, however, has an effective horsepower of 8,000 at 117 lb. initial pressure, and at 120 revolutions will indicate up to 10,000 h.p.; it is therefore the largest engine of its kind in Europe; for in the noted mills of Krupp's (Essen) there is nothing so large or modern, but at Schneider & Co.'s (at Creusot, France), there is one engine indicating 8,000 horsepower.

The engine is a triple-tandem compound, with the high-pressure cylinders in front. Steam distribution to each high-pressure cylinder is by one piston valve.

The low-pressure cylinder has two piston valves. Every valve has the same diameter and is perfectly interchangeable, the one with the other.

Both sets of cylinders and their valves are entirely surrounded by steam spaces, forming jackets.

In starting, steam is admitted to these jackets by means of a lever under the engine man's control. Steam is then admitted to the high-pressure cylinders by valves operated by small steam motors, and it then circulates around the cylinders, afterward entering at the high-pressure valve chest. It is thence exhausted into the low-pressure cylinders, the exhaust steam from which group passes around the latter cylinders direct to the air through two large conduits on each side of the middle cylinder.

To prevent large losses by condensation while not working, the low-pressure cylinders are cut off from the jackets by valves between the low-pressure valve chests and the low pressure cylinders. These valves close simultaneously with the main steam valve.

No separate steam reservoir is provided for the reception of the steam before its entry to the cylinders other than that constituted by the voluminous steam jackets of the high-pressure cylinders and the steam-pipes themselves, which take the form of cylindrical containers at the entry to the cylinders.

The connecting rods drive upon three cranks set at 120°, and motion from the crank shaft is transmitted to the valve-gear shaft by means of two sets of pinions.

The eccentrics on the valve-gear shaft actuate three reversing links of the Allan

(straight) pattern. This reversing gear is power-operated by steam-cylinder and oil cataract and is controlled from the high platform of the chief machinist.

The three link rods extend, on the right-hand side of each cylinder, to the rocking shafts, located on the trunk castings connecting the two pairs of cylinders. All three valves of each pair of tandem cylinders are operated from the one drive shaft.

The engine has no bed or foundation frame. The cylinders and the crank-shaft brackets are bolted, separately, direct to the foundation of concrete.

The I-section ribbed castings connecting the cylinders and crank-shaft brackets serve as the guidebars for the crossheads, the flanges of which latter bear upon the upper and lower machined faces of these stretchers.

The general dimensions are as follows: 3 high-pressure cylinders each 0.900 m. diam.; 3 low-pressure cylinders, each 1.350 m. diam. The stroke is 1.3 meters.

Galvanized Iron.

Detailed tests by I. Szirmay on a comparison of coating iron and steel goods by the hot *versus* the electrolytic method (*Zeit. f. Electrochem.*, Vol. II, page 335, 1905) prove the superiority of the electrolytic deposit, both as regards its adhesion when the metal is subjected to mechanical tests, and its resistance to atmospheric corrosion. Moreover, the amount of zinc required for protection is less in the electrolytic than in the hot process. The author ascribes this to contamination of the zinc, to the irregularity of the deposit, and to the enclosed salts (zinc and ammonium chlorides) in the hot process. However, even in the electrolytic process, it is advisable to use only such electrolytes as are unlikely to corrode the iron should they become entrained.

Effect of Dynamite Explosion.

L. Thomas, in *La Nature*, 1904, pp. 180-181, and *Proceedings of the Institute of Civil Engineers*, 1905, CLIX, pp. 53-54, states that experimental explosions of large charges of dynamite in the open air show that no dangerous and destructive effects are produced beyond a radius varying from 328 to 1,640 ft., according to the weight of the charge. In the experiments, the dynamite was enclosed in packing cases, each holding 55 lb. of the explosive, and charges of 55, 110, 551 and 2,204 lb. respectively were exploded. The direct destructive effects of the different charges were limited to distances of 57.4, 131.2, 180.4 and 410.1 ft. respectively. Beyond those limits were small neutral zones, and beyond the latter, zones in which the effects of the countershocks only were manifested. The results indicate that the distance within which the destructive action of the explosion is felt, increases in proportion to the square root of the weight of the charge.

Coke-Making From Lean Coal.

BY HENRI HENNEBUTTE.*

Ever since the seams of coking coals have begun to exhibit signs of exhaustion, and the growing depth of the pits has led to the extraction of coal insufficiently caking for the purpose of making metallurgical coke—attempts have been made to manufacture coke from semi-caking, or lean coal. This problem has been solved with commercial success.

When coal is coked in an oven its hydrocarbons are distilled. The vapor tension of the hydrocarbons is greater the higher the percentage of hydrogen they possess. The products which come off first are found (when a given hydrocarbon is subjected to fractional distillation) to be richer in hydrogen than the original substance. For, on rapidly heating a hydrocarbon, the high-hydrogen products escape first, the carbon gradually increasing until that alone is left.

The coking power of a coal is a function of the amount of hydrocarbons it contains. Thus it is possible to impart artificially a coking power to coals by allowing them to absorb suitable hydrocarbons. However, no coal whose coefficient of contraction does not at least equal that of its expansion is suitable for making coke; although, out of the samples investigated, only 16% failed in this respect.

Coke consists of a coherent mass of grains cemented together by a binder; if, when the temperature falls considerably, the mass does not possess a sufficient degree of contractility, irrespective of the quantity of cementing substance between each grain, the resulting coke will be friable and lack cohesion.

In manufacturing coke from non-caking coal, it is necessary to determine the temperature at which the driving off of its own volatile matter becomes completed. The volatile matter passing through the portions which have become coked, deposits its dissociated carbon. Thus, if an artificial addition of hydrocarbons be made, it is necessary that their temperature of distillation should correspond with that at which the evolution of the natural volatile matter of the coke finishes, otherwise wastage will occur.

The hydrocarbon to be added is simply a coal-tar oxidation product. The coal, and the hydrocarbon, in a finely pulverulent state, are mixed in a machine of special design, in the proportions of 97% of fine coal to 3% of cement.

The process has been in operation for several years and has proved a commercial success. By its means a dense, strong coke, possessing the required degree of porosity and resistance to crushing, and of great value for use in large blast-furnaces, has been regularly produced from coal containing 15% of volatile matter.

*Abstract of paper read before the Metallurgical Section of the Mining and Metallurgical Congress at Liège.

A Successful Fan Test.

BY J. T. BEARD.

Seldom has it been the lot of the writer to conduct a more successful test of a mine-ventilating fan than that of the large 28-ft. fan recently erected at the Henry colliery of the Lehigh Valley Coal Company, at Hancock, or North Wilkes-Barre, Pa., April 25, 1905. The fan was designed by the writer and built by the Allis-Chalmers Company, at its large shops at Scranton, Pa. Two fans were built for this colliery at the same time. One of these fans had been thrown into commission or connected with the mine at the time the test was made upon the second fan. As the mine was a gassy one, it was decided to confine the test to the second fan; this had not been connected with the mine circulation.

in. wide and 7 ft. 9 in. long, measured radially. The blades were further stiffened by the side casing, which consisted of two annular disks of No. 8 steel, flanged at the intake circle to meet the housing. The foundation was a heavy concrete masonry, built to the spiral curve of the housing and surmounted by an expanding chimney, whose two faces were tangent, respectively, to the outer fan circle and the spiral curve of the housing. The foundation reflected credit on the engineering department of the Lehigh Valley Company.

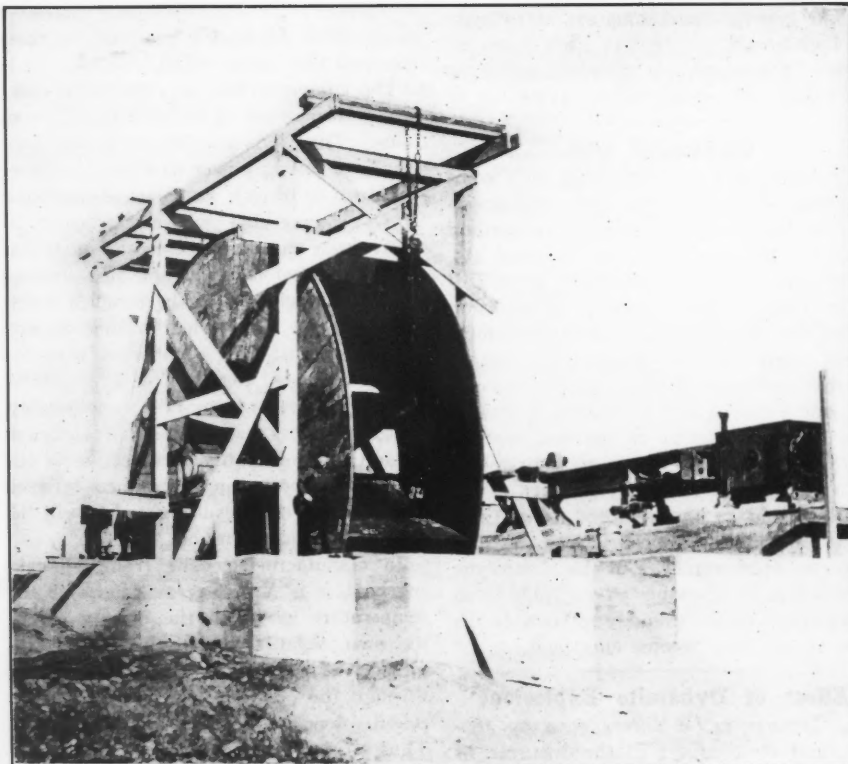
The fan was direct-connected to a fine type of girder-frame, Reynolds-Corliss single engine (22 by 48 in.) built by Allis-Chalmers Company.

The dimensions of the fan, taken before the test began, were as follows:

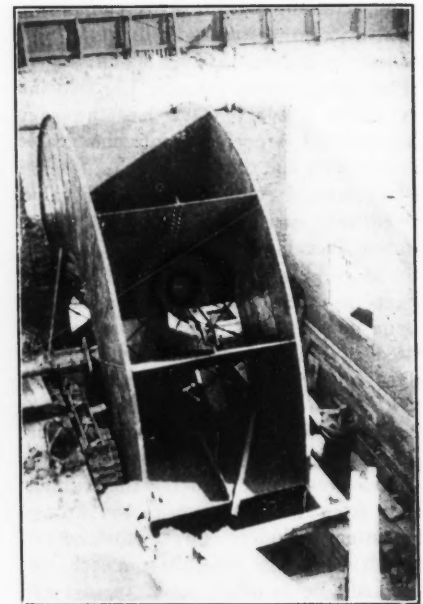
a fairly static condition in the fan drift, which hope was realized only in part, however, owing to the impossibility of making these brattices tight under the great pressure thrown upon them when the fan was running.

Two Biram anemometers were used in taking the readings in the fan drift; simultaneous readings were taken on each side of the fan. To obtain the water-gauge readings, two iron pipes were inserted through the side walls of the drift, the ends of the pipes reaching to about the center of the drift, each being provided with a thin sheet-iron plate, fitted flush with the end of the pipe to avoid the effect of the eddy of the air passing the pipe, thereby giving a more reliable reading. One of the gauges was the improved Davis pattern, which is a most convenient and reliable instrument; the other was the common form of mine gauge. These gauges were inserted tightly into the outer ends of the iron pipes.

The plan of the test was to take, simultaneously, anemometer and water-gauge



FAN IN PROCESS OF ERECTION.



FAN-WHEEL IN POSITION.

The general plan and construction of the fan is shown in the accompanying illustrations. The fan proper consisted of a central conical casting supporting 12 radial and carrying the 12 blades. The central casting, in the form of a double cone, was securely keyed to a 14-in. steel shaft, having 12- by 24-in. journals, bronze-seated and water-jacketed. The fan blades (which were radial for the outer two-thirds of their length) curved forward in the direction of motion, the inner third being sway-braced and tied forward by a system of light, strong rods. The blades were thus normal to the outer circumference of the fan, and approached a tangent to the inner circle bounding the intake openings on either side. The blades were of steel, 1/4 in. thick, 7 ft. 8

Outer diameter.....	28 ft. 0 in
Inner diameter.....	12 ft. 6 in
Length of blades, radially.....	7 ft. 9 in
Width of blades.....	7 ft. 8 in
Expansion of casing at cut-off.....	6 ft. 6 in.
Double intake area of fan—	
2.7854 by 12.52 =	245.4 sq. ft.
Fan drift—East side, area.....	120 sq. ft.
West side, area.....	121 sq. ft.
Total area.....	241 sq. ft.
Mine shaft, 12 by 12, area.....	144 sq. ft.

This fan was built for an exhaust fan; the center of the fan shaft was set back a distance of 31 ft. 3 in. from the face of the mine shaft, which was covered over with a pair of explosion doors. A strong brattice had been previously erected at the foot of the shaft to avoid any interference with the regular circulation of the mine. For the purposes of the test, another brattice was temporarily erected in the fan drift, and it was hoped, by this means and by closing the explosion doors, to obtain

readings and engine cards, together with the temperature and barometric pressure, and under these three conditions: (1) Fan drift closed; (2) fan drift wide open to atmosphere; (3) fan drift partly open, representing the normal working condition of the mine. In the first and

FIRST TEST.

Speed R. P. M.	W. G. inches.	Quantity, Cu. Ft.	H. P. on Air.	I. H. P.	Efficiency.	Barom. Inches.	Temp. Fahr.
19	.31						
23	.36						
25	.41	29,000	2.040	5.86	34.81	29.48	55
47	1.40						
50	1.58	60,000	16.267	29.02	56.06	29.48	55
55	1.71						
75	3.80	113,500	74.010	91.04	81.30	29.48	55
81	4.10						

third conditions, readings were to be taken for three different speeds of the fan, at 25, 50 and 75 rev. per minute.

The results obtained in the tests, respectively, are given herewith.

SECOND TEST.

Brattice in fan drift removed; explosion doors opened wide.

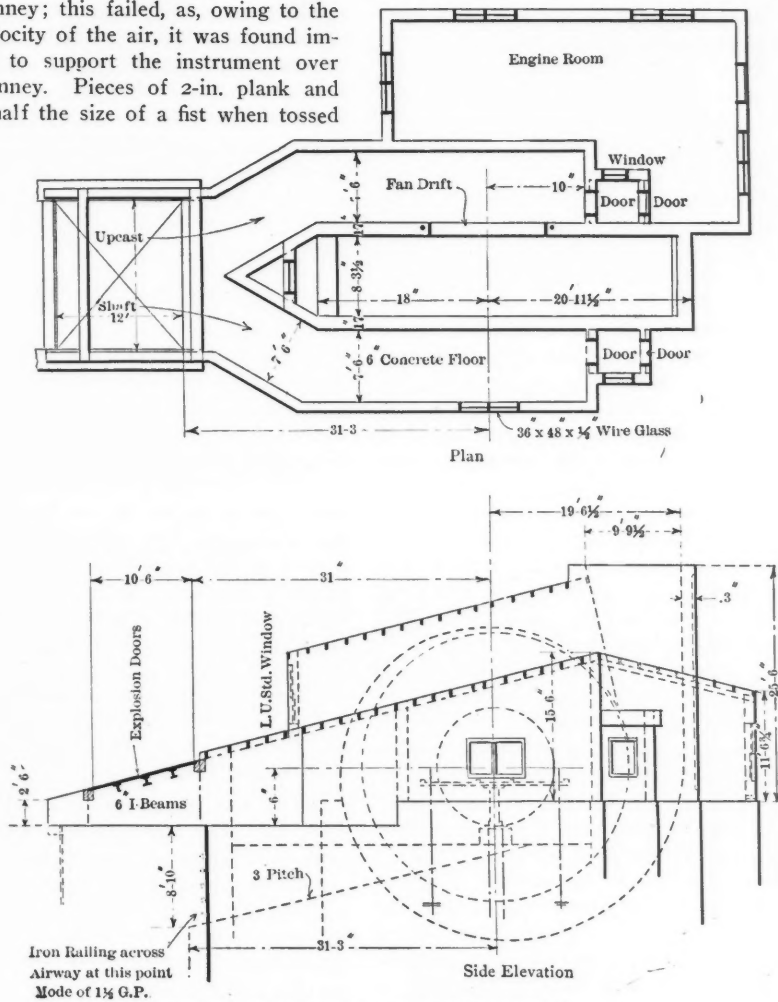
The engine was run at a uniform speed of 75 r.p.m. Such was the force of the air, however, that it was impossible to get into the fan drift to take any air measurements. The attempt was then made to take anemometer readings at the top of the chimney; this failed, as, owing to the high velocity of the air, it was found impossible to support the instrument over the chimney. Pieces of 2-in. plank and stones half the size of a fist when tossed

THIRD TEST.

Explosion doors arranged to give a 3-in. water gauge at 75 revolutions per minute.

Speed R. P. M.	W. G. Inches.	Quantity, Cu. Ft.	H. P. on Air.	I. H. P.	Efficiency.	Barom. Inches.	Temp. Fahr.
25	.4	150,000	9,454	15.45	61.19	29.36	48
50	1.2	292,000	55,214	93.72	58.90	29.36	48
75	3.0	476,000	225,020	317.80	70.80	29.37	50

The efficiencies given herewith are the the combined efficiencies of the fan and



GENERAL ARRANGEMENT IN FAN HOUSING.*

down the chimney were quickly thrown out by the force of the current, the pieces of plank being thrown 30 ft. upward into the atmosphere. The reading of the water gauge, taken only 20 ft. from the opening, was but a trifle less than 2 in. (1.9 in.). Engine cards were taken showing an i.h.p. of 361.5; and, assuming an efficiency of 60%, the estimated volume of air passing through the fan was 725,000 cu. ft. per minute.

Speed R. P. M.	W. G. Inches.	Quantity, Cu. Ft.	H. P. on Air.	I. H. P.	Efficiency.	Barom. Inches.	Temp. Fahr.
75	1.90	(725,000)	(216.9)	361.5	(60)	29.39	55

engine, which materially lowers the results at those speeds below the normal working speed (75 r.p.m.) because of the greatly increased frictional ratio in the engine, which gives better efficiencies at higher speeds. Assuming an efficiency of 90% at a speed of 75 r.p.m., the power delivered to the fan in the third test would be 317.8 by 0.90 = 286 h.p., making the efficiency of the fan alone, at this speed, 78.67%. It is interesting to note that the results obtained in these tests are 92.7% of those required by the formulas by which this fan was designed.

* In fan-housing plan, there should be another opening into the fan, and above the words "Concrete floor," similar to "Fan Drift" on the other side.

Chemical Industry of Poland.

According to a report of the British Foreign Office (*Annual Series*, No. 3,351), the chemical industry of Poland was not very successful in 1904. The production of sulphuric acid was regulated by agreement between the producers, who raised the price and lessened the production to about one-half the quantity they are capable of producing. This was very prejudicial to the other branches of the chemical industry, in which the price of sulphuric acid is of great consequence.

Pyrite, and common salt, are burdened with a relatively high import duty. Pyrite is not exploited in Russia, and has to be imported from Spain and Germany. Salt, being only found in Poland in small quantity at Ciechocinek, has either to be brought from the north of the Crimea, whence the transport is excessively expensive, or from Germany, in which case there is a duty of 50c. per 50 kg.

The new tariff is favorable to the production of white lead and zinc oxide, and for the preparation of mercury, which has heretofore been exported as a metal and re-imported in the form of its products.

A great drawback to the chemical industry in Russia is the system of patents (by which foreigners, especially Germans, hold patents for inventions in Russia) which prevents others from making use of this form of production, of which, however, the patentees themselves do not made use in Russia.

Slide-Rule Solutions of Kutter's Formula.

The old-time definition of a logarithm as "a means for the facilitation of extensive numerical calculations" is exemplified by the two 'Cox computers' just received by us.

The constant and increasing expansion of the slide-rule principle has in the first instance resulted in a mechanical solution of Kutter's formula, accomplished by setting a divided circle and, after the revolution of a sector pivoted about the same center, reading off the discharge or velocity; according to that calculation for which the computer has been directly set.

The high-pressure fluid-discharge computer, as the second of these two labor savers is called, has as much to commend it as the first. It has, however, the disadvantage of divisions in miles and cubic feet per hour, instead of thousands of feet and cubic feet per minute. Another point that might be bettered is the substitution of weights per cubic foot of the liquids used, instead of specific gravities, but on the whole the instrument may be said to be of distinct value, in fact, only a little less than that of the first computer.

Peroxide of hydrogen, hypodermically administered, at intervals of 2½ min., is an excellent antidote for cyanide poisoning.

Igneous Rocks in Ore Deposition.

BY A. LAKES.

We are in the habit of associating igneous rocks with ore deposition; in fact, we have held it almost as an axiom, "No igneous rock, no ore deposit." The association seems general and intimate, but there are exceptions and qualifications. All igneous rocks are not necessarily ore generators, nor does their presence appear absolutely necessary to all cases of ore deposition; they do not appear to be always the direct sources or originators of all orebodies. Examples can be cited where vein deposition clearly occurred long after the eruption, cooling and consolidation of certain igneous rocks, even long after the solfataric period. Although veins may be found at the direct contact of igneous with other rocks, yet this position may, at times, be purely mechanical; the line of parting at the contact of an igneous rock with a sedimentary one is a natural vacant zone for subsequent ore-bearing solutions to follow, just as they invade fault fissures and other natural openings and lines of weakness, irrespective of the character or origin of the rock. Again, some igneous rocks, by presenting a clean fracture or a soft permeable decomposition zone, are natural passage-ways for waters and permeating ore-solutions.

As regards the kinds of igneous rocks that have been the most prolific as ore generators, it is not always the massive eruptive of older date, such as the granite diorites, or so-called porphyry, but in many cases the intrusion of a more recent and basic rock of the lamprophyric or basaltic type. This was brought forcibly to my notice recently in a re-examination of the Minnie Moore mine, on Wood river, Idaho. In my first examination of this mine some years ago, it was provisionally surmised that the orebodies originated in enormous masses of granodiorite penetrating the limestone and shale of that region; that the ore probably came from elements of the diorite, and was distributed and deposited in corrugated fissures and crushed breccia-zones caused by the intrusive mass acting on the pliable strata; and that the ores were distributed by ascending mineral solutions and vapors at the time of (or immediately subsequent to) the diorite eruption. The theory seemed to be supported by bodies of ore close to the contact between the diorite and the adjacent limestone and altered shale.

Subsequent development, however, has shown that the more favorite locus for ore deposition is not so much at this point of contact, but in fissures some distance away and traversing the limestone. At numerous openings, the contact of the diorite with the shale or limestone was found to be "tight," undecomposed, impervious and barren. Still later and deeper developments and the re-

searches of Dr. W. Jenney and Messrs. Niven and Price during the last two years, have shown in the lower workings the occurrence of a dark fine-grained basic dike of lamprophyre type and determined by Professor Kemp to be camptonite. This almost invariably accompanies the Minnie vein in the lower workings; being more or less heavily replaced by rich silver-lead ore, with depth, it practically constitutes the vein itself. It had been noted previously that a black vitreous rock was a frequent accompaniment of the orebodies; this was supposed to be a black slate or an altered black limestone (such as are not uncommon in the district) until Dr. Jenney discovered undoubted basic dikes in the neighboring Relief ground, which led him to suspect their presence also in connection with the Minnie orebodies. The "black rock" was proven, by microscopic examination, to be a genuine igneous camptonite. This discovery modified the theory of the source and genesis of the ore from a direct connection with the older diorite eruption to this more recent one. In this case it would seem as if the adjacent eruptions of intrusive granite and diorite may have been the primary and principal cause of the mechanical folding and faulting of the strata, thus providing openings which were afterward followed by the more basic ore-bearing dikes, intrusions and ore solutions accompanying their eruption. There may also have been a general mineralizing of the region by the first great dioritic eruption of camptonite. This seems likely, because in other parts of the field (where the later intrusions are not known to exist) there is deposition of ore at or near the diorite contact (though not so far as is known, as large and rich as in the Minnie Moore ground or in the vicinity of the camptonite intrusions). This case seems analogous to some others.

In the Comstock, it was not the older massive prophyritic and dioritic eruptions that seem to have been responsible for the final ore deposit, but the more recent little "black basic dike" found accompanying the ore. In the San Juan region, in the vicinity of the American Nettie mine, near Ouray, according to Irving, it was the later intrusions of monzonite, rather than the older flows of andesite breccia that yielded ore.

At Cripple Creek, Colo., there was first the eruption of the great andesitic volcano. This, however, seems not to have been the principal ore bringer, but a later eruption of phonolite dikes and intrusions; and, most of all, a still later basic nepheline basalt of probably late-Tertiary age.

At Leadville, in the early stages of our knowledge of that camp, it was assumed that the silver-lead ore was found only at the direct contact of the "blue limestone" and the overlying "white porphyry." Later developments showed that the ore penetrates deeply into the under-

lying limestone and is not confined to this "contact" zone; but its presence at various lower horizons is rather dependent on later intrusions of other more recent porphyries.

At Aspen the orebodies are not generally in direct contact with, nor directly dependent on, the diorite or porphyry intrusions, but occur in fault-planes, intersecting the strata and porphyry masses alike; therefore, they are of later origin than any of the igneous agents, though probably these igneous rocks were the primary cause of the general mineralization of the district.

At Georgetown, Colo., miners formerly counted it important for an orebody to occur at "contact" with a porphyry dike, or to have a porphyry wall. J. E. Spurr has recently shown that this "important contact" is a mere mechanical accident; quite as many large ore-bearing veins occur in gneiss or granite, as in the so-called "porphyry contacts," and entirely remote from and irrespective of them. He further shows that vein formation by orebodies was subsequent to the felsite-porphyry eruption and intrusion (after the latter had cooled and consolidated) and was in no way directly connected with it. When rich orebodies in this vicinity are found in connection with igneous dikes, it is because the dike acted as a dam against which the ore deposited at the mechanical line of contact; just as masses of ore are sometimes dammed up against the walls of an impervious gouge-lined fault-fissure, or as the porphyry dike is favorable for a clean fracture which lets the ore solution through.

To miners and those examining mines, it may be worth while to be on the lookout for small basic dikes such as those cited in the Minnie Moore.

It has been suggested by A. W. Warwick that the rôle of the earlier and more massive igneous rocks was that of disturbing, fissuring and generally mineralizing the area; while any later intrusion was more in the nature of a rearrangement, concentrating and enriching the mineral matter already diffused. Mr. Warwick also cites a curious occurrence noted by him in the little Jessie mine in Arizona. There is a large mineralized dike of the "elvan" type, 8 to 14 ft. wide. On the contacts on both sides were orebodies. Near a more recent vogesite dike, cutting the elvan dike at a very acute angle and running into it for some distance, was a zone of enrichment; this was not only in the contact, but also in the mass of the elvan dike itself, and close to the vogesite intrusion. In this zone lenses of high-grade ore were encountered (from \$800 to \$1,200 per ton). This richness appeared due to the presence of the vogesite intrusion. (Vogesite is a lamprophyre of the syenite type, containing orthoclase and hornblende; camptonite is a dioritic type of lamprophyre, containing plagioclase and hornblende.)

The Copper Queen Smelter.

The reduction works of the Copper Queen Consolidated Mining Company at Douglas, Ariz., when additions are completed in the fall of 1905, will consist of a boiler plant with 4,000 h.p. of water-tube boilers; four No. 10 and five

The method of bedding the ore and shoveling it into cars that go to the furnaces is shown in the accompanying illustrations, which give a fair idea of the great size of the bedding trenches. This system, affording storage for a huge quantity of material, is shovelled directly into the furnaces. Three 60-ft

nace and converter building (which is 650 by 150 ft.) contains eight blast-furnaces and seven stands of converters of the trough type, with space for two more furnaces and two more converters. There is a relining plant at each end, with stands for relining and drying 30 shells. All the buildings are of steel frame, with brick walls.

Mining Industry of Poland.

According to British Foreign Office Report, No. 3351, Annual Series, attempts were made in 1904 to work the old lead and copper mines in the neighborhood of Kielce, which were exploited 100 years ago, with fair results; but the lead mine at Karczowka, which was reported to be extremely rich, only gave about 10 tons of galena for six months' work. Similar attempts to work the old copper mines at Chenciny were also made on a small scale. The ore is a carbonate, from which sulphate of copper is manufactured. This sulphate commands a better price than that prepared in the chemical factories, as it does not contain any iron salts.

In 1904 a company prospected successfully for lead in the Government of Kielce. The ore lies at a depth of about 160 ft., the deposit being 2 to 6 ft. thick. It is of high grade in lead.

The production of zinc is steadily increasing, having been in 1904 nearly 11,000 tons, which is 7% more than in 1903. Three works are employed in this industry.

Concrete, made of the "run-of-crusher" rock, without the addition of sand, has



STEAM SHOVEL LOADING CHARGING CARS.

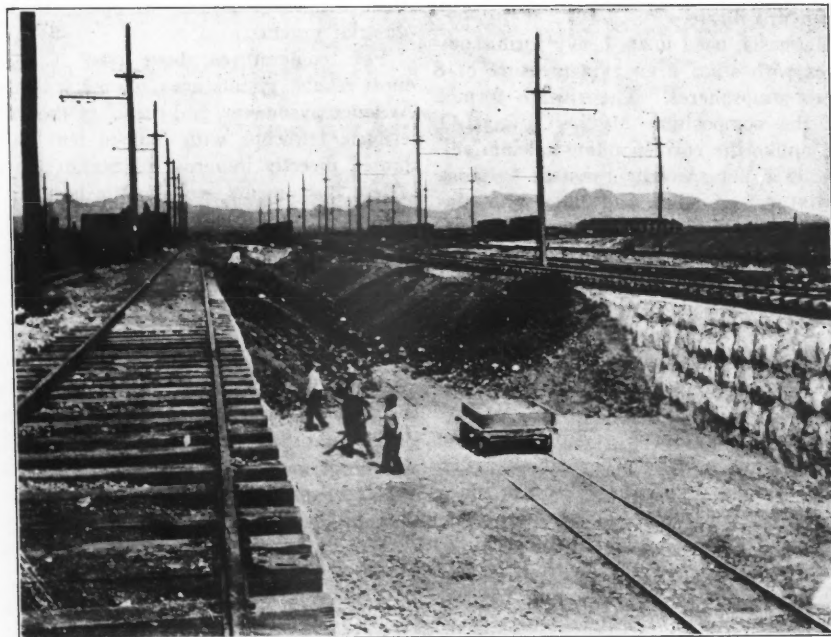
No. 9 rotary blowers, direct-connected to compound condensing engines; six cross-compound condensing blowing-engines with total displacement of 45,000 cu. ft. per minute; four 650-h.p. cross-compound condensing engines, direct-connected to 400-k.w. generators which deliver current at 250 volts to operate the trolley system and the various motors about the works.

The ore from the Copper Queen mines is received in side-dump steel cars, which discharge into stone-lined pits. This and other ores are bedded in layers and flux is added in proper amount to make the smelting mixture. This mixture is loaded by steam shovels into charge cars, trains of which are then run up an incline direct to the furnaces.

This method of bedding down the furnace charges is a radical innovation in metallurgical engineering, and is a result of the bold application of the mechanical principles applied in the handling of large quantities of material in other branches of the mining industry. The metallurgist familiar only with the making-up of beds under roof (which in comparison with these are of insignificant size), would predict that an even distribution of the charge components and the shoveling up of a uniform mixture would be a physical impossibility; but, after the inevitable modifications had been made at the Copper Queen works, and after the operation of the system had been perfected, it was found that there was no difficulty in making the furnaces run as they ought to yield slags of the calculated composition.

quantity of ore, is applicable only in works which have ample yard area. The layout at the Copper Queen makes it a plant of magnificent distances.

The cars which take the ore from the bedding trenches to the furnaces are of rolling side-dump type, and discharge di-



MIXING BEDS AND TRACK.

electric cranes of 60-ton capacity transfer the matte from furnaces to converters, and the converter shells from the relining floor to the converter stands. The fur-

been successfully used; when the particles, known as "dust," are sufficiently clean and sharp, the results are even better than when sand is used.

Lime-Sand Brick.

According to E. Tischler (*Oest. Chem. Zeit.*, 1905, VIII, 145-148), if lime is mixed in the hydrated condition with silica, the strength of the product is less than when the hydration of the lime takes place after the mixing. The higher the specific gravity of the silica used, the greater is the strength of the product, except when quartz is employed, that form of silica reacting less readily than other modifications. The strength of the brick increases with the fineness of the particles of the constituents, and the treatment after molding is also of importance.

The best results are obtained by heating the molded bricks for half an hour at 100° C., and then allowing them to rest until the lime is completely hydrated. The maximum strength is, in general, attained by heating under pressure for 6 to 8 hours. An increase of the pressure above 12 to 15 atmospheres has no noteworthy effect on the strength of the product. The brick obtained from a mixture, in which the proportions of lime and silica were as 1 to 3, had the greatest tensile strength.

At a pressure of 25 atmospheres it is not possible to effect the quantitative union of lime and silica, but by increasing the pressure to 200 atmospheres, and with a mixture of equal proportions of lime and silica, free silica could be detected in the product only in very small quantities, and free lime only up to 1 or 2%. The silicate formed in the process has the composition $\text{CaO} \cdot \text{SiO}_2 \cdot 2.34\text{H}_2\text{O}$, but the percentage of water in the product varies slightly. In thin plates each grain of silica appears surrounded by a darker, finely-granular portion which represents the hydrosilicate.

Magnesia, used in its heavy form, combines with silica even at a pressure of 8 to 10 atmospheres. The silicate formed has the composition $\text{MgO} \cdot \text{SiO}_2 \cdot 2.3\text{H}_2\text{O}$, but, unlike the corresponding calcium silicate, it is not specially resistant to frost.

Mixtures of silica and lime with alumina and aluminum hydroxide disintegrate, and only a very small percentage of silica is combined. Mixtures of lime, silica and ignited kaolin give better results, especially a mixture of 96 parts of kaolin, 80 of silica and 20 of lime.

H. Gerlings reports (*Jour. Chem. Met. and Min. Soc. of So. Africa*, 1905, V, 229-230) that the presence of iron pyrite in the sand has no effect beyond changing the color to a yellowish or reddish tone, and the brick requires a little more lime to give it the same resistance to crushing. Ferric oxide reacts very slowly, if at all, with silica, during the steaming of the bricks, and may be considered inert save for its coloring properties. Five lime-sand bricks were heated rapidly in a muffle to about 1,250° C., and taken out while warm. They kept their shape, were white and semi-vitreous, and had not shrunk at all.

Optical Pyrometry.

C. W. Waidner and G. K. Burgess, in United States Bureau of Standards, Bulletin No. 2, 1905, pp. 189-254, describe the various types of optical pyrometers, together with an investigation of their calibration, range, sources of error, and precision, including: (a) The Le Chatelier optical pyrometer; (b) Féry absorption pyrometer; (c) Mesuré & Nouel's pyrometric telescope; (d) Wanner pyrometer; (e) Holborn-Kurlbaum pyrometer; (f) Morse pyrometer, and (g) Féry thermo-electric telescope.

They point out that the Mesuré & Nouel pyrometric telescope cannot be considered an instrument of precision, although it is serviceable for the approximate control of temperatures above 800° C., and answers the requirements of many furnace operations sufficiently well. The other instruments examined are all capable of an accuracy of 1% in absolute temperature-measurements in the ranges for which they are adapted. For relative temperature measurements, the precision attainable is better than 1%, except perhaps in the case of the Féry absorption pyrometer, and may even be as good as 2° at 1500° C. with the Holborn-Kurlbaum instrument.

For the lowest temperature which can be measured optically (about 600° C.), the Le Chatelier, Holborn-Kurlbaum and Morse pyrometers and the Féry mirror telescope are available. The lower limit of the Wanner pyrometer and the Féry thermo-electric telescope is about 900° C. The upper limit is about 1100° C. in the case of the Morse instrument, and 1600° C. with the Féry thermo-electric telescope, but with the other instruments it is higher than the temperatures attainable in industrial practice.

For temperatures above 1500° C., the most reliable results are obtained with the Wanner pyrometer, and the Féry thermo-electric telescope with fluorite lens calibrated directly in terms of Stefan's law. These instruments are also the best with regard to ease of calibration and control; and the Féry telescope appears to be specially suitable for adaptation as a recording instrument.

According to a United States customs decision, June 7, 1905, bricks made of magnesia obtained from magnesite are dutiable at \$1.25 per ton as "fire brick weighing more than 10 lb. each, not glazed, enamelled, ornamented or decorated in any manner," under paragraph 87 of the tariff. The merchandise had been assessed for duty under the same paragraph at 25% *ad valorem* as "brick other than fire brick." The Government sought to establish that fire brick applied only to brick made of fire clay. This contention was not sustained by the board, which upheld the claim of the importer.

Wages in Idaho.

The wages paid in Idaho mines and the hours of labor are as follows: In the Cœur d'Alene the work-time is 10 hours day shift and nine hours night shift, and \$3.50 per shift is the minimum for all underground men, except in the mines at Wardner, where a good many shovelers receive only \$3 per shift. For any extra hazardous work, like wet shaft sinking, \$4 is paid. Timbermen are paid \$4 per day, usually an eight-hour shift. It is the general custom for the men to go in and out of the mines on the company time. The common rate of board is \$1 a day.

In the Owyhee county mines there are two local unions, one at Silver City and one at De Lamar. Eight-hour shifts are the rule, and the wages paid hand-tool miners, or single jackers, who constitute the bulk of the crews employed, is \$3 per shift; car men and muckers the same. A few machine men are employed in the Trade Dollar mine, and are paid \$3.50 a day; timbermen, \$3.50. The men go in and out on their own time and are expected to put in the full eight hours at the face. The common rate of board is \$1 a day.

At most other camps in Idaho, the miners are paid \$3.50 a day, except in shaft sinking, when the usual pay is \$4 per eight-hour shift.

Tin in Alaska.

At the May meeting of the New York section of the Society of Chemical Industry, Martin Schwiliter spoke briefly of the discovery of cassiterite on the Seward peninsula. This district is the home of earlier discoveries, the placer goldfields of Nome being on its southern shore; but the tin discovery is within 30 miles of Cape of Wales, which is the most westerly point of the peninsula, and some 160 miles northwest of Nome. The inland country is not well explored, but consists of mountains 2,000 or 3,000 ft. high, and rising abruptly from the sea and rather destitute of timber. The summers are moderate, but the winters are cold and stormy for several months; and while the climate is severe, yet it is not as bad as popularly supposed. Supplies are shut off from November to June. During the open season, steamers ply between Nome and Seattle, and between Nome and San Francisco. In 1901, W. C. Bartels (of the Bartels Tin Mining Co.) first found tin on Cape mountain. Since then numerous other strikes have been made, 10 to 30 miles away. The "granite" of the neighborhood seems to carry tin, sometimes in large crystals, and often intimately mixed with the rock.

The United States in 1904 produced 159 tons of concentrated tin ore, mainly in South Carolina. The product, carrying 40 to 70% Sn, was shipped to England.

Metallurgy of Vanadium.

The method of extracting vanadium and the preparation of vanadium alloys has been described by Herrenschildt (*Oest. Zeit.*, 1905, Vol. LIII, p. 201). Natural lead vanadate, containing 12 to 14% of vanadic acid, and about 50% of lead, is melted in a furnace with sodium carbonate and coke. The lead oxide is thereby reduced, and a slag containing sodium aluminate, vanadate and silicate is formed. This slag is melted separately, and oxidized to convert all the vanadium into vanadic acid, then run off into water and lixiviated several times. The solution is purified from silica by evaporating to a syrup, treating with sulphuric acid of 66° B., and passing through a filter-press. The resulting solution of sodium sulphate and vanadic acid is evaporated to expel the excess of sulphuric acid, and, after washing with water, furnishes a yield of 92 to 95% of the vanadic acid.

In order to prepare ferro-vanadium, this product is mixed with ferrous sulphate and sodium carbonate, and the precipitate thus obtained is dried and treated either in the electric furnace or with thermite. Copper- and nickel- vanadium may be prepared in a similar way.

Cement Floors.

For floors a mixture of 1 part portland cement, 3 parts clean, sharp sand and 5 parts of broken stone that will pass through a 2-inch ring is recommended. There should be a finishing coat 1/2 to 1 inch thick, according to amount of use of the floor, and this may be made of various proportions from 1 of cement and 1/2 of sand, to 1 of cement and 2 of sand, the mixtures with the larger amount of sand standing the wear of traffic best, and those richest in cement being most nearly impervious of water. Trowel finish usually makes a floor quite impervious. Expansion joints must be provided if there is likely to be considerable change in temperature of the floor, or steel mesh reinforcing may be used. Such a floor is not ready to use in less than a week after it is fully completed and longer time is desirable. It will set sufficiently to bear weights in less time but will not stand wear. Failure may occur even with the utmost care and the best materials. It is always advisable to keep the upper surface damp while the material is setting.

A Swiss electrical construction company has for eight years experimented with the coupling in parallel of a gas-engine driven generator to an alternator driven by a turbine. By means of three-phase current supplied by a group of generators with a gas-engine, the transmission of 200 h.p. was accomplished.

The Hancock jig, with sieve 3 by 20 ft., at the Wallaroo mines, Australia, treats ordinarily about 30 tons of ore per hour.

A New Centrifugal Elevator.*

BY W. PECK.

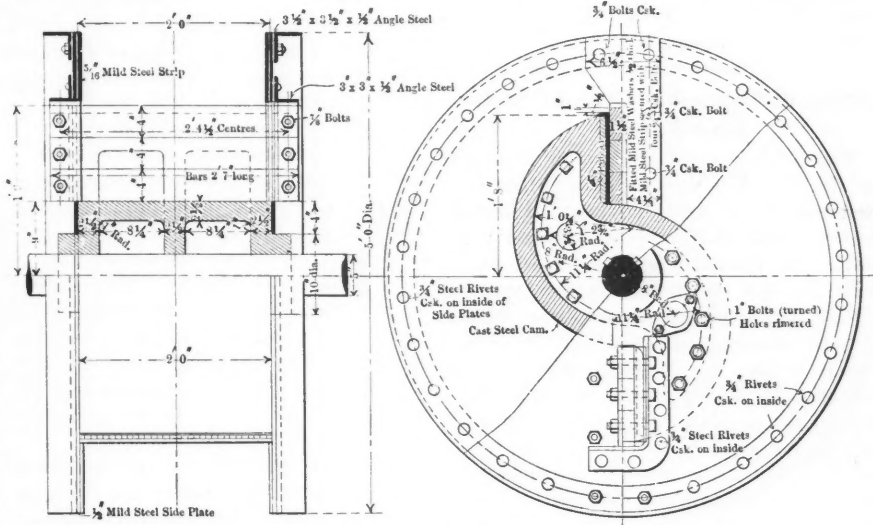
The centrifugal elevator (invented by me) is designed for conveying the tailing of a gold dredge to such distance that it will not impede dredging operations. It throws the tailing through the air to the required height and distance, only gravity and the resistance of the air having to be overcome.

The elevator consists of a cam-shaped steel casting with a disk of mild-steel plate on either side. These side plates project a few inches beyond the tips of the beaters, in order to prevent odd stones from straying in an undesired direction; they serve also to prevent extra large stones from reaching the beaters, for they slide off the rims into the water. The two beater surfaces are faced with renewable strips of hard, tough steel; the ends of these strips project through slots in the side disks, and are secured by bolts to angle steels riveted to the outside surface of the plates.

drag back over the surface. The position of the feed chute should be such that the delivery end overlaps, by about 2 in., the tip of the beater. When the latter is horizontal the chute should be set at an angle of about 50° from the horizontal. The resistance offered by the air to the revolving drum is slight, for the air between the disks is imprisoned, and revolves with the drum.

To arrive at the weight elevated per i. h. p. (neglecting friction and air resistance), divide 33,000 by the height in feet it is required to stack, and the result is the weight (in pounds) delivered per minute to the stack. If the tailing does not contain more than 30% of silt, the height to which the elevator will stack it can be ascertained by the laws of falling bodies, thus: Velocity in feet per second of beater tips ÷ 32 = time, in seconds, a body would have to fall to acquire the velocity. Then height of stack = 16 × (time in seconds)².

The above gives the height very ac-



ELEVATOR IN SECTION AND ELEVATION.

Care must be taken that the material to be projected is distributed as evenly as possible over the whole surface of the beaters, not only over the breadth, but also over the depth; for, if the stuff receives the blow from the metallic surface, it will be thrown more efficiently than if it is hit second-hand, as it were, through the stone and silt behind it. To attain this clean blow, it is requisite to consider the speed of the elevator, generally 240 r. p. m.; there being two beater surfaces, this means an interval of one-eighth of a second between each beater, so the tailing must fall on the elevator with a speed of a little less than the depth of the beater per eighth of a second. If this speed be exceeded, some of the stuff will strike the cam boss and not be projected. The beater surfaces are radial, less power being required than if they were not so; also the wear is less, as the stuff does not

curately when the major part of the material is stone; but with sand it is evident the result will not be so good, and it would not be safe to guarantee, with fine silt, more than one-half of that height. If an excessive quantity of water is allowed to fall (along with the sand and stone) on the elevator, it not only increases the power required (in the proportion its weight bears to the rest of the stuff), but it also forms in front of the machine a spray through which the sand cannot travel freely.

Regarding cost of upkeep, the average is about \$2.50 per week, being confined to the replacement of beater bars. The machine is frequently driven by a small separate engine; but it is more satisfactory to drive from the main engine of the dredge, as the latter is usually a compound engine and consequently more economical. When driving from the main engine (which, when the dredge is in stiff ground, is liable to draw up at

*Abstract of a paper in *Trans. Austral. Inst. Min. Eng.*, 1905, Vol. X.

times), a driving pulley, connected to the drum shaft after the style of a free wheel, should be used, in order to allow the elevator to revolve when these reductions in speed occur.

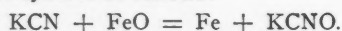
The advantages of the centrifugal as compared with the ladder elevator are: (1) Reduced first cost and upkeep, and longer life; (2) smaller pontoons, as the biggest centrifugal yet made weighed only 6 tons; this was for dredge with 7-ft. buckets, and elevated 60 ft.; (3) stoppages for elevator repairs entirely done away with, as new strips can be fitted during the stop for oiling round; (4) smaller driving power and consequent saving of fuel.

[In the discussion of this paper, F. Danvers Power stated that the centrifugal elevator had given great satisfaction, not only in its work, but also (being so much lighter than the bucket elevator) the cost of construction of the pontoon was less. Charles L. Garland said that Mr. Peck's invention marked a big departure in elevating and promised to overcome many difficulties; but he did not think it could elevate fines.]

Action of Potassium Cyanide in the Blast-Furnace.

The production of an inferior material in the puddling furnace even when the best pig iron is used, has been attributed to the action of nitrogen in the blast furnace. H. Braune (in *Oest. Zeit.*, 1905, LIII, p. 153) considers that it is mainly due to the formation of potassium cyanide and similar products which owe their origin to the use of basic charges, together with high pressure and temperature of the air blast. Iron and free nitrogen do not combine directly at any temperature, but if the nitrogen is combined, as in potassium cyanide, combination with the iron can take place very easily, the reaction being accelerated by rising temperature.

Iron oxide is also not attacked by free nitrogen, but it readily reacts with potassium cyanide as follows:



The potassium cyanate takes up oxygen, forming carbonate, which rises to the furnace mouth and is found in the flues and downcomers.

If bisilicate charges be used, and the iron be blown with the blast heated to 150 to 200° C., only traces of nitrogen are found in the resulting product.

To remove nitrogen from steel attempts have been made to use titanium-thermite.

Mica is used to a large extent in the production of "molded mica," a composition made up of small pieces of mica in combination with a shellac-like binder or matrix. The material is molded under hydraulic pressure and is largely used for electrical insulation. Above 125° F. it loses its characteristic form and disintegrates.

The Kedabeg Copper Mines.*

BY GUSTAV KÖLLER.

The mines of Kedabeg, with the smelting works of Kedabeg and Kalakent, are situated in the government of Elisabetpol, in the district of the same name, about 60 versts¹ southwest of the town of Elisabetpol and, and 42 versts south of Dalliar station, on the Trans-Caucasian railway.

The ore deposits consist of a series of lenses of pyrite (up to the present time 16 such deposits have been opened) which rest upon an acid eruptive rock, containing 60 to 80% silica. This eruptive forms a continuous mass of about one verst in length and half a verst in width at the surface, and consists of a highly metamorphosed rock with much secondary quartz, which latter mineral partly resembles a typical quartz-porphry, and partly a quartz-trachyte.

This ore-bearing mass is bounded on the east by diorites which are of considerable extent, and on the west by diabase-porphryite. The latter breaks through the ore-bearing rock in the form of numerous volcanic veins, and covers it in part, rising into a crest which forms the cone-shaped peak of the mountain. The whole of the southwestern slope of the mountain is composed of diabase-porphryite-tufa.

Another noteworthy occurrence is a basic pyroxene-garnet rock, composed of plagioclase, epidote and brown garnet, which under the name of "kedabegite" has lately been included in petrography by Prof. Fedorow, of Moscow. This authority considers that the pyroxene-garnet rock is the youngest formation of the group of rocks occurring here. It does not enter into direct combination with the ore, but always occurs in its immediate neighborhood.

The form and size of the orebodies differ considerably; under the hanging wall the orebody is generally flattened out, the upper surface being convex in form and rapidly thinning out as it goes to depth.

As a rule, the richer copper compounds are found concentrated under the hanging wall; toward the foot wall all the copper content diminishes, and at the partings generally disappears altogether.

The orebodies vary from 33 to 820 ft. in length, from 16.5 to 165 ft. in width, and from 6.5 to 165 ft. in thickness.

The transition from the orebody to the country rock is generally of gradual occurrence, and often the whole mass of ore consists of mineral penetrated by small veins of pyrite which are indistinguishable from the country rock. Distinct partings are lacking altogether.

The ore is a mixture of pyrite, or magnetic pyrite, with copper pyrite and covellite. The copper ore, especially the richer, occurs invariably in conjunction

with blende. Galena is rare and fahlore still more rare.

Of precious metals, the Kedabeg ores yield in the smelting processes 0.005 to 0.008%, of which 0.4 is gold. The ores less rich in copper are without exception poorer also in precious metals. Besides the copper pyrite and covellite, only the magnetic pyrite contains gold and silver, while the common pyrite shows scarcely a trace. Baryte is commonly associated with the ores, especially with the richer, being principally met with in the upper parts of the deposits. Gypsum is also found, though only in small quantity, and always near the bottom of the deposits. These ore deposits never run quite out to the surface, but lie at a depth of 40 to 140 feet.

The mines are worked by adits. For the winning of the ore three methods are employed. The first is the caving-in method, which is always used where the orebody is of considerable width, and when the roof consists of decomposed or fissured rock. In this method the orebody is divided into horizontal layers, 12 ft. in thickness, by driving levels. Each level is divided by drifts into rectangular pillars from which the ore is taken in vertical slices. In the first place, along the outer side of the pillar up to the end a stall is driven and timbered, after which, working homeward, the ore above the caps is removed. The space left vacant is filled by the caving-in of the dead rock above the ore.

It will of course be understood that the working must begin in the upper level and be carried downward, and that the extraction of the ore can only be begun in the next lower level when the top level is entirely worked out. This method involves the consumption of a large quantity of timber, which for the greater part is abandoned and lost.

The second method of working is the pillar and stall, with stowing. This system is employed for winning the ore where the roof consists of fairly solid rock. The third method is the pillar and stall without stowing, and this is only adopted in working small pockets with very solid hanging rock.

Nearly all the mining work is paid for on the tribute system, the miners earning 36 to 62c. per shift, and the trammers 26 to 32c. Electric drills, of the Siemens & Halske type, have lately been introduced.

According to E. Hubendick (*Oest. Zeit. f. Berg- u. Hüttenwesen*, 1905, LIII, 200) the proportion of dust in gas from blast-furnaces consuming coke is 2 to 4 grams per cu. m. in the case of hard ores, 4 to 6 grams with soft ore; but only 1.5 to 2.5 grams when charcoal is used. For use in gas-engines, the gas must be purified until only 0.1 to 1 gram of dust per cu. m. remains.

*Abstract of a paper read before the Institution of Mining and Metallurgy, April 13, 1905.

¹A verst is 0.6629 mile.

Copper Smelting at Kedabeg.*

BY GUSTAV KÖLLER.

Connected with the Kedabeg mines are two smelting works, of which the larger is at Kedabeg, 1.5 versts¹ from the mines. The smaller, known as the Kalakent works, is 12 versts from Kedabeg. For a long time the procuring of fuel was a matter of such extreme difficulty that the

tent of 87.1%, hydrogen 11.7%, and oxygen 1.2%. Its heating value is 10,700 calories.

In practice it may be assumed that 54 parts by weight of petroleum are equivalent in heating value to 100 parts of coal and to 250 parts of wood.

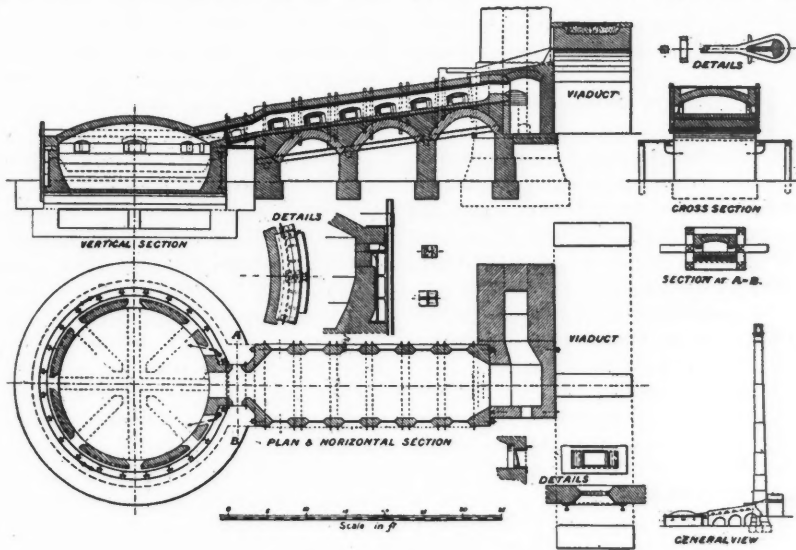
Notwithstanding its present high price, petroleum is still the cheapest and there-

wet method. The very lean ores, with only 2% Cu, are sold to the kerosene works at Baku for the manufacture of sulphuric acid.

The lump ore is roasted in kilns, which reduce the sulphur to 8 to 10%. Ore from 0.5 to 0.25 in. size is roasted in reverberatory furnaces. Ore of 0.25 in. size and under is roasted in Gerstenhöfer kilns, which reduce the sulphur to 6% without the use of extraneous fuel, or to 3% if fired with petroleum. With the Gerstenhöfer kiln two men in 24 h. roast 25,200 lb. of ore. About 1% of the ore is carried off as dust.

The ore between .25 in. and 0.5 in. size is too small for ordinary kiln roasting, and too large for the Gerstenhöfer kilns. It is therefore burned in reverberatory calciners, which are combined with the smelting furnaces, and fired by the waste gases from them. The arrangement is shown in the accompanying illustration. Each furnace can roast 21,600 lb. to 36,000 lb. in 24 hours, in charges of 7,200 lb. at a time, the furnace crew consisting of two men. Care is taken to avoid any sintering, to guard against which the raw ore is always mixed with 30% of ore that has previously been lightly roasted, the process in this way being regulated as required. The lump ores lose at least 10%, and the fine ores at least 15% of their weight by roasting.

Until 1886, the smelting was carried on at both works exclusively in shaft furnaces, using charcoal as fuel. Since the introduction of petroleum that method has been replaced by smelting in reverberatory furnaces, which is carried on at the Kedabeg works only. The works comprise six large reverberatory furnaces, which are constructed on the free-flaming



REVERBERATORY FURNACE.

very existence of Kedabeg seemed to be threatened. After the opening of the railway the exploiting of the forest domains was much facilitated, but the available supply of wood soon failed to meet the requirement of the works. When the Trans-Caucasian Railway was opened between Tiflis and Baku, petroleum became available. At the present time the annual consumption has risen to about 20,000 tons. The conveyance of this large quantity of petroleum over the steep and bad roads of the district presented serious difficulty, to overcome which Messrs. Siemens decided to construct a pipe-line (about 29 miles long) from Dalliar station on the Trans-Caucasian railway to Kedabeg.

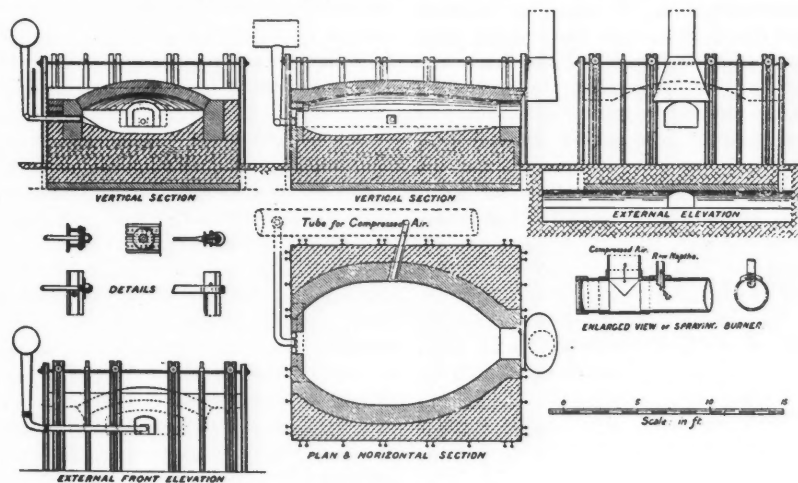
The price of the petroleum from Baku (Balachang) has risen, in recent years, from five kopecks to 17 kopecks per pood (36 lb.). The freight to Dalliar is 9.5 kopecks, and the cost of pumping thence to Kedabeg is 1.5 kopecks per pood, so that the total cost of one pood of petroleum delivered at the works at present amounts to 28 kopecks. Petroleum-residue (*mazout*) is sold for about one kopeck less, but on account of its viscosity can only be pumped up to Kedabeg during the summer, and even then this entails an additional pressure of six atmospheres.

The petroleum has a specific gravity of 0.882, and contains 87.4% carbon, 12.5% hydrogen, and 0.1% oxygen. Its heating value is 11,700 calories. The residue has a specific gravity of 0.928, with a carbon con-

junction with the massive copper pyrite. The pyritic ores, which form the chief bulk, are delivered to the works partly as lump ore and partly as fine, the proportion being 40% and 60% respectively. The ores with over 5% copper are reduced by smelting, and the poorer by the

fore the principal fuel used at Kedabeg. It is used for roasting and smelting the ores, for refining the copper, and for firing the steam boilers, the locomotives and forges; also for calcining of lime, the burning of bricks, etc.

The Kedabeg ores are variable in character, being either decidedly pyritic or very earthy, and are accompanied by barytes and blende in considerable quantity, the latter occurring especially in con-



REFINING FURNACE.

junction with the massive copper pyrite. The pyritic ores, which form the chief bulk, are delivered to the works partly as lump ore and partly as fine, the proportion being 40% and 60% respectively. The ores with over 5% copper are reduced by smelting, and the poorer by the

principle of Frederick Siemens. These are illustrated in the accompanying drawing.

The melting chamber was originally 6 m. in diam., but it was subsequently enlarged, first to 6.5 m., and recently to 7 m., the depth of the bath being 1 to 1.2

*Abstract of a paper read before the Institution of Mining and Metallurgy, April 13, 1905.
¹ A verst is 0.6629 mile.

m., and the height of the crown above the spring of the arch 0.8 m. The furnace is stayed by means of wrought-iron plates laid loosely round it, and cast-iron plates tied together, which latter carry the skew-backs of the arch. Both are supported by vertical buckstaves, firmly embedded in masonry at their lower ends, and tied at the top with hoops of steel or iron. The furnaces are no longer built in oval form, being now made circular. The former shape is better on starting a new furnace; but after cooling down several times, which is unavoidable in a campaign of over a year, the arch loses its stability, and the masonry is apt to give way at the points of change of radius, which, of course, cannot occur with circular arches.

The hearth is formed either of quartz in layers, or of quartz paste moistened with water. Afterward, the bottom can be covered with a layer of the highly ferruginous deposits from the molten metallic oxides. The quartz hearth is, in fact, very rapidly attacked by the basic material; but later on the operations are conducted on a natural basic hearth, which is absolutely reliable, and the hearth may be kept deep or shallow, according to the nature of the additions selected.

The slag line inside the furnace is protected by dead roasted matte, which has been finely screened. This forms a cheap and effective protective material and is preferable to quartz, of which large quantities would be continuously required.

The whole furnace plant is open to the weather, as the Asiatic workmen do not object to the exposure. In rainy weather, consequently, explosions of matte sometimes occur, but the fragments are never thrown to any great distance.

With regard to the construction of the furnaces, there is still one other point in which this differs from the original plan. The large skew-backs and the keystones, which are difficult to cut, are formed of bricks of ordinary pattern; and instead of using tie-rods connecting the vertical buckstaves for supporting the arch, a strong binding hoop encircles the buckstaves, so that, in the event of the crown burning through, repairs, or even the reconstruction of another arch on higher skewbacks will be rendered less difficult. The buckstaves also, when supported by the hoop, do not require to be so long, and are less likely to break on heating up the furnace after stoppages. When old steel rails are used, they should be annealed first in order to remove brittleness.

The furnaces are fired by introducing sprays of crude ungasified petroleum (under a pressure due to a head of about 30 ft), at either side of the waste-gas flue. The spray is injected in a direction approximately tangential to the furnace walls into the melting chamber, where it is immediately gasified. The two flames sweep around the circumference of the

furnace, meeting at the opposite side and returning across the middle in a straight line to the flue, where the waste gases escape into the roasting furnaces, and thence into the chimney.

At the point where they turn around in the furnace, the burning gases should be no longer under pressure, and this is arranged for by regulating the chimney draft. The most suitable height for the chimney has been found to be 30 to 32 m. In building the chimney, allowance must be made for carrying off the sulphurous acid gas given off in the attached roasting furnace.

For the charging of the smelting furnace, five doors are provided, and the roasting furnaces are fed from above. It has not been found practicable to arrange for the passage of the ore from the roasting furnace directly into the smelting furnace, on account of its tendency to sinter in the connecting flue, and the impossibility of moving it forward there.

The blende, together with the barytes, which is largely associated with the Kedabeg ores, has proved exceedingly troublesome. The zinc compounds separate with difficulty, being only partly taken up by the slag, and consequently collect to a considerable extent in the matte and introduce impurities into the metal. The zinc content clings to the product through all the subsequent processes and exercises a disturbing influence. Barytes tends to prolong the smelting process and hinders the separating of the slag on account of its high specific gravity.

The aim of the first smelting is the formation of a matte as rich as possible, but without too great a loss of copper by slagging. Experience at Kedabeg has shown that if the desulphurization of the ore is carried too far (to 5 or 6%), the reactions between the oxides and the metallic sulphides do not by any means take place with the desired regularity, but very often are accompanied by the separating out of objectionable compounds, very rich in iron, which adhere to the hearth and interrupt the smelting process. These can be neutralized either by increasing the temperature or by increasing the additions of quartz or other acid flux.

All of these remedies cause an increased consumption in fuel, on which account a too thorough roasting of the ore is to be avoided. It is not, however, always easy to control the degree to which roasting should be carried, and therefore the various qualities of ore are graded, in order to obtain the best possible conditions for smelting.

If in spite of this precaution, the troublesome deposits still form, raw sulphide very high in copper, or unroasted matte is added, but this is rarely necessary.

By this means, matte is obtained containing 25 to 30% copper, and slag with 0.4 to 0.8%. The last analysis of an average matte sample showed: 28.60% Cu; 36.69% Fe; 4.06% Zn; 0.85% Ni and Co;

0.10% Pb; 0.95% SiO₂; 0.11% Al₂O₃; 8.60% BaSO₄; 19.73% S; 0.05% As (Sn); 0.025% Ag; 0.0014% Au; total, 99.7664%.

The resulting slag is basic on account of the high proportion of iron in the ores. A recent analysis of the slag gave: 23.87% SiO₂; 50.52% FeO; 2.50% ZnO; 0.27% Al₂O₃; 0.78% MgO; 4.02% CaO; 16.15% BaSO₄; 0.58% Cu₂O; 0.10% As (Sn); 1.13 S; total, 99.92%. The zinc content often rises considerably, sometimes exceeding 5% ZnO. The ratio of SiO₂ and FeO varies with the quality of the ore, but on the whole the variations in these constituents are but slight.

For the spraying of the petroleum, widely differing types of apparatus are used. The kinds most usually employed are shown in the accompanying illustration. The method consists in the rapid gasifying of the oil, and in introducing it into the furnace under a fairly high pressure. It must on no account be permitted to enter in dribbles without pressure, as it is then carried out through the flue without any useful effect. The burner No. 1 has hitherto answered best for the ore-smelting, for which compressed air at a pressure of 1 to 1.2 in. of mercury and steam at 60 to 90 lb. per sq. in. are used. The temperature attainable in the furnace with this burner is 1500° C. and over. Where blast at high pressure is available, the burner No. 2 may be used with excellent results, the air being admitted through the center. When compelled to work without compressed air, a Körting blower or some similar apparatus must be employed for drawing the air through by suction, if a high temperature is required. The ideal arrangement would be to use highly compressed air, and to dispense with steam altogether, but the power absorbed would be excessive, since a pressure of at least four atmospheres would be necessary.

The simple plan of admitting petroleum at high pressure, without using steam as a carrier, was not attended with the hoped-for success, notwithstanding that spiral and edge sprayers were tried and the pressure raised to 117 lb. per sq. in. The combined use of steam and compressed air does not appear capable of being improved upon, at all events not with the type of furnace at Kedabeg.

The furnace previously described is capable of treating 72,000 lb. in 24 hours. This figure refers to highly roasted ore, which is smelted with difficulty. With ores containing more sulphur, about 20% more can be worked up. It will be seen that, compared with the tonnage in America, the Kedabeg output is low, but this is chiefly to be ascribed to the refractory character of the ore.

The charge amounts to 5,400 lb. at one time, which is generally made up of 2,160 lb. of roasted lump ore, 1,080 lb. of roasted middling from the reverberatory calciners, and 2,160 lb. of roasted fine ore from the Gerstenhöfer kilns. In addition to this, for the slagging of the iron, 530 to 720

lb. of a silicious, but easily fusible, flux is used (50% SiO₂). It consists of a highly metamorphosed augite-porphry, and is quarried in the neighborhood. If the furnace requires to be run extra hot, slags from the copper-refining process are added; otherwise only the foul slags from the first smelting are recharged.

As soon as the hearth is filled to the sill of the door with the molten mass, amounting to from 144,000 lb. to 216,000 lb., and when the surface of the metal has settled after the reactions, and bubbles of sulphurous-acid gas have ceased to appear, the slag is run off through the opening opposite the flue, and afterward the matte is tapped and run into large sand beds. Before recharging, the hearth is repaired, where necessary, with dead-roasted fine ore. The charge, as well as all other material about the works, is transported by locomotives, in self-tipping cars of 2 cu. m. capacity.

Each furnace is worked by four men, per shift of 12 hours, with one foreman to every three furnaces. The work is paid for according to tonnage, the rate being 14.5c. per 2,000 lb.

Repairs to the furnaces on an extensive scale are not often required, and it is only once in the year that any necessity for a prolonged stoppage occurs. This is occasioned by the renewal of the arch, an operation which requires eight days, including the time for cooling down. The skewbacks are made high enough to permit of building the new arch over the old one, as soon as the masonry shows signs of collapsing.

Each of the reverberatory calciners, combined with a smelting furnace, treats an average of 28,000 lb. in 24 hours, and is served by two men who are paid at the rate of 21c. per shift of 12 hours. The consumption of petroleum per furnace per 24 hours amounts to 360 poods, or about 18% of the weight of ore. Taking into account the time necessary for tapping the slag and the metal, and for making any small repairs, the time for which, altogether, amounts to several hours per day, the average consumption of petroleum equals 22% of the weight of roasted ore charged. If petroleum residues are used, then this proportion is increased by about 1 to 1.5%.

The matte is roasted in kilns and heaps, and is smelted to black copper in shaft furnaces, using anthracite as fuel.

Until a few years ago the refining was carried out in so-called shaft furnaces on the old Siberian system, these being originally adapted for wood fuel, and later on modified to permit of firing by petroleum. The new form now resembles in some respects the English form of furnace, but differs from that as regards the position of the bath, and in the method of directing the flames. The refining furnaces in use at the present time at Kedabeg are shown in the accompanying illustration.

The oil is sprayed by an air-blast at a pressure of 1 in. mercury. The flame is projected into the furnace at right angles to its longitudinal axis. At the short side of the furnace, on which the depression of the bath lies, an additional air blast meets the flame, which is sufficient to complete the combustion of the gasified petroleum, and the flame is swept round in a circle, before finally escaping through the opening opposite the bath which leads into the short chimney constructed of sheet iron.

The furnace has a capacity of from 3,600 lb. to 5,400 lb. of copper, and can treat 14,400 lb. in 24 hours. The refining process itself does not differ essentially from the method practiced in western Europe.

The melting down is performed under blast at a very low pressure, which on the one hand effects the complete combustion of the petroleum, and on the other, partially oxidizes the foreign substances. The time required for melting is generally

on the degree of purity of the raw copper, and is generally from 2.5 to 3 hours.

As soon as the surface of the bath has become completely quiescent, the first poling is begun, a single pole only being used. The object is not to reduce the whole of the copper oxide at once, since it is preferable to allow the oxidation to continue until the foreign constituents are entirely removed. For this purpose the blast is turned on once more, until a sample withdrawn in a spoon shows the characteristic cubic structure of the copper, and is entirely free from blowholes. After that the reduction of the copper oxide is proceeded with, by continuous poling, finishing under a covering of coal dust, until the copper reaches the desired degree of strength and toughness. Test pieces of the finished copper should show a rose-colored fracture and a silky structure, and should stand hammering and bending both in the red-hot and in the cold state, without showing any sign of cracking.

The petroleum being free from sulphur, no lead needs to be added, especially as the last traces of arsenic and antimony cannot be finally removed by means of lead. The following is the average composition of the Kedabeg commercial copper: 99.57% Cu; 0.06 to 0.1% Ag and Au; 0.027% Pb; 0.038% As; 0.06% Sb; 0.031% Ni and Co; 0.009% Fe; trace, Bi; trace, S.

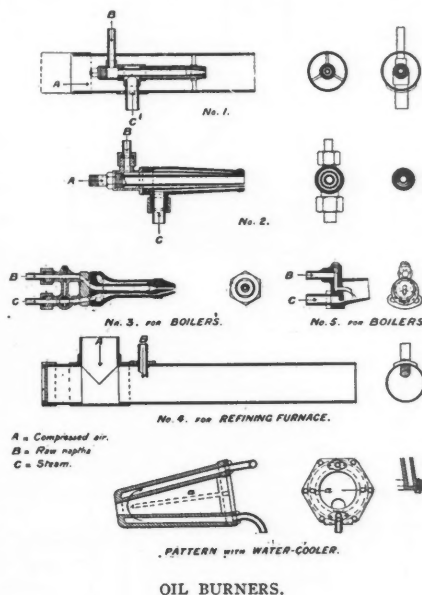
On account of its homogeneity, it is especially valued at the rolling mills, and is consequently largely used for rolling purposes. For the manufacture of brass the Kedabeg copper is less suitable.

For the production of 3,600 lb. of refined copper from raw copper, 2,700 lb. of petroleum is required, and for the refining of 3,600 lb. of precipitated copper, the consumption is 3,600 lb. The latter is less easily fused and large additions are necessary to form the slag, more especially additions of basic ferrous salts, tin, etc.

For the service of two refining furnaces, one foreman and one furnace man are required per shift of 12 hours, and four more men help in the work of tapping and charging each heat.

The new smelter of the Sullivan Group Mining Co., at Marysville, B. C., is operated by power derived from four 48-in. Pelton wheels, which work under a head of 325 ft., the water being delivered to the nozzles from a 24-in. steel pipe. Power is distributed about the works by wire-rope transmission. The ore accumulated in the storage bins is conveyed to the roasting furnaces by a belt conveyor. The roasting plant consists of four hand-raked reverberatories and two Heberlein rotary furnaces.

A discovery of molybdenite ore is reported on the south fork of the Salmon river, Idaho, 14 miles from Warren.



2 to 2.5 hours. The blast is then turned on the molten bath at full pressure (1 in. mercury) through a tuyere directed downward upon the surface of the metal. By this means the sulphur, zinc, arsenic and antimony are volatilized, much smoke being given off at the same time. The iron, together with a further portion of the zinc and copper, begins to slag off, and the copper oxide which forms provides the means of oxidizing the foreign substances. As soon as the slag becomes sufficiently liquid, it is skimmed off the surface of the bath. This stage necessitates 1 to 1.5 hours for its completion and constitutes the first purifying operation, after which the roasting begins. This latter operation is characterized by the escape of bubbles of sulphurous-acid gas at the surface of the bath, and the reaction is due to the well-known effect of oxide of copper on the copper sulphides. The duration of the roasting process depends

Tennessee Phosphate.

BY R. D. O. JOHNSON.

The phosphates of Tennessee so far known to exist in commercial quantities, are confined to Hickman, Maury, Lewis and Perry counties, in the center of the State. During the Silurian and Devonian periods, this region was the site of broad, shallow and partly land-locked seas, where the bottoms were subjected to tidal currents and wave action. The deposit was of organic origin, consisting partly of phosphatic shells of mollusks and partly of calcium-carbonate shells that form or-

resting directly upon one another or separated by thin layers of clay. It varies from 68% to 78% phosphate of lime, while its percentage of iron and alumina is generally over 5 per cent.

The blue-rock deposit is confined to Hickman and Perry counties. The deposit in the latter county is of such low grade that, under prevailing market conditions, it is not of commercial importance. This region has, however, been secured by the larger fertilizer companies. With the exception of small isolated areas on Leathwood creek, Tuckers Bend on Duck river,

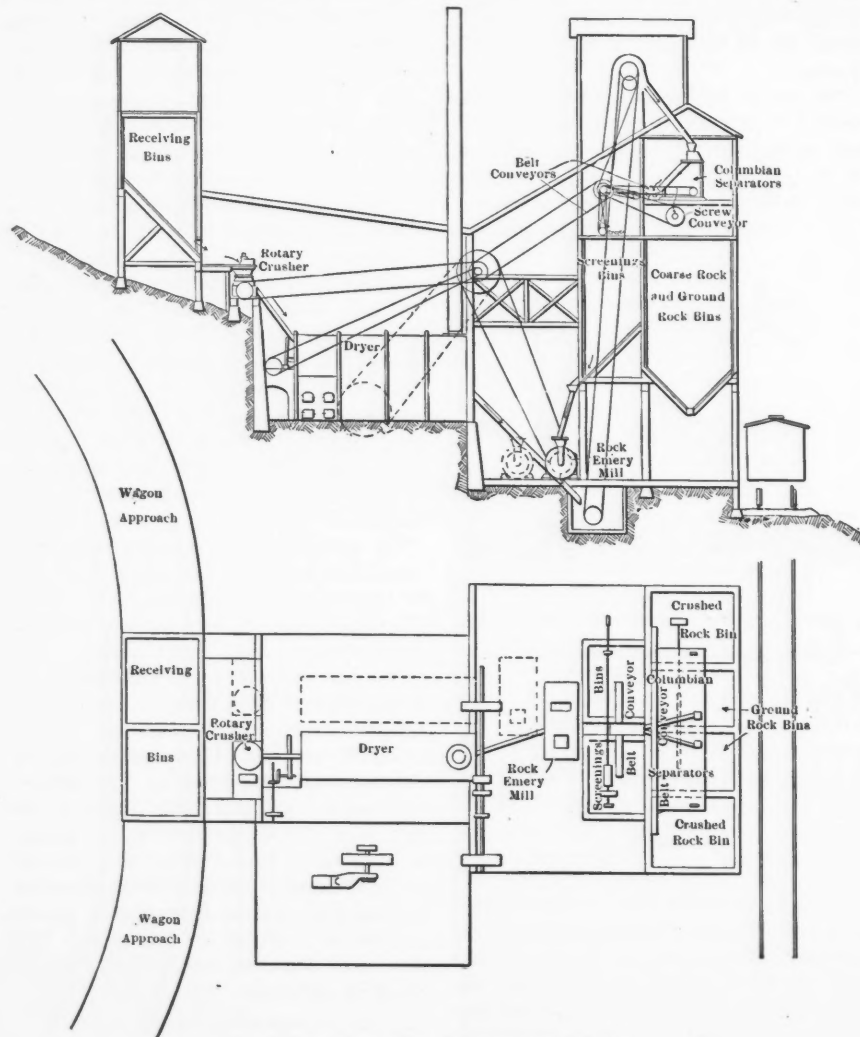
ing directly, and unconformably, upon the Silurian phosphatic limestone) constitutes "the blue-rock phosphate" of commerce. The next above is a stratum of black or brownish shale, highly bituminous and oily. Some tests recently made indicate that this shale can yield a good quality of gas. Considering that, in the mining of the blue rock, this shale constitutes "the mine waste" and is a by-product, it may become a valuable source of power for local mining and milling. The third member of this series is a greenish glauconite shale, imbedded in which are considerable quantities of nodules or concretions of phosphate of lime. These are hard and compact and contain much pyrite, difficult to crush and grind, and, as they do not contain over 65% phosphate of lime, they are not mined directly, but are saved as taken out in the process of mining the phosphate rock.

The origin of the blue rock is probably much the same as that of the phosphatic limestone of the Silurian period. In addition to the phosphate derived directly from animals then living, much was obtained from washings into the shallow bay of the residual mantle of the then exposed phosphatic limestones. This rock is partly primary (derived from organisms living at the time the rock was formed) and partly secondary, derived from the waste of pre-existing phosphatic limestones. The theory of the origin of these deposits is in accordance with that generally accepted, and may be found in the government reports of Hayes and Ulrich.

The Devonian phosphates are unchanged from their original form, and are, therefore, much harder and more compact than the brown-rock phosphates. They vary greatly in color and texture. The finer-grained, light-gray, compact varieties run much higher in phosphate of lime than the conglomerated coarse-grained, dark-colored varieties. The grading of the rock is made in accordance with these characteristics. The rock varies from 55% to 75% phosphate of lime, and is sold under a guarantee that it contains less than 3% of iron and alumina. The thickness of the bed varies, from nothing on the edges to 50 in. in some places. Thickening of the bed is usually accompanied by coarser texture, and lower content of phosphate of lime. Under prevailing prices, a bed under 18 in. in thickness cannot be worked to a profit.

The rock weighs 175 pounds per cubic foot in the bed, or equivalent to 3,400 long tons per acre per foot in thickness. The deposits of brown rock vary greatly in thickness and lateral extent, but are cheaply and easily mined. Lying, as they do, under comparatively level fields or low hill tops, only a small amount of stripping is necessary to expose them. The rock is mined with the pick and shovel, no blasting being required.

The nature, high grade and limited extent of the brown-rock deposits, together



PLAN AND ELEVATION OF PHOSPHATE MILL.

dinary limestone. The movement of the water rolled the more resistant phosphate and partly removed the softer carbonate. These conditions resulted in a series of beds of limestone containing from 30% to 40% phosphate of lime. Subsequently exposed by erosion over broad areas, these beds were leached by meteoric water removing the more soluble carbonates and leaving the phosphatic content. Where conditions have favored the weathering, this leaching proceeded to a considerable depth. The residual deposit constitutes "the brown-rock phosphate" of commerce. It is a loosely coherent, porous, rusty-brown rock, disposed in rather thin plates

and another place on Indian creek three miles south of Centerville, the workable beds of the deposit in Hickman county lie along Swan creek and its tributaries, and comprise the Swan Creek district. This district, with neighboring patches, has an area of 12,000 to 13,000 acres, about one-third being owned by the New York & St. Louis Mining & Manufacturing Co. The remaining two-thirds is held by the Virginia-Carolina Chemical Co., the American Agricultural Chemical Co., the Jarecki Chemical Co., the Meridian Fertilizer Co. and the Tennessee Chemical Co.

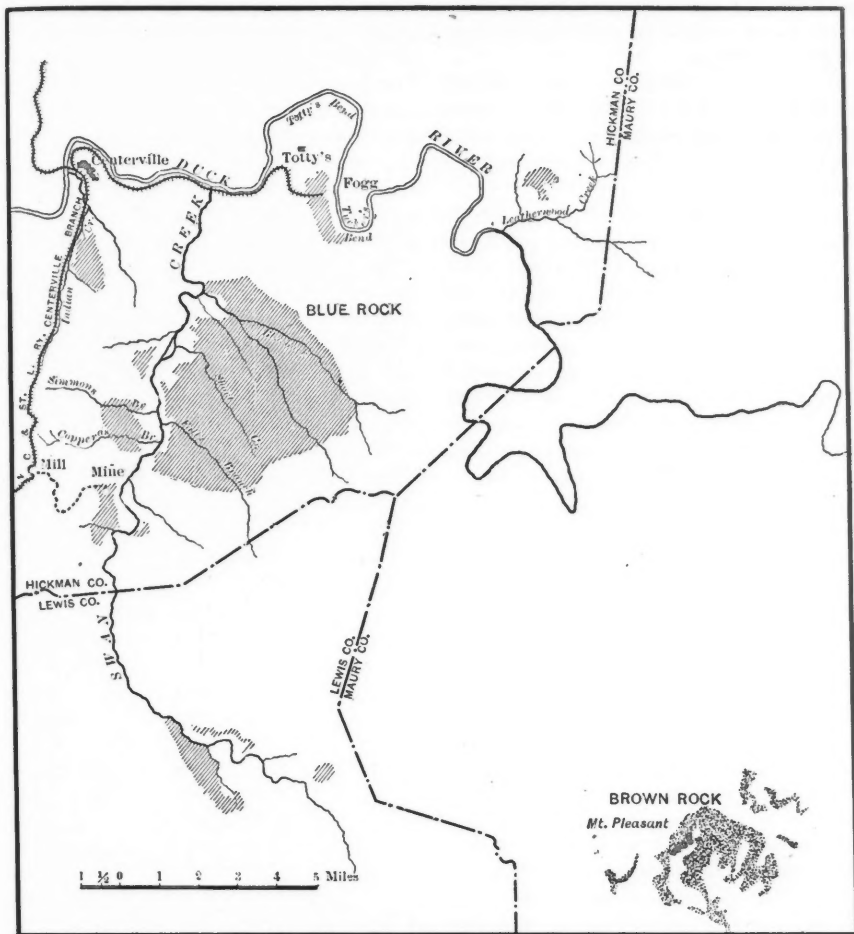
In this region the Devonian is represented by three thin strata, the lowest (ly-

with their disposition and ease of mining, have contributed to heavy production, low prices and rapid exhaustion. In the early mining. One small steam shovel has been employed for stripping, but its use has, apparently, not met with success, as the

tion in the bed. The upper third of the bed is usually dirty, loose and earthy, and is classed as "low-grade domestic," 68% to 70% phosphate of lime, with no guarantee as to iron and alumina. The middle third is harder and more compact, and is classed as "high-grade domestic." It analyses 72% to 75% phosphate of lime, with 5% of iron and alumina as a maximum. The bottom third is much more solid, and is graded as "export"; it assays 75% to 78% phosphate of lime and from 3½% to 5% iron and alumina. It is a trade rule that an excess of 1% of iron and alumina over the guaranteed content is equivalent to lowering the grade of the rock 2%. Blue rock, though generally lower in its content of phosphate of lime, holds a commercial parity by reason of its lower percentage of iron and alumina.

The stripping is a mixture of yellow clay and chert, the detritus of former overlying beds of St. Louis limestone. It varies in depth from nothing to 30 ft.; the average is 6 to 12 ft. Some stripping is done up to 20 ft., where the rock is thick and high grade. Stripping is done by hand, or by plow and scraper; and the average cost for rock uncovered is 75 cents per ton. After the rock is bared, the area is laid off in strips about 25 ft. wide, and the mining of these strips is given out on contract. The contract includes sorting, forking and loading into wagons. Forty-five cents per ton is the average cost for this work.

Mining can be carried on only in dry weather, as little or no provision is made for draining the cuts. The rock, as mined, contains from 15 to 20% moisture, and requires to be dried before shipment. The more primitive method is to spread the rock out over an even surface, depending upon the sun and wind to remove the



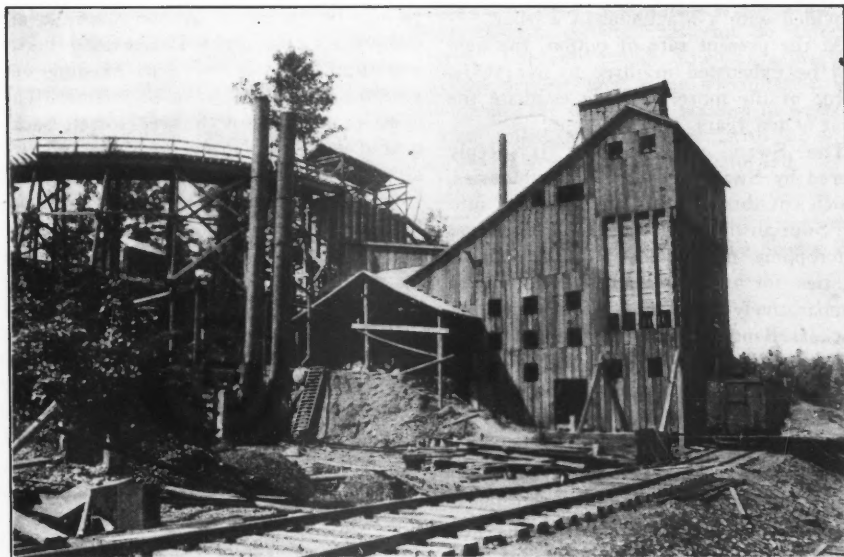
MAP OF PHOSPHATE DEPOSITS.

days of brown-rock mining, upon the discovery of a bed upon his land, any farmer with the apparatus at hand became a producer. The impending exhaustion of the brown-rock deposits has been fully appreciated by large fertilizer manufacturers. While enjoying bountiful supplies of good phosphate at low prices, they have secured their future supply by getting into their possession the much larger, more certain, though somewhat lower-grade deposits of blue rock.

The region of greatest importance in the production of brown rock is the Mt. Pleasant field in Maury county. Brown rock occurs as hillside and "collar" deposit in Hickman county, and has been mined there spasmodically ever since the discovery at Mt. Pleasant led to the search for it in other districts. The deposits in Hickman county, so far uncovered, are not of great importance.

The productive area of the Mt. Pleasant field is not over 3,000 acres in extent, and is owned mostly by the large fertilizer manufacturers and large mine operators. The thickness of the bed varies greatly, owing to the genesis of the deposit. Many "horses" (parts of the original limestone remaining unweathered) stand in the bed and prevent the use of steam shovels in

example has not been followed. The bed varies between 4 and 7 ft. in thickness, and may safely be estimated at a yield of 1,000



PHOSPHATE MILL, WITH DELIVERY AND DISCHARGE TRACKS.

ton of merchantable rock per acre per foot in thickness. The rock is sorted into three grades, according to appearance and loca-

moisture. The rock is turned periodically by plowing. A single rain will undo the effects of a month's air-drying.

Kiln-drying is the method more generally employed. Cord wood is piled to a depth of 3 ft. over the area of the kiln, and upon this is placed the forked rock to a depth of 5 or 6 ft.; it is confined, on the sides and ends, by dry walls laid up with the larger pieces of the rock. The kilns are generally under sheds, though many have no shelter. Some of the sheds are built with a kind of upper floor over which the loaded wagons may be driven. Trap doors in the floor permit the filling of the kiln with but little labor. The wagons employed are fitted with gravel beds having loose slatted bottoms through which the rock is dumped to the trap doors. Drying costs 15 cents per ton for cord wood, and 10 cents per ton for building up the kilns.

Hauling from the mines to the kilns is usually done by the company, though it is occasionally contracted at 25 cents per ton. Loading cars from the kilns costs 10 cents per ton. The following is the average cost of the dried rock aboard cars: Stripping, 75c. per ton; digging, forking, sorting, loading into wagons, 45c.; hauling from mine, 25c.; drying, cord wood, 15c.; drying, building kilns, 10c.; loading cars, 10c.; total, \$1.80.

Much fine material, "kiln screenings," from forking and handling, accumulates. It is shipped to the manufacturers, who make it into a low-grade acid-phosphate used in making "filler."

There are now very few independent mines in the Mount Pleasant field. Almost all accessible land has come into the control of the large manufacturer or the large mine operator. There are several crusher and pulverizing plants, but they are poorly and cheaply constructed. Little provision is made for storage. It is necessary to crush and grind as shipments are made. The best plant in the district is provided with a MacLanahan washer.

At the present rate of output, the field will be exhausted in three to five years. Some of the more sanguine estimate the limit at ten years.

The Swan creek district is deeply scored by Swan creek and its tributaries, which cut through the blue-rock bed into the Silurian limestone beneath. The great outcropping thus exposed offers opportunities for tunneling and developing at comparatively small cost. The mines at Tuckers Bend and those on Indian creek are entered in this way. In both of these the rock is mined on the room-and-pillar system. Though the beds are thin, the blocky character of the cherty limestone roof precludes the long-wall system. Between this limestone and the phosphate, lies a 12-in. bed of rather soft shale. The method of mining is to shoot out this shale, to carefully clean up and gob the waste, and to shoot up the exposed phosphate with horizontal holes. Great care is exercised in keeping the phosphate free from shale. It takes but little shale to

lower the grade of the rock. In working a 2-ft. bed, the rooms are not over 3 ft. in height. But little waste is taken out of the mine, the space occupied by the phosphate being ordinarily sufficient for underground storage.

Hand ratchet drills for shale, and $2\frac{1}{4}$ in. percussion drills for phosphate, constitute the usual equipment. Air-driven rotary drills find limited employment for boring shale.

The New York & St. Louis Mining & Manufacturing Co. will employ the long-wall system of mining. The bed it is now developing is overlain with 12 to 60 ft. of shale. This roof should bend down easily on the gob without rupture. This company is now driving a tunnel on the outcrop to the shaft, a distance of 600 ft. The tunnel is $6\frac{1}{4}$ by 10 ft. inside the timbering, and is wide enough for two tracks. The timbering consists of three-quarter sets, with a post in the middle of the cap standing between the tracks. The posts are 6 in.; the caps are 8 in., and hold pole lagging. The sets are placed 5 ft. apart. The timbering serves merely to hold up the slabs of shale that separate from the roof. In parts of the district narrow tunnels are timbered only with side posts, or stulls provided with individual caps, the center portion of the tunnels being cut in an arch and otherwise without support.

The shaft is 6 by 8 ft. in the clear and 124 ft. deep. It penetrated 63 ft. of clay and imbedded chert, and 61 ft. of Carboniferous shale before the phosphate rock was encountered. The shaft is timbered to the shale, which requires no timbering. This is the only shaft in the region, and was sunk for the purpose of delivering the phosphate at a high point and for a ventilating outlet.

The mechanical equipment consists of a 75-h.p. boiler, a 12 by 12 Norwalk air compressor, a 6 by 8 Lidgerwood hoisting engine and a Freeman hoisting engine for operating 650 ft. of incline. The mine is equipped with five Howell back-gear drills for boring the shale and five air-hammer drills for phosphate.

Iron tubs of 10 cu. ft. capacity, or 1,000 lb. of broken phosphate, are used in hoisting in place of cages, until the capacity of the mill is increased. The tubs are made low and flat so that they may be filled under a low roof. At the top of the shaft the tubs are dumped into a small bin, from which a skip of 20 cu. ft. capacity is filled. The skip is drawn up the incline to the top of the ridge and automatically dumps into a bin of 25 tons capacity. This bin is arranged to fill $1\frac{1}{2}$ yd. Aurora dump wagons. The operations of hoisting, dumping and drawing the skip up the incline are attended to by one man. One engineer, a fireman and a blacksmith constitute the top force.

The mill is located at a point on the Centerville branch of the N. C. & St. L. railroad, three miles from the top of the

incline at the shaft. As is shown in the accompanying cut, the mill has the advantage of hillside location. It is a frame structure on concrete foundation and is designed to have a capacity of 100 tons in 10 hours of crushed and ground rock. Provision is made for future doubling of capacity by leaving space for a crusher, dryer and pulverizing mill. The receiving bins have a capacity of 200 tons; 600 tons may be stored in the crushed and ground-rock bins. Bins are paired so that two grades of rock may be stored separately.

The dump wagons discharge directly into the receiving bins. The approaches to these bins are built sufficiently strong to stand the weight of traction engines and 16-ton cars. It is intended to use traction engines for transporting the rock when the capacity of the mill shall have been doubled.

The Sturtevant rotary crusher is fed by hand from the storage bins. The product of the crusher passes to a cylindrical dryer. The dried rock runs to the foot of the elevator, whence it is carried to two No. 2 Columbian screens. These screens have two screening surfaces and yield three products. The over-size of the top screen is designated as "coarse crushed" rock and ranges in size between $\frac{1}{2}$ and $\frac{1}{4}$ in. This product falls upon a 10-in. belt conveyor and is carried to either of the outer storage bins. The product passing through the second screen is not over 60-mesh size and is designated as "ground rock." It falls into a 6-in. screw conveyor and is delivered to either of the inside bins. The product passing through the top and over the lower screens is designated as "screening" and is delivered by another 10-in. belt-conveyor to the center of the screening-bins. This product is over 60-mesh, and under $\frac{1}{4}$ in. From the bins it is delivered to the feed hopper of a 42-in. vertical rock-emery mill. This machine has been installed as a matter of experiment and test. Though it has met with great success in grinding the softer brown rock, its value as a pulverizer of the denser and harder blue rock is yet to be determined. This mill discharges its product to the boot of the elevator. Fifteen per cent. of the product of the crusher is 60-mesh and below.

The plant is equipped with two 60-h.p. fire tube-boilers, a Hoppes heater and a 250-h.p. Porter-Allen automatic engine. The excess of engine power provides for future extensions. The boiler plant is sufficient for present needs. The mill has been in operation but a few weeks.

The following is a statement of costs of mining and milling blue rock, based upon a bed 24 in. thick; available records do not admit of more detail:

Mining, \$1.35 per long ton; hauling, \$0.35; crushing, \$0.25; loading in cars, \$0.025; total for crushed rock, \$1.975.

Ground rock—Delivery to mill, \$1.53 per short ton; milling, \$0.50; loading,

\$.025; sacking, \$.05; total, \$2.105. Sacks are extra.

Much of the ground rock is sold to the farmers and is used directly on the soil without further treatment. The "coarse crushed" rock is bought by fertilizer manufacturers.

Briquetting Tests.

The chapter recording the results of experiments made on the briquetting machines at the coal-testing plant of the United States Geological Survey, is one of the interesting features of Bulletin No. 261, published by the Survey. The briquetting plant consisted of two machines of distinctly different types, one being furnished by William Johnson & Sons, of Leeds, England, and the other by the National Compressed Fuel Co., of Chicago, Ill. The English machine is one of the standard types for briquetting with stiff pitch; it consists of a double-compression vertical table-press, with closed molds. The second machine consists of a Chisholm, Boyd & White press, constructed on Belgian patterns, and ordinarily known as the "eggette" machine.

In the operation of the English press, the binder was delivered to the coal in the worm which feeds the machine; or the coal and binder were mixed by hand, and then fed to the worm. After being mixed in the worm, the material entered an impact disintegrator to be reduced to the desired degree of fineness, after which the mass was heated in a pug-mill and the binder softened. From the pug-mill, the plastic mixture went to the press (in which the pressure varied from a few pounds up to 2,000 lb.). The briquettes made in this machine were rectangular, except for rounded corners, and weighed on an average 6.8 lb. each. The maximum capacity of the press was 6 tons of briquettes an hour.

In the case of the American press, the coal and binder were dumped into a mixing machine fitted with steam jackets for warming the cool material, after which the mass went to the press. This tangential machine consists of two pairs of narrow-faced rolls, on the face of which are molds for receiving the mixture to be pressed. As the rolls revolve, the excess material is squeezed out and the eggettes are delivered in a steady stream. The capacity of the press is fully 5 tons an hour. For experimental work, this machine had one advantage over the larger English press, in that it permitted the testing of mixtures in lots as small as 15 pounds.

The materials that have been tried as binders, in the laboratory experiments and on the two briquetting machines, include the following: Pitch of various grades; creosote; asphalt, hard and soft, crude and refined; asphaltic pitch; petroleum, both of asphalt and paraffin bases; molasses; lime; and clay. Pitch is the binder most commonly used commercially, and was

employed in the majority of the experiments. It is the residue left from the distillation of tar, which is produced from by-product ovens and from the various gas plants.

The United States Consular Reports announce that the manufacture of briquettes in Germany, the home of the briquette industry, is limited by the supply of pitch available. There is considerable variation in pitches, but the one found to give best results in briquetting is that containing a high percentage of volatile matter. Experiments proved that 7½ to 14% of oil is necessary in pitch to give proper binding qualities.

In binding with rosin, the cheaper grades can be used—the crude black rosin giving as good satisfaction as the partially refined. Rosin was found in some cases to be useful as a hardening agent as well as for a binder. It has been used with lime and pitch, and good briquettes resulted. In using rosin and pitch as a binder it was found that a smaller percentage of these two together was required to produce as good a briquette as when pitch was used alone. In burning there is little or no odor from the rosin, although there is some tendency to smoke.

Petroleum (of both paraffin and asphaltum bases) can sometimes be used to advantage in briquetting. On account of lack of time, but little experimenting was done with this binder. Experiments were also made with molasses, and it was shown that, probably, waste products from sugar and beet refineries can be utilized, in connection with certain other materials, to give a satisfactory binder. Lime was used in combination both with rosin and molasses, with encouraging results. With this binder, however, the percentage of ash is increased in the fuel without raising its efficiency; but it is one of the cheapest of binders, and in most cases is convenient to coal districts. A few experiments were made with clay in combination with other compounds in an attempt to obtain a suitable binder for lignitic coals, but without success.

In testing the value of the various binders for briquetting coal, a series of experiments was made with each in the laboratory by briquetting the mixture in a hand press. The results of these experiments, together with the accounts of the tests of coals sent from sixteen States and Territories, are interesting. According to the results obtained in the laboratory, from 1 to 15 tons of briquettes were made, by either the English or the American machine from each coal submitted. A series of experiments showed that coke breeze (fine or waste coke) could be briquetted so that it can be used as a substitute for lump coke. These briquettes are tough and strong; they stand more handling and have a much greater crushing strength than the best of coal briquettes.

Assaying Cyanide Solutions.*

BY A. M. HENDERSON.

The following method of assaying cyanide solutions was used with success. The solutions to be assayed are electrolyzed for a period of four hours, the gold being precipitated on a cathode of lead-foil, the anode consisting of a wrought-iron rod. The formation of prussian blue on the anode is prevented by the addition of an excess of ammonia; the necessary circulation of the solution is caused by the liberated gas bubbles and by the peculiar shape of the cathode.

The precipitation of gold is very complete; on solutions assaying 10 to 15 dwt. of gold per ton and containing .03 to .25% of cyanide, the value is reduced to below 3 grains in 4 hours with the necessary current density. As compared with evaporation, the results are more consistent. In practice, 10 assay tons (292 c.c.) of solution are taken in a tall beaker, and 12 to 15 c.c. of strong ammonia added.

The lead cathode consists of a cylinder of lead-foil (2½ in. high and 1 in. in diam.), with three V-shaped notches cut in the lower rim, a lead strip being attached at the top with which to make connection. The lead-foil cylinder should be covered to a depth of about ½ in. and a 6-in. nail is used as an anode. The disengaged gas bubbles cause an upward current in the solution inside the cylinder, down round the outside, and through the V-notches in the bottom.

It is usual to make from 14 to 20 assays at one time, all joined in series between the terminals of 110-volt lighting mains. With 20 assays in series, no extra resistance is necessary; but with a lesser number than 14, incandescent lamps are inserted.

The current used is from .06 to 1.2 amp., the fouler the solution, the higher the current density that can be safely used. The gold comes down as a bright yellow deposit, and, when precipitation is complete, the cathode is washed in water, dried, rolled up and scorified with the addition of some test-lead and cupelled.

Coke made from crushed coal is said to be of superior quality and to be produced more rapidly than in the usual way.

Mr. A. S. Mann, in a paper read before the American Society of Mechanical Engineers, gives 2½ to 3½ min. as the time required to start a 1,500-kw. Curtis turbine. Most of this time is used in forcing the fire under the boilers (those referred to supplied other machinery), the actual bringing to speed after the throttle is off its seat taking only a half minute, against 5 min. required to bring a large steam-engine up to speed, starting hot.

*Presented by F. B. Stevens, before the Institution of Mining and Metallurgy, May 18, 1905.

Petroleum Production of Russia.

According to a report of the British Foreign Office (*Annual Series*, No. 3,366), the production of petroleum at Baku in 1904 was 73,705,852 bbl., against 71,626,611 bbl. in 1903, the smallness of the increase being due to the disturbed condition of affairs in the oilfield and the frequent fires, by which large quantities of oil were destroyed, and the subsequent prolonged strikes, during which the output of oil, except from flowing wells, entirely ceased. In the early part of 1904 prices of kerosene were fairly high, but later the demand decreased, and a considerable fall in prices followed. Meanwhile Baku continued forwarding kerosene to Batoum, so that toward the autumn the tank storage accommodation at that port became scarce, and at the end of the year stocks of oil were so large that all available reservoirs were filled. Tankage at Batoum is estimated at 15,500,000 poods, and the stocks amounted to nearly 15,000,000 poods.

The total shipments of petroleum products from Batoum in 1904 as compared with 1903 were:

To	1904.	1903.
	Barrels.	Barrels.
Foreign countries.....	9,261,718	9,415,256
Russia.....	427,690	502,750

The total number of wells in the Baku oilfield on December 31, 1904, together with the number for the previous year, according to the report furnished by the committee of petroleum producers, was:

	1904.	1903.
Producing wells.....	1,555	1,420
Trial pumping.....	31	27
Drilling.....	279	358
Deepening.....	66	96
Cleaning out and under repair....	327	257
Standing idle.....	1,443	1,276
Total.....	3,701	3,434

A report, of recent date, by W. H. Stuart, United States consul at Batoum, gives the following additional details:

"The loss of production by the December strike was not less than 110,000 bbl. per day for the month, which would have increased the difference between the output in 1903 and 1904, but would not have brought the 1904 production up to that of 1903 if the loss by fires and strikes in the latter year were taken into consideration. As there were 239 wells completed in 1904, against 189 in 1903, results indicate very clearly that production can be maintained at the quantity necessary to cover the demand only by the drilling of at least 300 wells yearly; and, as time goes on, the number of wells will have to be further increased to keep up with the requirements, as, notwithstanding the territory (except the older district of Balakhani) shows no marked signs of exhaustion, the water in the wells is generally increasing, which, although not af-

fecting the volume of production materially, adds to the cost of the crude oil.

"At present the stocks of refined oil at Batoum are nearly twice as large as they were at this time last year, and owing to the fact that these stocks are available only for export, while recent labor and political disturbances have made the shipment of all goods almost impossible, they act as a very depressing influence upon the export market, as buyers for export naturally think there is a limit to the storage and the credit of the refiners, and that when that limit is reached the refiners will have to sell their stocks at a heavy discount. This is said to be one reason for the declining price of Russian refined for export. Another reason given is the declining price of American refined, which is supposed to indicate an increasing crude production in the United States. This frightens buyers of Russian refined, who, remembering the strong competition last year in the United Kingdom and Continental Europe, fear to buy Russian refined ahead because of the possibility of a still further decline in the price of American refined, which will absolutely prohibit competition.

"At present there seems to be no demand for refined oil for export and very little for the home trade, notwithstanding that the season of heavy shipment via Volga is close at hand. The export demand is influenced undoubtedly by the foregoing conditions, and general trade is exceedingly dull because of strikes and other disturbances at Baku and in all parts of Russia."

No new territory has been developed during 1904; the new Berekei field has shown hot water in some wells, tending to discourage further search, but two or three fair wells in the field, which have been producing for some months, will keep the interest from failing entirely. This field will not, however, be a factor in the trade for some years.

Lighting of Mill Buildings.*

BY C. A. RAYMOND.

It is not until recently that the lighting of mill buildings has occupied the attention of designers in this country to any great extent, but rapid strides are now being made in the direction of better diffusion. The area of glass in most buildings has been largely increased, in some instances to excess. The area of glass should be limited by the following considerations: (1) In mill buildings where double glazing is too expensive the heating is rendered more difficult by an increase of glass surface. (2) An excess of glass, when exposed to direct sunlight, is apt to make the building excessively warm, unless rendered translucent by a coating of white lead or similar preparation. (3) The expense of replacing broken

*Abstract of a paper read before the Toledo Society of Engineers.

glass in some classes of shops may be considerable, though this may be obviated by proper protection.

The location of a building, with respect to the points of the compass, largely affects the quality of the lighting. North light is the best, because of its steadiness. It is, however, not so important to have a large quantity of light as to have it well diffused. These facts have developed the saw-tooth roof, a European type, which is now being used in some very good buildings in this country. There are several strong objections to it, but much also to be said in its favor. It is not difficult to design a building so that this roof may be used no matter how the land may lie with reference to the points of the compass, the worst case being when the designer is compelled to run his building toward the quarter points. In locations where much snow falls, this type of roof should be avoided; but where snows are infrequent and not usually deep, it offers, as a rule, a very satisfactory method of lighting, though some means must often be provided for warming the gutters to dispose of the snow and ice rapidly. Gutters should be specially large or leakage is apt to occur.

As far as possible, roof lights, to be most efficient, should be placed normal to the direction of the source of light. This is illustrated by the usual form of saw-tooth which is inclined at an angle of 20° to the vertical.

Ribbed glass has done much to improve the quality of light in mill buildings. It serves as a cheap substitute for prismatic glass, and owing to its great diffusive qualities and low cost, is extensively used in both skylights and windows. It is no doubt most effective for windows when the ribs run horizontally, but shopmen who have worked by it without shades find the glare from it troublesome to the eyes when exposed to direct sunlight. This difficulty may be effectively obviated by shades, but these are ordinarily considered too expensive. With the use of this glass the central part of the room gains a large part of that light which in the case of ordinary glass falls on the floor near the windows.

Translucent fabric is a fairly low-priced and otherwise a good substitute for glass. Being translucent and not transparent, it is good for skylights.

In order to aid in the diffusion of light, the interior of the building may be painted white, simple whitewash being frequently employed.

Condensation is a point to be reckoned with in skylights, but is usually cared for by means of gutters placed at intervals underneath the glass. Many kinds of roofing, also, are troublesome on this account.

Large sheets of mica are successfully built up of smaller ones. For insulation, they will give results as good as the single large sheets and cost less.

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EDITORIAL.

A FEATURE of the week now closing has been the rise in the price of the common stock of the American Smelting & Refining Company above that of the preferred, which happened for the first time. This was due evidently to manipulation rather than to any outside demand, although the position of the company is undoubtedly strong.

IN PRACTICAL METALLURGY, the question is not what is the maximum percentage of metal that can be extracted from the ore, but what is the percentage that it will pay best to extract. This point is often lost sight of. A smelter may produce extraordinarily clean slags by continuously recharging a large proportion of them to the furnace, creating the "endless chain," but the gain may be far outweighed by the cost.

THE TONNAGE of zinc ore produced in Colorado, especially at Leadville, has increased largely during the present year, owing chiefly to the new mills that have gone into commission. Elsewhere in the West, new mills that were commenced last fall and winter are now beginning to turn out concentrates, which will greatly swell the output of that class of ore. In all likelihood there will be in the near future a surplus production, which will have an important effect on the market.

The Sault Ste. Marie Canal.

The celebration of the fiftieth anniversary of the completion of the first lock at the Sault Ste. Marie takes place this week. The first vessel passed through from Lake Michigan to Lake Superior in June, 1855, but the formal opening did not take place until August; and that is now commemorated in the ceremonies at the Sault. In the half century the traffic on the Lakes has so grown that the Sault canal carries yearly a tonnage far in excess of the Suez, or any other of the world's ship canals. It is of the greatest importance to the iron industry. The opening of this channel made possible the free shipment of iron ores and the development of the Lake Superior region; and 75 per cent of our great output of pig iron is made from Lake ores, nine-tenths of which pass through the locks at the Sault. The celebration of this

notable anniversary is of far more than local importance; it is cosmopolitan.

Dredging for Tin Ore.

A new development in the mining industry, which has not been generally noticed, is the exploitation of alluvial tin deposits by dredging, in the same manner as for gold-bearing gravel. According to the last annual report of the Department of Mines of New South Wales, the dredging for tin ore in that State has now become a firmly established practice. It dates back several years, and there has been in each year a substantial increase in the quantity of ore won in this way.

In 1904 there were six pump dredges and one bucket dredge operating on stanniferous gravel, besides several small enterprises, which obtained 319 tons of ore, valued approximately at \$130,000. The statistics indicate that the industry is likely to be a growing one. The major part of the production in 1904 was made by six pump dredges in the Tingha district, the total value of the plants employed being about \$125,000. Some idea as to the results can be derived from the statistics of three of them. These obtained 111.4 tons of ore from the treatment of 130,540 cubic yards of gravel, showing an average yield of a little less than 1.8 pound per cubic yard.

The successful development of this practice in New South Wales is suggestive of its possible application in the Straits Settlements, and elsewhere. Incidentally, it is interesting to note that a small quantity of tin is recovered in New South Wales by the gold dredges.

Petroleum as Metallurgical Fuel.

The use of petroleum as a metallurgical fuel is likely to attain increased importance, especially in Arizona and elsewhere in the Southwest, where coal and coke are dear and petroleum can be obtained at comparatively low cost from southern California. The failure of certain attempts to use this fuel, which have already been made in Arizona, has been due to defective metallurgical practice, rather than to any difficulty in the use of the fuel. At the Selby smelter, near San Francisco, petroleum has been used with great success for several years for the heating of various kinds of furnaces.

In this connection, the article describing the smelting practice at Kedabeg, in

Russia, which is printed elsewhere in this issue, is of particular interest, since it outlines the method by which petroleum is applied to the heating of smelting and refining furnaces, on the largest scale that has yet been practiced. Even the furnaces employed at Kedabeg, however, are small in comparison with those which are used in America, but the application of petroleum to the larger furnaces is obviously only a matter of detail, requiring some modification in the introduction of the liquid fuel analogous to the method of applying gaseous fuel in long zinc-smelting furnaces, wherein approximately the same temperature has to be maintained throughout the furnace.

Incidentally, it is interesting to note that the furnace plant at Kedabeg is unshoused. This would constitute a precedent for a similar arrangement in Arizona and elsewhere, where the climate is dry, which has indeed been suggested. However, it is doubtful if this be a wise method of cheapening the cost of plant construction. At Kedabeg there are rains, and explosions of matte sometimes occur. It is remarked that the fragments do not fly far, and the men easily find shelter from them. The need of being on the lookout for such accidents is not, however, conducive to good work.

Russian Mineral Resources.

The reports from the petroleum fields of the Caucasus indicate the serious manner in which the internal disturbances in Russia are affecting the mineral industry of that Empire. The statistics of gold production are not published so promptly, but they will also in all probability show the unfavorable result of the war on domestic industry, although no rioting has been reported from the districts in which gold mining is carried on.

Aside from iron and coal, the production of petroleum and manganese ore in the Caucasus, and of gold and platinum in the Urals and in Siberia, are the important features in the mining industry of Russia at the present time, at least so far as the rest of the world is concerned. There is a comparatively small production of copper at Kedabeg in the Caucasus, and of zinc in Poland, which possesses the extension of the field that is so remarkably productive in the Prussian province of Upper Silesia. Recently the zinc production of Poland has been increasing at a large ratio, that industry at

least having been unaffected by the war. Of lead and silver there is only an insignificant production in Russia.

The mineral resources of Russia are believed to be great, and it is upon that belief, together with the favorable opinions as to the other natural resources of the Empire, that the confidence in its future is based. Russia needs a long period of rest, during which its industrial development may be properly prosecuted. It is to be hoped that the diplomatic conference, to begin at Portsmouth this month, will result in the conclusion of the war, and lead to domestic reforms in Russia which will stimulate industrial enterprise. When that time comes, we have no doubt that American engineers and manufacturers will find a new field for their efforts, which will be to the general advantage, as has been the case in Mexico, South Africa and elsewhere.

Pig-Iron Production.

The statement of the American Iron & Steel Association, the details of which are given on another page, shows that the production of pig iron in the United States, in the first half of the current year, was largely in excess of that in the first half of last year; and also exceeded, by nearly two million tons, the output of any half-year on record. The total, classed by the uses for which it is intended, was as follows, comparison being made with the first half of last year:

	1904.		1905.	
	Tons.	Per Ct.	Tons.	Per Ct.
Foundry and forge.....	2,252,725	27.6	2,888,604	25.9
Bessemer.....	4,530,946	55.4	6,008,427	53.8
Basic.....	1,061,901	13.0	1,966,592	17.6
Charcoal.....	213,356	2.6	170,512	1.5
Spiegel and ferro.....	114,510	1.4	129,040	1.2
Total.....	8,173,438	100.0	11,163,175	100.0

Aside from the large increase in the total, the important feature is the increase in the proportion of basic iron. The great extension in the manufacture of steel made by the basic open-hearth process evidently continues, and is shown by the increased demand for basic pig.

The production may be classed by districts as follows:

	1904.		1905.	
	Tons.	Per Ct.	Tons.	Per Ct.
1. East.....	377,841	4.6	723,835	6.5
2. Maryland.....	135,416	1.6	156,334	1.4
3. Central West.....	6,052,831	74.1	8,386,906	75.1
4. Northwest.....	243,181	3.0	332,187	3.0
5. South.....	1,317,187	16.1	1,387,537	12.4
6. West of Miss.....	46,982	0.6	176,376	1.6
Totals.....	8,173,438	100.0	11,163,175	100.0

In this table the East includes New England, New York and New Jersey;

Maryland is placed by itself, as its production comes from a single group of furnaces, which use chiefly Cuban and Spanish ores. The limitations of State lines do not always permit an exact division. Thus local ores are generally used in the East; but the increase in that district this year was largely from the Lackawanna furnaces at Buffalo, which use Lake Superior ores. To a certain extent, however, this is offset by the stacks in Eastern Pennsylvania, which use Cornwall and Lehigh Valley ores, so that the classification may be considered as fairly accurate.

From the table it appears that 78 per cent of the iron output this year, was from the districts using Lake Superior ore; 12.5 per cent from Alabama and Virginia ore; 8 per cent from other local ore; and 1.5 per cent from imported ore. The Lake region supplied four-fifths of the raw material needed, in a period of exceptional demand.

The average output per furnace, taking all the stacks in blast, was 39,900 tons for the half-year. Taking coke furnaces alone, the average output was 46,200 tons; the anthracite furnaces, which include very few of recent construction, reported an average of 20,150 tons; while the charcoal furnaces reached 8,500 tons.

Large as the production was, it seems to have been absorbed by consumers. There was some increase in unsold stocks, but it was trifling in comparison with production; the total stocks amounting to about a week's production.

Honesty in Engineering.

Mining engineers who are considerate of the dignity of their profession are bound to deplore certain recent financial occurrences, during which names have been bandied back and forth. It is to be highly regretted that the public, which, under most circumstances, finds difficulty in discriminating among "mining experts," should derive anew the impression that the mining engineer is inevitably a partisan of the promoter, or of whomever it may be, employing his services. Unfortunately, there is a popular belief that any mining engineer can be engaged to make a favorable (or unfavorable) report on a property (according to the wishes of his employer, or his own selfish purpose), regardless of any real examination of the property. There are undoubtedly men, of more or less acquaintance with mines and mining, who will write such reports;

but they are not mining engineers, or if so, they are dishonest ones. The engineering profession comprises such black sheep, but they are relatively few, just as in the legal and medical professions. The difference is merely that the layman is better able to detect dishonesty in the better-known professions than he is in engineering.

The function of the mining engineer is to determine facts, and from the facts to deduce conclusions based on the accumulated knowledge of economic geology, metallurgy and the handling of material. Sometimes a thoroughly honest engineer is only competent to determine the facts; it may be necessary to submit his report to some specialist to arrive at an accurate conclusion. In the determination of facts, so far as they are facts, there ought not to be serious differences among the reports of several engineers of equal competency, save such minor ones as may arise from variations in methods of measurement, etc., which tend to disappear as practice becomes standardized. The concordant results which are obtained in the estimation of ore in well-developed mines are properly appreciated by experienced mining operators. In such respects, mining engineering is no more inexact than is the estimation that is necessary in canal construction, for instance, or in other civil-engineering work. The results are honest and reasonable approximations, and this is all that can be said of most human endeavor.

The mining engineer is, however, frequently required to express an opinion as to prospects which cannot be measured, these often presenting only slight evidence, and in such effort there is ample opportunity for honest difference in opinion; but an honorable man will nevertheless state the facts as they are, and the reasons for his opinion, which will have more or less weight, according to circumstances.

In the recent occurrences referred to above, the question appears to have been chiefly a determination of fact. With the specific case we have no concern; but frequently there are similar, although less notorious, controversies. Many engineers can recall instances where sound and honest opinions, based on precise determination of the facts, have been discarded in favor of the reverse, the fallacy or dishonesty of which has been ultimately proved only by a large expenditure of

money. It is necessary for mining investors to learn not only the wisdom of employing engineers, but also the necessity of securing the right kind of an engineer; such a one, we can give the assurance, will at least report the facts as accurately as he can observe them; he will not color his opinion for the mere sake of obtaining his fee.

Cerro Gordo.

The rejuvenation of Nevada through the discovery of the new gold-mining districts in the previously unexplored part of the State, where its western boundary line makes a jog into California, is naturally directing attention to some of the old camps over the line, in Inyo county, Cal., which were the scenes of active mining 30 years ago, but for 20 years have remained almost entirely abandoned. Among these are several camps in the Panamint range, whither prospectors have lately gone anew, and a famous old camp at Cerro Gordo, near Owen's lake, which for many years has been practically forgotten. Historically, Cerro Gordo is of particular interest, it being one of the first silver-lead mining camps of the United States, ranking in importance in the early seventies only after Eureka, Nev., and Bingham and the Cottonwoods in Utah.

The birth of the silver-lead smelting industry of the United States is commonly credited to Eureka, although furnaces had previously been erected at Oreana, Nev., at Argenta, Mont., and even before them in the Patagonia mountains, south of Tucson, Ariz., where there was extensive mining and smelting by Americans prior to the Civil War. Those operations were, however, of spasmodic character, never long sustained, were directed especially toward the extraction of silver, and contributed no important knowledge to the metallurgy of lead. Eureka, on the other hand, possessing silver-lead deposits of a magnitude greater than any previously opened in North America, became immediately a dominant factor in the domestic supply of lead and developed a smelting practice, in which numerous of the metallurgists subsequently eminent at Salt Lake and Leadville received their training.

Before Eureka had become productive, however, which was in 1870, smelting having been begun on a small scale at the end of 1869, Cerro Gordo was already

turning out a good deal of lead. The latter district had been known as early as 1865, perhaps earlier, having been discovered, like many mining districts in that part of California, by Mexicans. They worked the ores for a while in a primitive manner, smelting in *vasos*, but the district did not attract much attention until 1869, when some of its mines were acquired by Americans, especially V. Beaudry and M. W. Belshaw, who erected small blast furnaces, and after a good deal of experimenting succeeded in successfully fluxing the ores. The production in 1869 was about 1,000 tons of base bullion, the annual output increasing steadily up to 5,600 tons in 1874. The total production of Utah in that year was 18,000 tons, and of Nevada 11,500 tons, wherefore California occupied a very respectable statistical position.

After 1874 the output of Cerro Gordo fell off because of the apparent exhaustion of some of the mines, expensive litigation between others, the high cost of transportation to and from the district, the scarcity of water and the declining prices of lead and silver; and in the early eighties it dwindled to insignificance. The smelting that was carried on there was commercially successful, but it contributed little, or nothing, to the technical knowledge of the art. The ore was chiefly galena, averaging high in silver and lead. It was found generally in contact veins, of considerable width, but pockety in character, occurring between limestone and talcose slate. So far as we are aware they have never been described in the literature of economic geology, unless, perhaps, in some forgotten reports of the State Mining Bureau, which is surprising in view of the really important production of the district.

The history of Cerro Gordo is of peculiar interest at this time, because the renewed activity in other camps of Inyo county, brought about by the recent discoveries by the "overflow" prospectors from the new districts in the Nevada desert, is expected to have a beneficial effect on its fortunes. Some of its old mines will doubtless be re-opened with a view to operation by modern methods. Indeed, steps are already being taken in that direction. The changed conditions in the mining industry, since the suspension of work at Cerro Gordo in the eighties, ought to enable a profit to be made where there was formerly a loss.

Metallics.

Ajax drill sharpeners are used at the Alaska-Treadwell mine. One machine sharpens 460 bits per shift.

Pig lead can be rolled into sheet at a cost of less than 0.5c. per lb., at which figure the work can frequently be contracted.

The production of arsenic in Cornwall continues to diminish, the Devon Great Consols mine having recently been closed because of lack of profit.

The Mond process for the production of zinc, with bleaching powder as a by-product, by the electrolysis of zinc-chloride solution continues in successful use at Winnington, near Chester, England.

The cost of a gas-power plant, including generator and engine, up to 500 h. p., is about 25% higher than the cost of a steam plant of similar size. Over 1,000 h.p. the costs are approximately equal.

The increased demand for sulphuric acid free from arsenic has directed the attention of manufacturers (chamber process) to the precautions necessary in the use of hydrogen sulphide for precipitating arsenic from the acid.

The expansive force to which a high-temperature furnace is subjected is very great. When any solid body expands by heating, the force exerted is equivalent to that which is required to expand the same substance to the same extent by mechanical means.

In good practice in the use of Siemens regenerative furnaces, the products of combustion escaping to the chimney should be about 300° C. in temperature, but they are often hotter than that because of insufficient capacity of the checker-works, or defective design in other respects.

The most approved system of mechanical draught for boilers and furnaces is the use of large exhaust fans, which draw the products of combustion through a heat economizer and discharge them through a steel chimney of sufficient height to disperse them, so they will not be a nuisance.

In hydraulicking, the duty of a miner's inch of water is ordinarily 1 to 5 cu. yd. of gravel per 24 hours, depending on the conditions, but in the Klondike it rises to 8 cu. yd., because of the well-rounded character of the material washed, the absence of large stones, the heavy grades of the sluices and the general employment of block riffles.

In chemical laboratories cast-iron sinks of the simplest pattern may be satisfactorily employed. They should be protected, however, both inside and out with asphalt paint, applied three or four times a year. Sinks provided with small traps are likely to be troublesome, the traps quickly choking with rust. One

large trap for the whole laboratory is most economical in installation and maintenance, and is satisfactory from sanitary considerations.

In designing sampling works, concentrating mills, etc., it is advisable to set the main crushing rolls in line and leave a clear space all the way across the mill above them, so that an overhead crawl with chain-block can be put in to serve all the rolls. This is a great aid in changing shells and making other repairs of heavy parts.

The thermal efficiency of a gas producer, operated in accordance with modern practice, is generally about 80%, which corresponds with the efficiency realized in the best steam-boiler practice, but the producer often shows upward of 80%, which the boiler seldom does, and the average efficiency of the producer is better than that of the boiler.

Dredging for gold in the interior of Alaska costs 80c. per cu. yd. where the gravel must be thawed ahead of the dredge. In the Seward peninsula it is estimated that if a property be sufficiently large for a 10-year life, a dredge can be operated at a cost of 30c. per cu. yd. The field for dredges in placer mining in Alaska is extremely limited.

In the chloridizing roasting of silicious silver ore (the silver occurring chiefly in the form of argentite, to a less extent as stephanite, chlorobromide and native silver) at the Palmarejo mines, Chihuahua, the loss of silver by volatilization averaged 12% in the treatment of 20,000 tons of ore, which assayed 30 oz. silver per ton. Salt and pyrite were added to the ore to the amount of 5% of each. The furnaces (White-Howell) were provided with dust chambers.

Drill steel contains 0.8 to 1% of carbon. If any of its carbon content is lost by oxidation, the steel becomes softer and dulls more quickly. This is what happens when the steel is "burned." In heating for sharpening it is therefore essential to observe that the heating be not too long continued, nor carried above a cherry red, that the air blast be not too strong, and that the bit and some of the shank be well bedded in the coal, and not merely in a thin bed of hot cinder.

The standard practice in the equipment of electric power stations is fast coming to be the use of steam-turbine driven units of large size. The steam turbine has also been introduced into mining work. Its advantages over the reciprocating engine are not sufficient to cause it to be substituted for the reciprocating engine in existing plants, but it is chosen in ordering new equipment. The steam turbine does exceedingly well to reach an economy of 12 lb. of steam per h.p.-hour, equivalent to approximately 1.25 lb. of coal, while the modern gas-engine

of large size can produce a brake horsepower with a gas consumption of about 8,700 B. t. u., or about 0.75 lb. of coal per h.p.-hour, allowing for losses in the producer.

The smallest size of air drill, 2¼ in., is called the "baby drill," or one-man drill, because it can be readily handled by one man. The sizes of drill in commonest use are the 3⅛ in. and 3¼ in. According to a recent report, there were in use in 101 mines of the Transvaal 2,355 drills, of which 70% were 3¼ in. When the holes are deep and the drilling hard, the 3⅛-in. drill is likely to be preferable. In shaft sinking in syenite, at the Alaska-Treadwell mine, it was found that the number of feet drilled with the 3⅛-in. size was 30% more than with the 3¼-in. size.

Native sulphur (both the Sicilian product and that from Louisiana) is consumed mostly (in burning to sulphur dioxide) in the manufacture of sulphite pulp for paper making. The shipping ports for sulphur are principally New York, Boston and Portland for one quotation; and Philadelphia and Baltimore for another. There are many plants for the manufacture of sulphite paper pulp in Maine, New Hampshire, New York, Michigan, Wisconsin and Canada; and there are also three in Virginia; one in West Virginia; one in Ohio, and one in South Carolina.

With the Word drill sharpener, at the Black Oak mine, Soulsbyville, Cal., one man sharpens an average of 50 drills per hour, with less than one-half the fuel required in hand work. The saving of the machine over hand labor was \$1,738.50 in wages and \$183 in coal, a total of \$1,921.50, approximately 36,000 drills having been sharpened. By a change in the dies the machine will sharpen hand-drills as well as machine-drills. The life of a bit sharpened by machine is longer than when done by hand, the bits being better formed and more compact, beside taking a better and more even temper.

It is a common experience for assayers in dry climates to have much difficulty with their delicate button balances. In many Western States, simply brushing the glass accidentally, as in dusting it, may so charge the instrument with static electricity, that all weighing is impossible. Indeed, sometimes, as in a wind storm, the air friction on the case will cause the rider to be utterly unmanageable; and passing the handkerchief over the case will make the rider jump about like a pithball on an electroscope, and for the same reason, even throwing it off the arm. This trouble may be overcome by simply wiping the case with a moist cloth, which will dissipate the disturbing electric charge. The remedy may be only temporary, but it is simple, and can be repeated quickly and as often as may be necessary.

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.

STANDARDIZATION OF SCREENS.

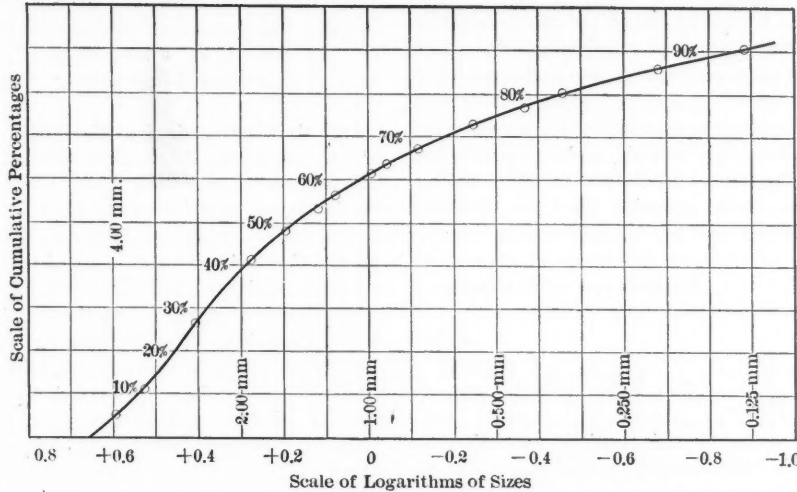
The Editor:

Sir—Your article on 'Standardization of Screens' in the JOURNAL of June 15, 1905, introduces a question of importance to mining engineers in the laboratory study of mill products. Taking Mr. McDermott's questions in order, I submit a

variation of actual from nominal mesh. The examples given herewith illustrate this:

Nominal Mesh.	Maker's	Actual Mesh
		by Count.
24	23 by 23.5
60	56 by 58
80	72 by 68
100	101 by 102
120	116 by 120

The comparative measurements, given herewith, afford another illustration. The table shows the calculated size of opening according to the maker's catalogue, and the actual average size of the opening as



few suggestions in discussing the subject.

1. No doubt the lack of uniformity, in the definition of grading by screen sizes, renders well nigh meaningless most published sizing records in which the precise aperture in the testing screen is not stated. A glance at the sizes in Tables A and B illustrates this point. They show two sets of sizing screens in which the apertures in the same mesh numbers differ from 10 to 40%. Any records, therefore, in which only mesh numbers are stated have no comparative interest. I propose to show, however, that if the sizes of apertures are known, whatever they may be, we may make definite analytical comparisons.

2. The records should certainly state whether the screening has been done wet or dry; also other information to indicate the degree of precision to which the work has been carried. In dry screening on woven wire, the size of the sample and the time of shaking and jarring are important factors. To obtain results significant in the first place of decimals, much care is necessary; and on the finer hand-screens one must shake vigorously as long as ten minutes with samples weighing no more than 200 grams.

3. A standard series of sizes is desirable; but, however desirable, such a series is probably impracticable. This opinion is based on the difficulty experienced in getting uniform weaving of wire cloth. The deviation of measured, from calculated, size of hole may result in part from irregularity in the drawing of the wire, but more important in its effect is the

measured by a microscope micrometer, both on a sample of the cloth and on the piece furnished by the makers to duplicate the sample.

COMPARATIVE MEASUREMENTS OF OPENINGS IN WOVEN-WIRE CLOTH.

Nominal Mesh.	Calculated size of Opening.	Actual Measurement of Openings.	
		Sample.	Piece Furnished by Makers to Duplicate Sample.
40	0.344 mm.	No Sample	0.371 mm.
60	0.244 "	" "	0.270 "
100	0.144 "	0.172 mm.	0.158 "
120	0.122 "	0.134 "	0.119 "

NOTE.—The wires were not counted. The sizes are averages of from 20 to 72 measurements.

Whatever may be the size of aperture in the testing screens (provided only that the sizes are known and the ratio between successive sizes is not too great), the resulting data may be expressed graphically in a plotted curve. This may be compared directly with similar records of other samples, even though they were tested with a different set of sieves. Or, if desired, the plotted curve may be used as a means of translating the sizing record in tabular form to any other set of standard or arbitrary sizes.

To illustrate this I present herewith a sizing record, Table A, made with a set of testing screens of known aperture, a curve constructed from these data, and Table B showing the same sizing record translated to Mr. McDermott's suggested standard. In the diagram the logarithms of the sizes are plotted instead of the sizes themselves, and the points on the

curve are given by plotting the total percentage resting on each screen; this is called the cumulative percentage, and the curve 'cumulative logarithmic.' In spite of the formidable name, the construction of the curve and its use are simple and

TABLE A. Sizing Record.

Nominal Mesh Number.	Measured Size of Opening, mm.	Logarithm of Size.	Percentages.	Cumulative Percentages.
On 4 mesh	5.30	+0.724	0	0
8 "	3.93	+0.595	5.4	5.4
8 "	3.36	+0.524	5.8	11.2
8 "	2.57	+0.410	15.7	26.9
10 "	1.89	+0.278	14.7	41.6
12 "	1.57	+0.197	6.3	47.9
14 "	1.31	+0.118	5.2	53.1
16 "	1.20	+0.079	3.1	56.2
18 "	0.980	+0.009	5.2	61.4
20 "	0.907	-0.042	2.1	63.5
24 "	0.762	-0.118	3.7	67.2
30 "	0.566	-0.247	5.7	72.9
40 "	0.427	-0.370	3.9	76.8
50 "	0.351	-0.455	3.3	80.1
60 "	0.277	-0.558	—	—
80 "	0.206	-0.686	5.8	85.9
100 "	0.137	-0.863	—	—
120 "	0.130	-0.886	4.5	90.4
Finer.....			9.2	99.6

easily understood if once tried. The use of the logarithms of the sizes permits the presentation of the entire range of sizes in one figure without changing the scale of the drawing for coarse and fine sizes. The logarithms need be looked up only once and recorded as a part of the tabular statement of the measured sizes of the sieves of the testing outfit.

4, 5 and 6. In view of the indefiniteness of mesh number, it does not serve to define sizes for laboratory testing. No doubt Mr. McDermott is right in his statement

TABLE B. Sizing Record to Mr. McDermott's suggested standard. Translated from Table A by means of the Sizing Curve.

Maker's Nominal Mesh Number.	Calculated Size of Opening, mm.	Logarithm of Size.	Cumulative Percentage Resting on Plotted Curve	Percentages by Difference.
8	1.7526	+0.244	44.5	44.5
10	1.3208	+0.121	53.8	9.3
12	1.2014	+0.080	56.3	2.5
14	1.0015	0.000	61.2	4.9
16	.8610	-0.065	64.8	3.6
18	.7559	-0.122	67.4	2.6
20	.6858	-0.164	69.3	1.9
22	.6365	-0.196	70.7	1.4
25	.5562	-0.255	73.0	2.3
28	.5258	-0.279	74.0	1.0
30	.4902	-0.310	75.0	1.0
35	.4006	-0.397	77.9	2.9
40	.3353	-0.475	80.3	2.4
45	.2901	-0.538	82.1	1.8
50	.2438	-0.613	84.2	2.1
60	.2073	-0.683	86.0	1.8
70	.1852	-0.732	87.3	1.3
80	.1651	-0.782	88.3	1.0
90	.1501	-0.824	89.3	1.0
100	.1422	-0.847	89.8	0.5
150	.098	-1.009	93.0	3.2
200	.0762	-1.118	—	—

that the mesh number represents a fairly definite conception in the minds of engineers, which results from continued use. All things become familiar by use, and screen sizes expressed either in millimeters or inches will in time become equally familiar.

I would retain mesh number only as a secondary and general description, to be used until it is dropped, by common usage, when all shall have become familiar with the notation of actual measured size.

Example: Standard size, 0.500 mm. (30 mesh). 30 mesh in Table A, 0.566 mm.; in Table B, 0.490 mm. Catalogue of one maker lists 30-mesh wire cloth with openings from 0.368 mm. to 0.655 mm.

7. I am used to the millimeter for the measurement of screen openings; that unit has an inherent advantage for small sizes because the decimals are less awkward than when the inch is the unit.

8. I consider it better to choose for a standard an arbitrary scale of sizes which are in true geometrical progression. Prof. Richards ('Ore Dressing,' p. 1138) recommends the Rittinger sieve scale, which ranges up and down from 1 mm. by doubling or halving the area of successive holes. For exact scientific work, Richards advises the use of a scale in which the ratio between successive dia-

eters is $1.189 (= \sqrt[4]{2})$ instead of Rittinger's $1.414 (= \sqrt[2]{2})$. This gives just

twice as many sizes as the Rittinger scale, and sieves approximating this ratio are particularly useful in testing products which have already been sized in the mill process.

Table C gives the Richards-Rittinger scale from 2 mm. downward. The mesh numbers are chosen, as explained, for descriptive purposes only. The last two columns give cumulative percentages as

TABLE C.
Sizing Record to the Richards-Rittinger scale.
Translated from Table A by means
of the Sizing Curve.

Arbitrary Size, mm.	Mesh Number Descriptive of Size.	Logarithm of Size.	Cumulative Percentages Read from the Plotted Curve.	Percentages by Difference.
2.00	7	+0.301	39.1	39.1
1.68	8	+0.225	46.0	6.9
1.41	10	+0.150	51.5	5.5
1.19	12	+0.075	56.6	5.1
1.00	14	0.000	61.2	4.6
0.841	16	-0.075	65.2	4.0
0.707	20	-0.151	68.8	3.6
0.595	25	-0.226	71.8	3.0
0.500	30	-0.301	74.7	2.9
0.420	35	-0.376	77.2	2.5
0.354	40	-0.452	79.5	2.3
0.297	45	-0.527	81.8	2.3
0.250	50	-0.602	83.9	2.1
0.210	60	-0.677	85.8	1.9
0.177	80	-0.753	87.7	1.9
0.149	100	-0.828	89.4	1.7
0.125	125	-0.903	91.0	1.6
0.105	150	-0.978	92.5	1.5
0.0883	175	-1.054		
0.0742	200	-1.129		

read from the curve and the percentage resting on each size. It is important to note the uniform gradation of the numbers in the percentage column. This gradation is not an accident, but is the rule in a sizing record in which the successive sizes are in geometrical progression.

The irregular gradation of percentages in Tables A and B is due, not to the character of the sample, but to the irregular spacing of the sizes.

9. Sizing by settling in beakers will permit the determination of very fine sizes, and Richards ('Ore Dressing,' p. 1146) describes a method in which quartz-sizes down to 0.012 mm. were determined. A more detailed description of the same experiments appears in my paper ('The Plotting of Sizing Tests,' *Trans. Am. Inst. Min. Eng.*, Atlantic City meeting, February, 1904).

13. With the adoption of a standard method and scale of plotting, the sizing curve will probably prove to be the most satisfactory means for permanent record. It represents accurately the distribution of sizes in the sample, and its form is not in the least dependent on the testing sieves used, provided they are carefully measured and the ratio between successive sizes is not too great.

W. SPENCER HUTCHINSON.

Boston, Mass., June 30, 1905.

SLAG CALCULATION.

The Editor:

Sir—I note with much interest the paper in this JOURNAL (June 29, 1905) on "A Slag Calculation," by C. S. Palmer; and with equal pleasure the comment on the same by "W. R." in a later issue (July 22, 1905). The first paper carries information that needs no apology as regards any betrayal of professional secrets. The mode of calculation (as remarked by "W. R.") does proceed in the direction of calculating from a known charge to the slag composition, rather than from a desired slag composition to an unknown charge. "W. R." is also right in stating that the method suggested by Furman is clear and simple and practical. But here a question arises as to the possibility of calculating a charge for a desired slag to which any untried furnace will be promptly and regularly obedient, having special reference to the copper-matte smelting furnace. Take the very first fact to ascertain about any blast-furnace—the amount of sulphur burnt off; how can this be ascertained for any charge without trial? It may run anywhere from 65% to 85%. Then when this is ascertained and a fusible slag is coming through, how can the forty-and-one conditions be ascertained, adjusted and controlled without experience? So that practically it will come back to that outlined by Mr. Palmer, which starts from the actual behavior of a furnace. Of course, in starting up a furnace, one must figure toward a desired point, say, a 40% silica slag; but after once, starting, will it not be easier to vary the charge and to figure back from the iron, the lime and the silica used, to the slag made?

SMELTER.

Pittsburg, July 24, 1905.

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.

THE METRIC FALLACY.

The Editor:

Sir—It may be a little late to reply to the letter on "arithmetic arguments," by Caldwell Harpur, which appeared in your issue for June 1, but a long absence from home has prevented my seeing it until now.

The showing made by Mr. Dale and myself, regarding the saving of time in primary education by the adoption of the metric system, was intended as a reply to the statements made by the metric advocates before the House Committee on Coinage, Weights and Measures of the Fifty-seventh Congress. At the hearings of that committee Dr. S. W. Stratton said:

"Careful estimates made by experienced educators place the time saved by the adoption of the metric system from two-thirds to one year in the life of every school child."

This statement can only be understood as it was plainly intended to be understood—that the saving is to be from two-thirds to an entire year of school work, and the statement has been repeated over and over again, and always in words which bear no other construction. By consulting the official schedule of the curriculum of the public schools of New York city, I find that the time devoted to the subject of arithmetic aggregates less than seven months, and, as nearly as it can be determined, that the time devoted to denominate numbers and weights and measures aggregates less than six weeks. This plainly makes the contention of the metric advocates absurd, and their line of retreat is a claim that they never meant what they plainly said, but that instead of a saving of a year of school work, they meant a saving of the time devoted to arithmetic during a year of work.

Whatever they may have meant, the facts are now clear, and the margin of possible saving is so small as to render its trumpeting and its trumpeters alike ridiculous.

Nor will it do to set up the claim that the estimates of these experienced educators relate to conditions in England. The statement was made before the American House committee, and as applying to American schools and to American conditions. The statement must stand in its original words, with its original meaning and in its original application, and its disproof, being complete, must stand also.

F. A. HALSEY.

New York, July 25, 1905.

THE COPPER ORE OF BUTTE.

The Editor:

Sir—Contrary to the statement of Mr. Ingalls, in his article on the cost of mining (this JOURNAL, July 15, 1905), it is an interesting fact that chalcopryite is a rarity in Butte, instead of one of the ore minerals (see Weed, *Bull.* 213, U. S. G. S., p. 175; and H. V. Winchell, *Bull. Geol. Soc. Am.*, Vol. XIV, pp. 269-276). In a residence of seven years here, constantly studying the mines and watching a production of more than three million tons of ore per annum, I have not seen a ton of chalcopryite altogether.

H. V. WINCHELL.

Butte, Mont., July 18, 1905.

[We are indebted to Mr. Winchell for his correction of this error, though we knew that chalcopryite is a rare mineral at Butte. The fact illustrates the difficulty with which an error is eliminated from standard literature. The wrong statement appeared not only in earlier publications of the *Trans.* of the Am. Inst. Min. Eng., but also in those of the United States Geological Survey; corrections of course appeared in later papers.—EDITOR.]

MILL TAILING FOR CONCRETE BLOCKS.

The Editor:

Sir—Noting the editorial in the JOURNAL of July 15 on concrete blocks, it may be worth mention that such blocks are being manufactured from mill tailing at Wallace, Idaho.

W. A. S.

Butte, Mont., July 22, 1905.

Melting Steel With Cast Iron.

R. P. Cunningham, in *Transactions of the American Foundrymen's Association*, June, 1905, pp. 8-10, states that by a judicious use of steel scrap, castings can be produced of any required strength, but that close attention is required in charging the proper quantities of materials, fuel and fluxes. For thin castings, only a little steel can be used; for thick, heavy castings much more is permissible. It is an advantage to employ a little ferro-silicon and ferro-manganese unless the iron used contains manganese and silicon in fair proportions. The results of 18 casts with different percentages showed that not more than 33% of steel could be used with advantage, as above this proportion there was excessive shrinkage and only a slight gain in strength. For ordinary work 25% of the steel is recommended. The bars cast in the middle of each heat were always the best.

W. E. Hunter and J. S. Myers, in *Engineering News*, July 27, 1905, describe a method of computing the volume of conical piles of material enclosed by walls at the base, which is very useful in estimating the content of heaps of ore or coal. Reference should be made to the original.

The American Institute of Mining Engineers.

BY E. JACOBS.

Continuing our report, in the evening of July 1, a public reception, under the auspices of the Government of British Columbia, was held in the legislative hall of Parliament buildings, where the guests were received by the Lieut.-Governor. There was a large gathering, many ladies and gentlemen attending to do honor to the visitors. Besides the A. I. M. E. party, Captain Miles and several other officers of the U. S. S. *Boston*, then at Victoria, were present. Among the leading Victorians were His Honor the Lieut.-Governor; Hon. Richard McBride, premier and minister of mines; Hon. F. J. Fulton, provincial secretary; Hon. R. F. Green, commissioner of lands and works; Hon. R. G. Tatlow, minister of finance; Hon. A. E. Smith, United States consul; His Worship the mayor of Victoria (Mr. G. H. Barnard); S. J. Pitts, president of the Victoria Board of Trade, and many others.

Sunday was spent in various ways—church-going, driving, social calls, etc. A few visited the Vancouver Portland Cement Co.'s cement manufactory, at Tod inlet, a few miles from Victoria. On Monday there was a steamer excursion among the islands off the southeast coast of Vancouver island, this having been arranged by the city council, board of trade and others, as the citizens' part in entertaining the visitors; they were accompanied on the day's outing by about 300 residents.

The Tyee Copper Co., Ltd., was the host on Tuesday, July 4, the Company's general manager, Clermont Livingston, having arranged for a special train to convey the visitors to Duncans; this is 40 miles distant from Victoria, on the Esquimalt & Nanaimo railway. From this station they were driven 11 miles to the Company's Tyee mine, on Mt. Sicker. Those who preferred to go to the Company's smelting works were taken 20 miles farther by rail. At the mine, the superintendent, E. C. Musgrave, conducted a small party of mining engineers, including Messrs. Alfred H. Brooks, geologist in charge of the United States division of Alaska mineral resources; D. W. Brunton, and E. V. d'Invilliers; they inspected as much of the mine as could be seen in two hours. The time was spent in examining particular features of the geology and ore occurrences. Others also went underground, but most of the party were content to watch the operations at the surface. Those who proceeded to the smelter at Ladysmith were entertained by the manager, Thos. Kiddie, and his assistant, W. J. Watson; these gentlemen and the provincial mineralogist each conducted a party through the works. The visiting metallurgists were particularly interested in the methods of

handling the fines, in the making and burning of the bricks therefrom, and in the roasted product. Attention was incidentally given to the movable bridges, with their economic and efficient working in building up the roast-piles (50 ft. long by 40 ft. wide by 8 ft. high, and containing an average of 350 tons). The sampling mill is equipped with a complete sampling plant, including Snyder automatic samplers, crushers, screens, rolls and grinders, and a novel and effective contrivance for dividing the final ground sample. The hot-blast system, already referred to, was closely examined. This had been in practical use only a few days, following experiments on a smaller scale; but, in that short time, it has demonstrated its effectiveness in a substantial reduction in the coke used, in an increase of raw-ore charge in the smelting, and in a general betterment of conditions in the blast furnace. Further, a cleaner slag is produced than when cold-air blast and more burnt ore were used.

On Wednesday morning, July 5, the business session was resumed. It was opened by an interesting address by W. S. Ayres, of Banff, Alberta, "On the Deutschman Cave" (at Ross peak, near Glacier, and about 10 miles on the British Columbian side of the boundary line between that province and Alberta). A preliminary examination of this cave for the Canadian government had been made five weeks previously by Mr. Ayres. The address was illustrated by lime-light views. In a lengthy report made to the Government, Mr. Ayres described the ascent to the cave, which is 1,900 ft. above Ross peak water tank, and some 8,000 ft. distant from the railway.

D. W. Brunton, of Denver, Colo., followed with a paper on "An improvement in mine maps." This advocated the making of such additions to the ordinary mine-survey map as to render it a complete statement of the amount and value of ore in sight at any particular time. Comparatively little extra labor is involved in this undertaking, since the larger and more expensive part of the work has already been completed when the mine has been surveyed and mapped. The necessary additions consist in working out and platting on the maps the geology of the mine, as exposed in the workings, in such a manner that the geological survey may be of daily use in the development and operation of the mine. Much detail was given and numerous illustrative drawings were described. The opinion was expressed that every company operating large mines would find it advantageous to employ, as a separate official, a competent mining geologist; it should be his duty to follow continuously all workings and surveys. The proper man for this work is one who has nothing else to do, and who will do this one thing with enthusiasm and technical knowledge.

At this point an adjournment was

taken that the provincial mineral museum might be inspected. A glass model of the Highland mine, Ainsworth, West Kootenay, was exhibited by the manager, Mr. Norman Carmichael.

At the afternoon meeting, W. M. Brewer gave an address on "A Reconnaissance of the Coast Line of British Columbia and Southeastern Alaska." This included: (1) A generalized description of the coast line with reference to to fiords, islands, and its prevailing rugged character; (2) the general distribution of copper ores along the coast (at Howe sound, Texada island, Princess Royal island, Gribbell island, Prince of Wales island, the Juneau district, and in the Whitehorse copper belt); and (3) a general description of the country from Skagway to Whitehorse rapids, with reference to the geology of the neighborhood of the rapids. At the conclusion of this address the meeting was formally declared closed.

The final public gathering at Victoria was a garden party and reception at Government House. The visitors left Victoria after midnight, on the steamer *Princess Victoria*, for Vancouver, where Thursday, July 6, was spent; at 10 P. M. a start was made for "the golden north," on board the C. P. R. steamer *Princess May*.

The Production of Nails.

The statistics collected by the American Iron & Steel Association show that in 1904 there was again a large increase in the production and use of steel-wire nails; while the making of cut nails continues to be a declining industry. The association's figures of the production of iron and steel-cut nails and cut spikes embrace only standard sizes of nails and spikes cut from plates. They do not include railroad and other forged spikes, machine-made horse-shoe nails, cut tacks, nor hob, clout, basket, shoe or other small sizes of nails. The total production for two years past was as follows, in kegs of 100 lb. each:

	1903.		1904.	
	Kegs.	Per ct.	Kegs.	Per ct.
Cut nails.....	1,435,898	13.0	1,283,362	9.7
Wire nails.....	9,631,661	87.0	11,926,661	90.3
Total.....	11,067,554	100.0	13,210,023	100.0

This shows an increase of 2,295,000 kegs, or 20.9%, in wire nails, accompanied by a decrease of 152,531 kegs, or 10.6%, in cut nails; the total increase being 2,142,469 kegs, or 19.3%. The wire nails were all made of steel. Of the cut nails, 887,675 kegs, or 69.2%, were made from steel plates, and 395,687 kegs, or 30.8%, from iron plates. In 1904, therefore, only 3% of all the nails were made from iron plates. Ten years ago about half the total production of nails was cut nails; and more than three-quarters of that description were made from iron plates.

A new mananese mineral, purpurite, is reported from North Carolina and California. It is a hydrous manganic phosphate.

Pig-Iron Production.

In our last issue we gave, from advance sheets, the statement of pig-iron production compiled by the American Iron and Steel Association, for the half-year ending June 30, 1905. We add some interesting details given in the report.

The total production of pig iron by States was as follows, for 1904 and the first half of 1905:

	1904.		1905.
	1st Half.	2d Half.	1st Half.
Mass. and Conn....	5,567	6,504	7,636
New York.....	250,980	354,729	550,208
New Jersey.....	121,294	141,000	165,991
Pennsylvania.....	3,713,867	3,930,454	5,226,691
Maryland.....	135,416	158,025	156,334
Virginia.....	186,037	124,489	240,672
N. C., Ga. and Tex.	44,342	31,344	25,752
Alabama.....	800,256	653,257	743,547
West Virginia.....	103,153	167,792	149,016
Kentucky.....	17,516	19,590	32,793
Tennessee.....	165,883	136,113	195,757
Ohio.....	1,540,743	1,437,186	2,181,058
Illinois.....	798,221	857,770	979,157
Michigan.....	138,744	94,481	147,953
Wis. and Minn.....	104,437	104,967	184,234
Mo., Colo., Oregon and Washington.	46,982	104,794	176,376
Total.....	8,173,438	8,323,595	11,163,175

The production of bituminous coal and coke pig iron in the first six months of 1905 was 10,162,488 gross tons; of anthracite and coke mixed, 815,028 tons; of anthracite alone, 15,147 tons; of charcoal iron, 170,512 tons.

The production of spiegeleisen ferro-manganese, ferro-phosphorus, and ferro-bessemmer in the first half of 1905 was 129,040 gross tons, against 105,882 tons in the last half of 1904 and 114,510 tons in the first half of 1904. The production of ferro-manganese alone in the first half of 1905 amounted to 35,221 tons, against 30,535 tons in the last half of 1904 and 26,541 tons in the first half of that year. The production of spiegeleisen alone in the first half of 1905 amounted to 90,113 tons, against 74,705 tons in the last half of 1904 and 87,665 tons in the first half of that year. The production of ferro-phosphorus in the first half of 1905 amounted to 1,206 tons, against 642 tons in the last half of 1904 and 304 tons in the first half. In the first half of 1905 there were made 2,500 tons of ferro-bessemmer pig iron, but in neither half of 1904 was iron of that character reported to the association.

The whole number of furnaces in blast on June 30, 1905, was 294, against 261 on Dec. 31, 1904, and 216 on June 30, 1904. The number of furnaces idle on June 30, 1905, was 138. Of the active furnaces on June 30, 1905, 229 used bituminous fuel, 39 used anthracite coal and coke mixed, 3 used anthracite coal alone, and 23 used charcoal alone.

During the first six months of 1905 the number of furnaces actually in blast during a part or the whole of the period was 334, as compared with 297 during the last half of 1904 and 295 during the first half of that year.

On June 30, 1905, there were 11 furnaces in course of construction, of which 10 will use bituminous fuel when completed and one will use charcoal. Of the bituminous furnaces two are being built

in New York, two in Pennsylvania, one in Virginia, one in Tennessee, one in Alabama, two in Ohio, and one in Colorado. The charcoal furnace is being built in Michigan.

The statistics of unsold stocks do not include pig iron sold and not removed from the furnace bank, nor pig iron manufactured by rolling-mill owners for their own use, nor pig iron in the hands of consumers. The stocks which were unsold in the hands of manufacturers or their agents or were under their control in warrant yards or elsewhere on June 30, 1905, amounted to 480,319 tons, against 408,792 tons on Dec. 31, 1904; 623,254 tons on June 30, 1904, and 591,438 tons on Dec. 31, of last year.

On June 30, 1905, the American Pig Iron Storage Warrant Company had 88,900 tons of pig iron stored in its yards, of which 29,950 tons were controlled by the makers, leaving 58,950 tons in other hands. Adding these 58,950 tons to the 480,319 tons reported above gives a total of 539,269 tons on the market on June 30, 1905, against 446,442 tons on Dec. 31 of last year.

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.

Diamond Drilling.

I should like to know why black diamonds are used for core drilling? Are they not very expensive and cannot the same work be done with steel bits?—S. B.

Answer.—Black diamonds are used instead of the gems, because they are decidedly less expensive. However, the black diamond itself is expensive, and it constitutes one of the chief items of cost in diamond drilling. Steel bits are employed under certain circumstances, as for example in drilling at Lake Superior, where masses of copper are likely to be encountered, which would tear the diamonds out of the bit; but ordinarily steel bits are not sufficiently hard. In connection with the Davis calyx drill, however, a specially hardened steel shot is employed as the cutting agent. This drill is successful in certain kinds of work, and has the advantage of bringing out a larger core than the ordinary diamond drill.

Lime Scale in Water-Jackets.

I am troubled with the formation of lime precipitates or scales in the water jacket of our copper furnace. Can you give a remedy, or tell me how to avoid

this difficulty by precipitation before the water enters the jacket?—F. M.

Answer.—The usual practice in the case of supply of hard water is to let the jackets scale up, burn out, and replace them. The only amelioration is to close down the furnace and clean out the jackets through the hand-holes, which will be necessary with more or less frequency according to the aggravation of the trouble. Deposits often occur at the bottom of the jacket, causing it to burn at that point. The condition of the jacket-bottom can be ascertained by testing with a sulphur match, holding it firmly against the jacket, head on, about 1 in. above the bottom. If the match ignites within a few minutes, the presence of a crust is indicated, the iron under that condition transmitting sufficient heat from the interior of the furnace, which it will not do if there be free circulation of water.

If the trouble is unusually serious, the water might be softened, which is good practice in the use of hard water for steam-generation, wherein the objection to scaling is analogous to the condition in furnace jackets. Lime, present in water as the sulphate, can be precipitated by means of sodium carbonate. The cost of the process is dependent of course upon the hardness of the water, the quantity to be treated and other conditions. The quantity of water required by a copper matte smelting furnace is not large, being only about 30 gal. per min. for a furnace of 36 by 96 in. hearth area. We are unaware, however, of any smelter who is softening water preliminary to using it in the jackets.

The subject of water-softening is discussed in an excellent article in the *Journal of the Society of Chemical Industry*, April 29, 1905, pp. 392-395.

Another expedient, which is worth consideration because of its simplicity, is a cooling and re-use of the jacket-water, whereby after the first precipitation of scale there would be only such as might come from the comparatively small quantity of fresh water added to make good the loss by evaporation. This would have the effect of materially reducing the average hardness of the water used. A cooler constructed entirely of wood is described in Hofman's 'Metallurgy of Lead,' fifth edition, p. 249, and in *Transactions of the American Institute of Mining Engineers*, XXV, pp. 43-50. This was designed for use in connection with a 42 by 120 in. matte-smelting furnace, and cooled about 200 gal. of water per minute from nearly boiling down to the temperature of the air. The cost of the apparatus was \$310, about 14,500 ft., board measure, of lumber being required in its construction, the material and carpentry coming to \$20 per M. The apparatus is so simple that it can be built by a common carpenter anywhere.

Abstracts of Official Reports.

Calumet & Hecla Mining Company.

The report of this company for the year ending April 30, 1905, is brief and unsatisfactory, as usual. The production of copper was 85,644,401 lb., an increase of 9,034,256 lb., or 11.8% over the previous year. The assets and liabilities at the close of the year were as follows:

ASSETS.	
Cash at mine office.....	\$133,047
Cash at New York office.....	15,000
Cash at Boston office, exchange, copper at 15c. per lb and mineral at 6c. per lb.....	6,496,133
Insurance fund (specially invested).....	927,034
Bills receivable at Boston and mine.....	590,212
Employees' aid fund.....	10,991
Total assets.....	\$8,172,417
LIABILITIES.	
Drafts in transit.....	\$111,668
Bills and accounts payable at Boston and mine.....	313,560
Mill extension, contracts for machinery, electric power plant, Kearsarge lode exploration, changes at smelting works, etc.	603,000
Total liabilities.....	\$1,028,228
Balance of assets.....	\$7,144,189

The balance of assets shows an increase of \$561,150, over the report for April 30, 1904. This increase was chiefly in cash and copper on hand.

President Agassiz says in his report: "During the past year we produced mineral equal to 43,090 (short) tons of copper, as against 41,612 tons in the previous year. Our product of refined copper was 42,822 (short) tons. For the previous year it was 38,305 tons. The price of copper has varied from 12½c. to 15½c. per lb., and is now about 15¼c. The new openings of the past year on the conglomerate belt, in the vicinity of the Red Jacket shaft have improved somewhat, especially north of the Red Jacket shaft in the 'five forties.' Work on the slope reaching into the 'five forties' has continued uninterruptedly during the year. The southern openings in the Hecla and South Hecla branches remain of about the same character.

"The work of opening three shafts on the Kearsarge lode has progressed satisfactorily, and the quality of the ground passed through in one of the shafts is promising. Since July about 75,000 tons of amygdaloid rock have been stamped from the Osceola lode. An extraction of 22 lb. of copper per ton of rock has been obtained. It is proposed to increase the product from this amygdaloid by openings from one or more of the shafts already opened on the lode.

"At Lake Linden the remodeling of the Calumet mill has been completed; the mill is running most satisfactorily, and is making a marked saving of copper as compared with the results obtained with the old machinery. This gives us now 17 heads equipped with economical milling and washing machinery. We have started the remodeling of the Hecla mill and hope to have six additional heads running on the new system by May, 1906, leaving only five heads to be remodeled in the year

1906-1907. During the past two years extensive experiments have been made upon the tailing from our mills in hope of finding some means to decrease the loss of fine copper. The progress thus far made is satisfactory.

"At the Lake Linden smelting works an addition has been made to the machine shop; one blister furnace and three refining furnaces have been rebuilt. Since July we have smelted about 1,500 tons of mineral per month from the Mohawk, Wolverine, Atlantic and Michigan mines, with excellent results as to the quality of copper produced. We have purchased the timber on about 42,000 acres of land situated in Keweenaw county.

"The expenditure of the Aid Fund during the fiscal year amounted to \$54,317. The value of the Aid Fund at cost is \$109,319."

Test of a Curtis Turbine.

The accompanying table gives results of tests made by Frederick Sargent and L. A. Ferguson on a 2,000-kw. Curtis turbo-generator. It is a four-stage machine designed in 1903, and recently changed as a result of experiments conducted during the past year. The machine as tested conforms as nearly as possible to the standard four-stage machines now being produced, but the changes made have been confined to the buckets, thus giving lower efficiency than the more lately designed machines.

TESTS OF THE TURBO-GENERATOR.

	Full Load.	¾	½	No Load.
Duration of tests, hours.....	1.250	0.916	1.000	1.33
Steam pressure (gage) lbs.....	163.3	170.2	155.5	154.5
Back pressure (absolute) in. of mercury.....	1.49	1.40	1.45	1.85
Superheat, deg. F....	207.	120.	204.	156.
Load in kilowatts....	2023.7	1066.7	555.	00.
Steam consumption per k. w. hour.	15.02	16.31	18.9	1510.5*

*Total pounds per hour.

All of the instruments were carefully tested and standardized during the trials, the electrical instruments being checked at the New York Testing Laboratory. The surface condenser showed practically no leakage. Every precaution was taken to make the tests reliable and accurate.

Shipments of Government tin from Java in 1904 amounted to 11,749 tons, as against 15,381 tons in 1903 and 10,339 tons in 1902. The quantity of private tin shipped in 1904 was 3,077 tons, as compared with 3,436 tons in 1903 and 4,405 tons in 1902.

According to a recent consular report, natural gas has been discovered at Yamachiche, Quebec. The flow started when the drill had been driven down about 280 ft., and was so strong that it forced the string of tools out of the well. Natural gas is already used for fuel at St. Genevieve, in the same district.

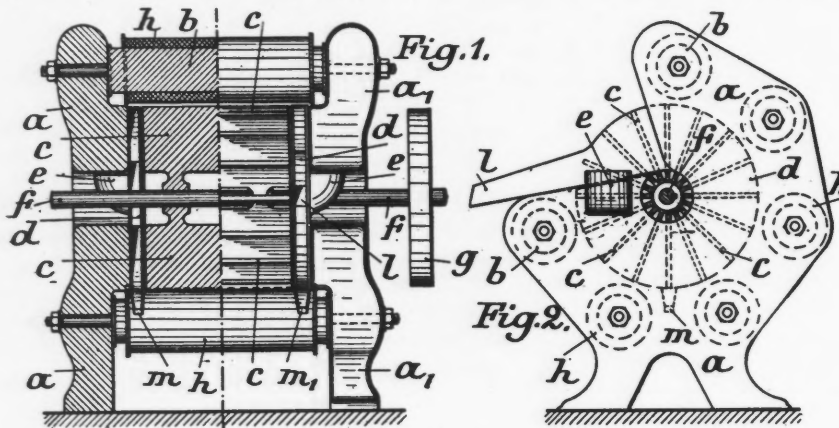
Electromagnetic Ore-Separator.

Erich Langguth, Euskirchen, Germany, has patented (U. S., 793,137) a new separator in which there is a non-magnetic screen between the material and the acting surface of the electro-magnets, which

on the rotor-plate (5). Suitable valves carry off the surplus air. The dry air insures high insulation, so that the machines may be operated with certainty in a moist, steam-laden or dusty atmosphere. This invention is of particular interest in

is at the side by a chute adjustable in height. To prevent furnace gases from penetrating to the ore-chamber, the circular edges of its floor and roof both travel in troughs of sand. Pipes with dampers regulate the supply of air to the roasting material.

The furnace is designed especially for use in connection with the Huntington-Heberlein process, and is finding employment therein.



LANGGUTH SEPARATOR.

are arranged like the spokes of a wheel. Referring to the drawing, *e* is the hopper from which the charge falls against the drum *d*; as the drum rotates the magnets are energized, and the magnetic particles form clusters adhering to the inside surfaces of the drums, opposite the ends of the armature-pieces *c*. The non-magnetic particles falling between the radials *c* go down to the discharge at *m*, while the magnetic particles are suspended until past the point *d*, where the current is cut out, and they are free to drop and discharge at *l*.

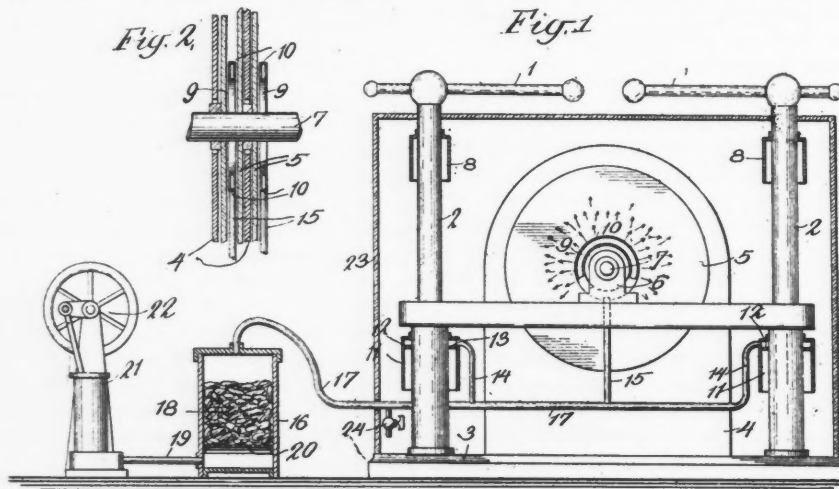
connection with the electrostatic ore separator of which Prof. Blake is the chief inventor.

Heberlein-Hommel Roasting Furnace.

Ferdinand Heberlein and W. Hommel have patented (United States No. 781,824) a rotary muffle roasting furnace, the hearth of which is a circular, rotating plate, a combustion chamber beneath it being divided into three compartments, which, as the hearth turns, successively communicate with a fireplace located at the side. Radiating partitions in these compartments extend from the periphery toward (but not to) the center; and this arrangement causes the furnace gases to travel radially inward and then radially outward to the flues; thence they are

Electrostatic Apparatus.

Lucien I. Blake, Lawrence, Kan., has patented (U. S., 792,751) an arrangement to increase the reliability of influence-machines for generating static electricity, in



BLAKE GENERATOR.

which air is forced from the pump (21), through the drier (16), which may contain calcium chloride or other suitable drying material, through the pipes (17 and 15), to the annular nozzles (9), (see Fig. 2), from which the dry air impinges

carried over the roof of the ore-chamber to exterior flues.

The material is fed through a hopper, placed slightly out of center, and is stirred by one or more angularly disposed plates located just over the hearth. The delivery

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 25, 1905.

- 795,275. PROCESS OF MANUFACTURING PORTLAND CEMENT FROM SLAG.—Carl von Forell, Hamburg, Germany, assignor to Henry Edmunds, London, England.
- 795,294. FUEL-BRIQUET AND METHOD OF MAKING THE SAME.—Michael F. Maginnis, Philadelphia, Pa.
- 795,299. GAS-FURNACE.—Patrick J. Nevins, Haverhill, Mass.
- 795,332. CHIMNEY.—Joseph Broome, Bayonne, N. J.
- 795,349. APPARATUS FOR SCREENING AND DRYING MATERIALS.—John J. Gledhill, Chicago, Ill.
- 795,404. MACHINE FOR FORMING CEMENT BLOCKS.—Bert Miller and Oliver F. Smith, Peoria, Ill.
- 795,471. ORE-REDUCING APPARATUS.—William T. Armstrong, San Jose, Cal.
- 795,488. PROCESS OF MANUFACTURING BRICK OR TILE.—Charles B. Cox, Carlton, Minn.
- 795,517. PROCESS OF PRODUCING TUNGSTEN STEELS.—Edward D. Kendall, Brooklyn, N. Y., assignor of one-half to Edward N. Dickerson, Stovall, N. C., and one-fourth to Emmet R. Olcott, New York, N. Y.
- 795,525. APPARATUS FOR PRODUCING PURE NITROGEN AND PURE OXYGEN.—Carl Linde, Munich, Germany, assignor of one-third to Charles F. Brush, Cleveland, Ohio.
- 795,534. DEEP-WELL-DRILLING MACHINE.—Mert McCain, Portland, Ind.
- 795,641. SPEED-CONTROLLING DEVICE FOR HOISTING MACHINERY.—John McGeorge, Cleveland, Ohio, assignor to the Electric Controller & Supply Company, Cleveland, Ohio, a corporation of Ohio.
- 795,643. MOLD FOR CASTING ROLLS.—Frank M. Newingham, Apollo, Pa.
- 795,667. BUSHING FOR OIL-WELL PUMPS.—William Wallace, Bakersfield, Cal.
- 795,722. MEANS FOR TRANSPORTING COAL, ETC.—James W. McKeever, Flemington, W. Va.
- 795,725. MACHINE FOR MAKING PLASTIC BLOCKS.—Charles H. Nesselroad, Stuart, Iowa.
- 795,735. FLUID-PRESSURE FEEDING DEVICE FOR ROCK-DRILLING ENGINES.—Charles H. Shaw, Denver, Colo.
- 795,770. COAL-LOADING APPARATUS.—John L. Howard, Oakland, Cal.
- 795,771. PNEUMATIC DISCHARGING DEVICE FOR LIQUID-CONTAINING VESSELS.—Isaac W. Heysinger, Philadelphia, Pa.
- 795,774. ORE TREATING AND FILTERING APPARATUS.—Theodore D. Jones, Denver, Colo.
- 795,790. PROCESS OF PRODUCING GAS.—Carleton Ellis, New York, N. Y., assignor to Eldred Process Company, New York, N. Y., a corporation of New York.
- 795,801. MACHINE FOR ROLLING RAIL-JOINTS OR FISH-PLATES.—Richard B. Charlton, Milwaukee, Wis., assignor to Continuous Rail Joint Company of America, a corporation of New Jersey.

Personal.

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

Mr. Samuel Newhouse was in Denver last week on his way to Utah.

Mr. Anton Eilers, of the American Smelting & Refining Co., is in Mexico.

Mr. Karl Eilers, of the American Smelting & Refining Co., is at Salt Lake city.

Mr. Ernest P. Dargin, of Tepic, Mexico, spent a few days in Denver last week.

Dr. J. S. C. Wells, professor of chemistry in Columbia University, is in Montana.

Mr. William Griffiths, of West Pittston, Pa., has gone to Alaska to examine some coal deposits there.

Mr. R. D. O. Johnson, of St. Louis, visited New York last week, on his way to Panama on professional business.

Mr. William E. Parnall has resigned his position as manager of the Bigelow group of mines in the Lake Superior copper region.

Mr. A. L. Queneau, of South Bethlehem, Pa., has been appointed consulting engineer to the New Jersey Zinc Company.

Mr. Charles McCrery, chairman of the board of directors of the Woodward Iron Co., will leave shortly on a trip to Europe.

Prof. Stephen M. Dixon, of Dalhousie College, Nova Scotia, has been appointed professor of civil engineering at Birmingham, England.

Mr. T. A. Rickard, after spending a few days in Denver, left for the Pacific Coast a few days ago, and is in San Francisco at present.

Mr. J. M. Janeway, Jr., of Princeton, N. J., has been appointed general manager of the Mineral Point Zinc Co., of Wisconsin and Chicago.

Mr. R. K. Painter, of Dumfries, Va., has gone to the State of Jalisco, Mexico, to examine some mining properties for Baltimore and Philadelphia parties.

Mr. H. W. Hardinge, of Denver, Col., arrived at New York from London on the *Campania*, July 21, and sailed for South America, July 27, where he has a professional engagement.

Mr. J. H. Adams, assistant general manager of the Southern division of the Republic Iron & Steel Co., accompanied by his family, has left Birmingham, Ala., for a tour in Europe. The trip will take up about six weeks.

Mr. S. J. Gormley, who has had direction of the blast-furnaces at the reduction works of the Amalgamated Copper Co., Anaconda, Montana, becomes superintendent of the Bingham Copper Co.'s smelters at West Jordan, Utah, on August 1.

Mr. J. M. Franklin, superintendent of coal mines with the Tennessee Coal, Iron & Railroad Co., has resigned and will return to Pennsylvania. Mr. E. S. Ball, who was appointed general manager of mines for the Tennessee Co., will be in charge of both coal and ore mines.

Mr. C. E. Walton, for some time past superintendent of the Lackawanna Steel Co.'s Brotherton and Sunday Lake mines, on the Gogebic range, has been appointed assistant general manager of the company's mines in Michigan. He is succeeded in his previous position by Captain John Hooper.

Mr. G. W. Shirling, superintendent of the Coalburg mines of the Sloss-Sheffield Steel & Iron Co., resigned August 1 and will go into the mining business for himself in this State. Mr. Shirling has been with the company and its predecessors for 23 years. He will be succeeded at the Coalburg mines by Sumter Lee, Jr.

Professor W. P. Blake, after long service, has resigned his position as professor of geology in the University of Arizona at Tucson. He is succeeded by Mr. C. F. Tolman, Jr., recently at Saria, in Sonora, Mexico. Mr. H. Vincent Wallace takes Mr. Tolman's place as manager of the Sombreretillo Mining Co., at Saria.

Mr. R. D. Hunter, formerly district manager of the Sullivan Machinery Co., at Denver, Col., has been appointed general sales manager of the company, with headquarters in the Railway Exchange Building, Chicago. Mr. W. P. J. Dinsmoor, for several years connected with the Denver office, succeeds Mr. Hunter as district manager. Mr. Matt Brodie, formerly of the Pittsburg office, has been appointed local manager of the Salt Lake branch.

A complimentary banquet was tendered by the Central Lead Co. at the St. Louis Country Club, July 25, to Mr. Arthur Thacher, the president and manager of the company. It was to celebrate, in a happy manner, the close of the successful career of this very prosperous company, which, after distributing 82 dividends during the 12 years of Mr. Thacher's management, has just been sold to the American Smelters' Securities Co. for \$1,500,000. When Mr. Thacher took charge of the company in 1892 it was scarcely more than a prospecting proposition, on which about \$25,000 had been expended on its development. Partly through raising additional capital, but mainly from the sales of ore, he equipped the property with a complete modern plant of 500 tons daily capacity, and with the proceeds of the sale and dividends, the fortunate stockholders who joined him in its pioneer days have averaged a return of 5% per month for the 12 years of Mr. Thacher's very successful management. In view of its unprecedented financial and technical success, as the company had to

struggle through the financial troubles of the 1893 panic and the lead depression, the company decided to celebrate the closing of its career by presenting him with a gold watch and chain. Mr. F. H. Ludington, the vice-president, made the presentation speech, while Mr. J. C. Howe, the treasurer, acted as toastmaster for the occasion. Some 21 covers were laid, and among the distinguished guests was Governor D. R. Francis, who, in a brief toast, condoled with himself for failing to exercise an option that he held on the Central Lead Co. several years ago for \$1,000,000, or for nearly one-half of what Mr. Thacher finally realized from the sale and interim dividends. The menu was decorated with a water-color sketch of the Theodora shaft as typifying Mr. Thacher's administration. This was the first modern three-compartment shaft in Missouri equipped with a steel gallow-frame. While it excited much unfavorable comment from his competitors as being needlessly extravagant, the heavy reduction in operating expenses obtained by this design, and the complete immunity from fire risks that it secures for the miners, has caused it to be imitated in all the subsequent shafts in that district.

Societies and Technical Schools.

American Electrochemical Society.—The eighth general meeting will be held at Bethlehem, Pa., September 18, 19 and 20 next. The programme includes meetings for the reading and discussion of papers on each day, with a number of excursions and visits to important works in the neighborhood. Dr. Joseph W. Richards is chairman of the local committee of arrangements, and Walter S. Landis is secretary.

Trade Catalogues.

"Crandall Packings" is a price list of goods made by the company of that name at Palmyra, N. Y.

Bulletin No. 48 of the Northern Electrical Manufacturing Co., Madison, Wis., describes electric grinders and buffing lathes.

The Jeffrey Manufacturing Co., Columbus, Ohio, hand us a flier devoted to their portable outfits for excavating and screening.

The S. H. Supply Co., Denver, Col., hands us their Catalogue No. 52, illustrating Wild's shaking screen, as used for ore sizing.

We have received the "Spiral Nut Lock" made by the company of the same name in Newark, N. J. The catalogue is of standard 6- by 9-in. size.

The Vanadium Alloys Co., 25 Broad street, New York, publish an interesting pamphlet regarding the properties and test results of vanadium steel.

Air Power, an advertising quarterly, is published by the Rand Drill Co., of New York. It is of general interest as well, and a distinct addition to this class of literature.

"Mine Cages, Skips and Ore Cars" is the title of the Wellman-Seaver-Morgan Co.'s. (Cleveland, Ohio) catalogue of this material. It is well illustrated and of standard size.

The Cameron Steam Pump Works, of New York, have sent out their latest productions in literature—two celluloid book marks, which serve as an admirable advertisement.

We have the "Miniature" of the American Blower Co., of Detroit, Mich. It is a small, admirably arranged flier descriptive of the fans and engines manufactured by the company.

"The Picture Book," published by the Kingsford Foundry & Machine Works, Oswego, N. Y., shows half-tones of its 2-, 3-, 4- and 6-stage turbine and compound pumps. Slime pumps and special types are also shown.

Industrial.

The P. H. & F. M. Roots Co., Connersville, Ind., reports orders for two blowers from the Anaconda Copper Mining Co., and an order for one blower for the United Verde plant in Arizona. The latter is to have a capacity of 400 cu. ft. per revolution.

The Canadian Pacific railway has just purchased four large steam shovels of the Locomotive & Machine Co., of Montreal, Ltd. This order is the first of its kind to be placed in Canada, all steam shovels having been purchased heretofore in the United States.

The Ingersoll-Rand Co. took possession of its new offices on the fourteenth floor of the Bowling Green building, 11 Broadway, New York, on August 1. At that time the offices of the Ingersoll-Sergeant Drill Co., at 26 Cortlandt street, and those of the Rand Drill Co., at 128 Broadway, were given up and the united force moved to the new offices.

The Sharon Foundry Co., Sharon, Pa., will build a 20-ton open-hearth furnace and will furnish steel castings as well as iron. Joseph Riddell has resigned as president and manager; W. W. Shilling was elected to succeed him, and P. McManus has been appointed superintendent. Mr. McManus for the past two years was superintendent of the Stirling Steel Foundry at Braddock.

That the steam turbine is rapidly increasing its foothold in the power field is evidenced by the remarkable increase in manufacture of the well-known Westinghouse-Parsons type. During the past six months the Westinghouse Machine Co. has contracted for 82,000 kw., ranging in

size from 200 kw. to 7,500 kw. Three units of the latter size are under contract for Greater New York railway and lighting power stations.

William F. Watson and other Pittsburg capitalists, together with Alliance, O., capital, within a short time, will erect a large steel casting plant at Alliance, the plans having been prepared in Philadelphia three years ago. Mr. Watson was formerly sales agent for American Steel Foundries, and he has promoted the new enterprise, which will make steel castings of all descriptions; it is said the capacity will be 1,200 to 1,500 tons per month.

The Nassau Smelting & Refining Works, of New York, are now producing phosphor-tin on a commercial scale. B. Lowenstein, proprietor of these works, claims that the use of this alloy in the brass foundry will prevent dressing. By alloying copper with phosphor-tin, or by adding a small percentage of bronze, brass, German silver, nickel, etc., castings of superior quality can be made. The tensile strength, elasticity and durability will also be increased.

Probably the largest electrical locomotive ever constructed is one recently built by the Westinghouse Electric & Manufacturing Company, of Pittsburg, and inspected by visitors of the International Railway Congress. The machine is formed of two units which can be used separately or conjointly. It has six large single-phase motors (for alternating current), has a 50,000-lb. pull at 10 miles per hour, and weighs, complete, 135 tons, its nominal rating being 1,350 horsepower.

German manufacturers have secured the two largest orders for cement ever placed in Mexico. The first, given some time ago by the Mexican Light & Power Co., called for 58,000 bbl. for the power plant at Necaxa, State of Puebla. The second order has just been given by the government, and calls for 40,000 bbl. It is to be used in the construction of the aqueduct that will supply the city with water. The aqueduct was commenced June 1; it will be 18 miles long, and will cost \$9,000,000.

The Rand Drill Co., New York, is experimenting with and intends shortly to place upon the market a new invention for tunneling. This consists of a revolving wheel, fitted with cutters, or moils driven by two "Little Giant" drills. The rock is chipped off in small fragments and not crushed into dust or pulverized stone, as is the case with ordinary drilling operations. Cutting is continuous, and dispenses entirely with blasting. The inventor, John C. Karn, claims that the wheel will drive 4 ft. per hour through any kind of rock. The cost of tunneling by this means is not stated, but if the machine proves successful in practice, it should effect a radical economy.

The Colorado Iron Works Co., of Denver, Colo., reports the following orders:

Carload of jackets for the Mazapil Copper Co., in Mexico; slag-pots, ladles and molds for the Ohio-Colorado Smelting Co., in Colorado; one 42 by 160 silver-lead blast furnace for the St. Joe Lead Co., in Missouri; two carloads of slag trucks and bowls for the Cananea Consolidated Copper Co., in Mexico; all the necessary accessories and equipments for the re-construction of the furnace for the Cia. Minera la Quimica y Anexas S. A., in Mexico; additional equipment for the Santa Maria de la Paz y Anexas, in Mexico; one 42-in. circular copper furnace and equipments for the Ohio-Mexican Mining Co., in Mexico. Milling orders are as follows: Machinery and equipment for the Hercules Mining Co., in Idaho, consisting of 13 improved impact screens, two sets of 36 by 16 Humphrey crushing rolls, etc.; one impact screen to the Annie Laurie Mining Co., in Utah; mining accessories, ore cars, buckets, etc., to the London Co., in Colorado; one Bartlett simplex concentrator to the Denver Ore-testing & Smelting Co., in Colorado.

Construction News.

Readers of the JOURNAL are requested to inform this Department of pending contracts, or of new work projected, giving name and address of the person in charge of the work or project.

Lead, South Dakota.—The Globe Mining Co. will install new pumps.

Paradise, Arizona.—Machinery for the Savage smelter is about to be installed.

Joplin, Missouri.—The Old Judge Mining Co., of Oronogo, will install new machinery.

Clifton, Graham Co., Ariz.—The Arizona Copper Co. will erect a new concentrating mill.

Salem, Kentucky.—The Albany Mining & Investment Co., of this place, is to erect a 100-ton lead and zinc mill.

Leavitt, California.—The Dry Lake Mining Co. will build a new 5-stamp mill. W. W. Smalley can give information.

New Castle, Pennsylvania.—The New Castle Portland Cement Co. is proceeding with the erection of its new plant.

Micanite, Colorado.—The United States Mica Mining & Milling Co., of Chicago, will enlarge its plant at this place.

Banning, California.—J. W. Greene, superintendent, Gold Park Consolidated Mines, will buy machinery for them.

Platteville, Wisconsin.—The Wicklow Co. is planning a new mill to be erected at once. Mr. Jarrat is superintendent.

Tuscaloosa, Alabama.—J. W. Miller, of Tuscaloosa, will develop coal land near this place, and will need hoists and tipples.

Mulatos, Sonora, Mexico.—The Mulatos Mining Co. expects in the near future to build a mill at its property near this place.

Copperton, New Mexico.—The Dens-

more-Stabler Refining Co., of Los Angeles, will erect a \$25,000 leaching plant.

Querida, Custer Co., Col.—The Bassick Gold Mining Co. contemplates the erection of a mill for the treatment of its ores.

Sunshine, Boulder Co., Col.—The Inter-Ocean Mining Co. will put in a roasting and cyanide plant near its mine at this place.

Middlesboro, Kentucky.—The Yellow Creek Coal Co. will install hoisting and pumping plant on coal lands lately purchased.

Mineral Point, Wisconsin.—The Mineral Point Zinc Works will erect new furnaces and buildings. A new crushing plant will also be built.

Searchlight, Nevada.—The Duplex Mining Co. will build a new cyanide plant. A. L. Glassell, of Los Angeles, is consulting engineer.

Joplin, Missouri.—The Granby Mining & Smelting Co. will build a new mill on its land at Oronogo. M. F. Downing is superintendent.

Prescott, Arizona.—P. E. Fitzsimmons has received the contract for 300,000 brick for erection of the new Val Verde smelter near this place.

Charleston, West Virginia.—The Kana-wha & New River Fire Brick Co. will erect a new plant. Edward M. Craig is general manager.

Gladstone, Col.—I. C. Boss has the contract for the 200-ton plant of the Mogul mill on Cement creek. A tramway will be built later.

Butte, Montana.—The Lenstrende-Buck Combination will build a stamp mill and install machinery at their mine, about a mile beyond the Garnet.

San Lorenzo, Mexico.—The American-Mexican Mining & Development Co. will construct a tramway to connect its mines with its smelting plant.

Deadwood, South Dakota.—The Puritan company will build a cyanide plant of 200-tons capacity. It will be equipped with modern machinery.

Salida, Chaffee Co., Col.—The Boston-Colorado Copper Co. intends building a concentrating plant about nine miles southwest of this place.

Guanacevi, Mexico.—J. A. Sordin, of Boston, Mass., is reported to be preparing for the erection of a 250-ton concentrating plant in this district.

Carthage, Missouri.—J. L. Moore and J. H. Magee, of this place, will rebuild their sludge mill at a cost of \$10,000. C. W. Squires will have charge.

Monterey, Mexico.—The Paloma Mining Co., Judge A. Orendorf (of Springfield, Ill.), president, expects to install considerable reduction machinery.

Salt Lake City, Utah.—The Boston Consolidated Mining Co. is to erect a 2,500-ton ore-dressing works, probably on the shore of Great Salt Lake.

Parral, Mexico.—It is reported that the United States Mining Co., of this place, intends changing its motive power from steam turbines to gas engines.

Kimberly, Utah.—The Annie Laurie Mining Co. will put in a steam and electric plant and operate with electric power. S. M. Levy is general manager.

Tonopah, Nevada.—The Tonopah Mining Co. asks for bids for furnishing the necessary supplies for a 100-stamp mill, to be erected 13 miles west of this place.

Tuscaloosa, Alabama.—The Big Sandy Iron Co. has purchased property near here and will erect a furnace. W. P. Pinckard, of Birmingham, can give information.

La Luz, Mexico.—La Luz Mining & Tunnel Co. has completed arrangements for a 300-stamp mill and cyaniding plant on its property. George J. Troop, Jr., is engineer.

Uniontown, Pennsylvania.—The South Fayette Coke Co. is erecting two coke-oven plants in German township, one of 80 and the other of 32 ovens. J. E. Husted is secretary.

Los Angeles, California.—C. W. Purington, of the Blue Bell Mining Co. of this place, will erect a 50-ton cyanide plant at Carters. H. C. Starbird is superintendent.

Carters, California.—The plant of the Star King mine at this place was destroyed with a loss of \$15,000 by fire on July 3. It is not known how soon the company will rebuild.

Weiser, Idaho.—The Idaho Reduction Co., Ltd., has obtained a patent on a new process for working low-grade copper ores and will install a plant in the Seven Devils district near Landore.

Joplin, Missouri.—The Garnet Mining Co. will soon contract for the building of a 200-ton lead mill at this place. It is estimated to cost \$13,000. W. A. Batson, of Joplin, can give information.

Los Angeles, California.—The Soledad Mining & Development Co. will let contracts for dredging in Southern California, near Saugus. Address C. R. Harris, manager, Douglas building, Los Angeles.

Silverton, Col.—The Ross Mining Co. will erect a 20-stamp mill and build a 2,000-ft. tramway for its Galty Boy property. It is estimated to cost \$40,000 and to be completed within six months.

Santa Barbara, Chihuahua, Mexico.—The State government has granted to the Cia. Metalurgica de Torreon a concession to build a reduction plant at Santa Barbara. J. W. Pender is general manager.

Keystone, South Dakota.—A large reduction plant will be built at this place for the Bullion mine. It is to have 200

tons capacity, and is to treat by amalgamation, concentrating and cyaniding processes.

Pittsburg, Pa.—Contracts for the equipment of the new iron mill to be built by the National Tube Co., Pittsburg, on the south side of that city, are now being awarded. The erection of a continuous merchant mill is also contemplated.

Montrose, Col.—Eight miles of canal and 20,000 yards of concrete masonry are required for the Uncompahgre Valley project in this vicinity. Information may be obtained from the engineer of the United States Reclamation Service at this place.

City of Mexico, Mexico.—William M. McCord, S. F. Fuller and A. B. Carpenter, of the City of Mexico, will establish a plant at Mango, Morelos, for the manufacture of fire brick. They have purchased extensive clay deposits situated near Mango.

Cody, Wyo.—Plans, specifications and proposal blanks for the construction of the Shoshone dam, eight miles west of this place, may be obtained from the chief engineer, United States Reclamation Service, Washington, D. C. Tenders will be received until September 5.

Tampico, Mexico.—The Tampico Asphalt Co. will erect an asphalt refinery with an initial capacity of 200 tons per month. The International Asphalt Co., of Tampico, and the Mexican Construction & Engineering Co., of the City of Mexico, are interested in the enterprise.

Uniontown, Pennsylvania.—John R. Bennett, of Fairmount, W. Va., has received the contract for erecting 200 coke ovens at the plant of the Riverview Coal & Coke Co., above Masontown. The company will later add 200 more ovens. W. A. Magee, of Pittsburg, is president.

Colorado Springs, Colorado.—Contracts have been let and work is proceeding upon the following named mills: The Green mountain, at Cunningham gulch; the new Gold Fitch, at Mannamac Fort; the Mogul, at Gladstone, and Ruby Basin, at Ruby Basin. The total daily capacity will be 1,100 tons.

Butte, Montana.—M. T. Jones, of Chicago, of the Amador Consolidated Mining Co. has made arrangements for the purchase of material to be used in building a new railway from Amador to the company's property, 10 miles away. It is expected that work will begin as soon as contracts can be let.

Dallas, Texas.—A lignite briquette plant will be built at this place for Dr. R. J. Shimpers and L. Philipson. They wish to purchase machinery and invite correspondence. A 200-ton briquette machine, coal crushers, boilers and engines, and electric machinery will be required. Address at this place.

Special Correspondence.**San Francisco.** July 26.

It is reported that the Venture Corporation, of London, has finally concluded the deal for the purchase of the holdings and dredges of the Boston & California, the Boston & Oroville, and the Oroville Gold Dredging & Exploration companies at Oroville, Butte county, and the Bear river dredge on Bear river. Among the owners of these properties are Messrs. Evans and Clark, of Boston; William P. Hammon and A. F. Jones, of Oroville; the estate of the late Col. J. E. Doolittle, Fred W. Bradley, W. H. Crocker, the Guggenheims, John Hays Hammond and several others who are prominently identified with dredging enterprises in California. There are eight dredges already at work on these properties, and orders for six more have already been placed. According to the report received, the stock of the company, which has been incorporated in London to take over the properties, has already been fully subscribed. The name of the new company will be Oroville Dredging, Ltd. The purchase price is said to be about \$3,000,000. Several of the other companies at Oroville, which were to have been included in the merger, declined to accept the propositions made and will continue to work independently. One of the reasons for the sale, not generally made public, is that the former owners of these companies have obtained large tracts of dredging land along the Yuba river, between Smartsville and Marysville, where they believe they can work at less cost than at Oroville, and where the ground is of nearly uniform value. Larger dredges have been constructed for this Yuba ground.

For some weeks drill prospecting has been conducted on the east side of the Sacramento river opposite Colusa, commencing as far north as Drumell's slough and continuing on down to the vicinity of the Japanese camp near the old Moulton pear orchard. In all about 25 holes have been bored, to a depth of about 60 ft., it being the rule to go down to gravel, if found within the 60-ft. limit. In nearly every hole colors of gold were found, the best prospect, or at least the greatest amount of color, being found near the Japanese camp. The results have not been made public.

At Oroville, W. T. Baggett has signed a contract for a large new bucket dredge of the Risdon style. The land on which this dredge will operate was turned down by some of the larger operators as not being rich enough to work, but Mr. Baggett, after a careful prospect of the land, decided it is a good dredging proposition.

The old Blue Ravine drift mine at Blue Ravine, above Folsom, Sacramento county, after having been closed for some time, is being started up again under superintendence of S. K. Thornton, who

for some years has been working quartz mines in Amador county. A new shaft is being sunk on the Bader ranch, about a mile from the old works. This will make the fourth shaft sunk on the channel, one after the other being abandoned and the plant moved to the new one for greater convenience in hoisting the gravel. The bedrock is from 60 to 80 ft. from the surface.

At the Williams Point gravel mine, 10 miles above Happy Camp, in Siskiyou county, which was recently sold by T. J. Nolton to Denver and Seattle men, a power plant is to be installed to pump water from the Klamath river and work the mine by hydraulic process. It is a new thing in this State to attempt to provide a hydraulic mine with water under pressure, by any pumping system.

It is learned that the Electric Light & Power Co. and the Siskiyou Electric Light & Power Co. have agreed upon a basis of consolidation, and the miners of Siskiyou county expect an increase in rates as a result. The former company receives its power from the Shasta river, and its service is limited to Yreka and Montague. The latter receives its power from Fall creek, 20 miles from Yreka, and its service extends to the above named places and also to Scott Valley, taking in the towns of Fort Jones, Etna, Greenview and Callahans and several mills along the line. Both plants are new.

Denver. July 27.

The news of the death of Edward W. Nash, president of the American Smelting & Refining Co., was received here with regret; he was a resident of Colorado for many years and largely interested in the development of Leadville during the early days of that camp. On the day of his funeral, which took place last Monday, all the offices and the plants were closed. He had been the executive head of the company since its organization.

The plant of the United States Zinc Co., at Pueblo, which is closely affiliated with the American Smelting & Refining Co., is being operated successfully, and a large amount of Utah, Montana and Idaho ore is being treated there.

During the past few days, articles of incorporation of the Yule Creek Railroad Co. have been filed, and it is reported that Osgood interests are back of this, as for a considerable distance the line will run into Colorado Fuel & Iron Co. territory. The plan is to build 40 miles of road, connecting with the Midland system at Bryant.

The Colorado Electric power plant at Cañon City has just completed the installation of two additional 250-h.p. boilers to increase the capacity for furnishing light and power to Cripple Creek and

a number of coal camps in the vicinity of Florence.

The report circulated that the plant of the United States Reduction & Refining Co. at Florence would be closed down, as a consequence of the railroad merger in the Cripple Creek district is positively denied by the management.

Judge Lewis, of the district court of Teller county, has sustained the motion of the attorneys of the Western Federation of Miners for a change of venue in the cases of the Granite, Golden Cycle, El Paso, Vindicator and Elkton companies against that organization, for damages on account of the closing down of the mines during the labor troubles.

The officers of the Doctor-Jack-Pot Co. have notified the stockholders that they will have until Aug. 26 to pay 2½c. per share in order to pay the indebtedness. By this \$75,000 will be raised; there is at present about \$15,000 in the treasury, the debts amounting to a little over \$50,000, principally in outstanding bonds and interest.

A geological incident worth mentioning occurred a few days ago, when on the 8-ft. level of the Elkton mine a completely carbonized tree, nearly a foot in diameter, was discovered.

The Mine Owners' Association is continuing the prosecutions against the so-called "high-graders" in the Cripple Creek district vigorously, and it is to be hoped that that trading in stolen ore will be stopped. One party has been arrested in this city, in the possession of a trunkful of high-grade ore, valued at \$4,000. Information has been obtained from one of the conspirators.

The Waldorf Mining & Milling Co., operating near Georgetown, has declared another dividend of ½c. per share, making a total of \$15,000 this month.

Between Aug. 10 and 15 it is expected that the Denver Northwestern & Pacific railroad will reach Hot Sulphur Springs.

Scranton. July 31.

On Monday the miners employed at the Hazel Mountain Coal Co., near Conyngham, came out on strike, claiming that there was no standard rate of wages, and the average miner is not able to earn a livelihood. This is not a very large colliery, as only 200 men and boys are employed, and the majority of these reside in Hazelton; therefore, very little trouble was experienced in tying up the mines. Very few of the employees reported for work, and those who did reside on the farms in the vicinity of the colliery. There was some excitement, as a few of the latter showed no disposition to obey the strike order, but when the strikers insisted they obeyed. According to the statement made, the employees of the colliery held their first meeting last Wednesday and formulated a list of grievances, the principal one being a demand for a

standard rate of wages for the mining of coal. A communication embodying this sentiment was forwarded to the officials the following day. A special meeting was held that evening, when the grievance committee made the announcement that the company officials took no notice of the demand except to declare verbally that a standard rate is being paid.

Nescopec mountain is the center of interest this summer in coal prospecting, and land-owners are anxiously awaiting the result of the drillings. A company financed by New York capital has started drilling on the Shellhammer farm, at Tank, near the Pennsylvania railroad station. Drilling for coal has been in progress before, higher up in the mountains, and the men now interested in the company have hopes of encountering the 21-ft. vein, which strikes off from Buck mountain.

The McCaffrey Co., which has been sinking a shaft on the Shaffer tract in McCauley mountain, has struck a 3½-ft. vein of coal. The shaft is being pushed further into the mountain.

During a storm on Tuesday the tower of the Auchincloss breaker at Nanticoke, with its electric wires, made a strong magnet and was struck by lightning. The current entered the building on the wires, which it followed to the motor at the top of the breaker. This was burned out and the woodwork took fire. By prompt action Foreman William Morgan and others succeeded in quenching the flames with the aid of the fire extinguishers.

The indications are that the Evans colliery, Beaver Meadow, the lease of which was recently abandoned by the A. S. Van Wickle estate, will shortly be purchased by another firm. Wilkes-Barre and Scranton capitalists are negotiating for the lease or purchase of the colliery. The owners, the Reader estate, of Easton, are eager to dispose of the colliery and will sell at a reasonable figure.

The Pine Brook breaker of the Scranton Coal Co. was struck by lightning on Tuesday, ripping off the shingles and creating alarm about the place. The tower is directly above the shaft, and the bolt, after striking it, ran down the shaft until lost in the ground.

The cleverness and presence of mind of a breaker boy prevented a terrible accident at a Plymouth breaker on Monday. The boy was picking slate at his chute when he noticed two or three sticks of dynamite among the coal, just about to pass into the breaking machinery. He promptly removed them. The officials of the Parrish Coal Co. have taken steps to prevent a recurrence of the danger. Henceforth miners or other workmen who desire such explosive will be compelled to carry it a portion of the way. It will be sent into the mine in cars as usual, but not to the chambers. The cars containing it will be left in the branches and those for whom it is destined must go

after it; otherwise the cars will remain in the branches. Other coal companies are taking similar action to avoid danger.

The deepest anthracite mining shaft is just finished at the Brookside colliery, near Tremont. It has been sunk more than a third of a mile, or 1,850 ft. The shaft will be used both for coal and water hoisting. The new shaft inaugurates extensive plans which the Philadelphia & Reading Coal & Iron Co. has under way for deep-seated mining. The Brookside is the largest producer in the southern coalfields, and the new shaft will add largely to its output. The product is sold as Lykens valley coal.

Calumet.

July 29.

The unusual activity manifested in the Lake Superior copper district this summer, while especially marked in Keweenaw county, is by no means confined to that section. In the South Range territory a large amount of new work is under way, and plans are maturing for additional explorations in that neighborhood. During the last few days the sinking of a shaft on that portion of the Globe property under option to the Copper Range Consolidated Co. was started and the work is now progressing steadily. The new shaft is 350 ft. south of where the Baltic lode was located some time ago with the diamond drill. The overburden at that point is 250 ft. thick, so that the sinking of the shaft will consume some time before the ledge is encountered.

Work at the Globe is of more than ordinary importance. It is probably the most valuable undeveloped tract in the Lake Superior district. The Baltic lode traverses the Globe for 6,000 ft., providing room for four shafts. The point where the present shaft is being opened is 700 ft. south of the Champion's boundary line, and the southerly openings of the Champion give the Copper Range people great confidence in the future of the Globe.

While no official action concerning the proposed exchange of land between the Atlantic and Baltic companies has as yet been taken, it is expected that some definite announcement regarding the same will be made after John Stanton's forthcoming visit to this district. This much is known, however, that in exchange for a portion of section 16 the Atlantic will secure from the Baltic Co. sufficient ground to permit the sinking of two shafts on the outcrop of the Baltic amygdaloid bed. The exploration of Atlantic's section 16 has been delayed, pending the result of the negotiations with the Baltic. Results at the Superior Copper Co.'s property, where explorations on the northerly extension of the Baltic lode are under way, are encouraging. The cross-cut eastward from the 180-ft. level has encountered an amygdaloid bed at a distance of 62 ft. This formation gave evidence of copper in its outcrop on surface,

and this induced the management to explore it at depth. The Baltic lode is opening up favorably on the 180-ft. level, drifts being in operation both north and south of the shaft. A stock-pile of good looking rock is accumulating from these openings. The Baltic lode is 45 ft. wide at this depth.

At the Challenge property of the St. Mary's Mineral Land Co. the exploratory shaft is very near the Baltic lode and it is likely to be encountered any day.

William E. Parnall has resigned the superintendency of the Bigelow syndicate of mines. Norman W. Haire, of Ironwood, judge of the circuit court of the Thirty-second district, succeeds him, becoming vice-president and general manager of the various companies, the change taking place September 1. Mr. Parnall, who succeeded to the management of these extensive interests at the death of his father in 1902, goes to Denver. It is understood that several changes coincident with the retirement of Mr. Parnall will be made. Judge Haire, who was elected a director of the Osceola in 1903, will surround himself with the most skillful and experienced staff procurable, and the general offices will be moved from Calumet to Houghton. While nothing official is known at the present time, in all likelihood William Uren, at present assistant superintendent, will have general supervision of mining operations at all the Bigelow properties. Mr. Uren's work at the Ahmeek has been highly successful and he has made numerous innovations of a beneficial nature there.

Leadville.

July 5.

With the unwatering of the Penrose shaft and the controlling of the water problem in the downtown section it is possible for other shafts in the vicinity to be sunk, as practically the whole of the section has been drained by the Coronado and Penrose. The cost has been enormous, being a little over \$200,000, but the camp will reap the benefit. The Home Extension and the Bohm shafts started to sink at the beginning of the week, the former being to the east and the latter to the south of the Penrose, and both are after the same ore-shoot found in the Penrose. Several claims in this section will sink the shafts deeper to catch the ore-shoots from Fryer hill and the Coronado. The effect of the draining of the downtown section is felt as far south as Rock hill, and north to Big Evans gulch.

The big mill at the Yak tunnel is now in full swing and turning out 250 tons of concentrate daily; the drawback heretofore was the lack of power, which was supplied this week. A large bin has been constructed capable of holding 50,000 tons, which will be used exclusively for iron; that will be brought direct from the tunnel and stored there for future use.

The opening of the large orebodies in the Sunday mine, Ball mountain, has made that section an active one this season, and not an idle hole in the vicinity of the Sunday is to be found. The Sunday is shipping 30 tons daily of ore that nets \$40 per ton; this comes from the old shaft, and the new shaft to the north is being sunk rapidly. The Mountain Lion, Butcher Boy, Alma Alva and others are doing considerable development work. Further north and toward the Little Jonny a number of prospects are being worked, and all are following small veins carrying from 2½ to 5 oz. gold per ton.

Terry Connors, a Leadville miner, is operating a tunnel on the Wild Irishman at Montezuma, and after driving a distance of 30 ft. on the vein a body of ruby silver was encountered. The tunnel will be driven a distance of 1,800 ft., and air compressors and machinery are now being installed.

The Walesburg, Garwood No. 3, and Newark, Williams gulch, Twin Lakes district, are owned by William Holz and Mark E. McCourt. A shaft on the former is down 30 ft., and on the other two two holes 10 ft. deep have been sunk. The vein on the Walesburg is 15 ft. wide, and on the other two 10 ft. Mr. McCourt brought samples of the ore to town during the week, claiming that it is uranium and molybdenite; he said that he sent samples of the ore to J. Dunraven Young, a leading chemist of Chicago, and that he pronounced the ore uranium. Frank I. Foote, of Rogers, Brown & Co., Chicago, has taken a lease and bond on the property and will drive a tunnel into Twin Peak mountain 500 ft. to tap the three different veins.

The Golden Curry, Tiger, Bartlett tunnel, and Gunnison, Sugar Loaf district, are shipping steadily, and during the week the T. L. Welch claim resumed work and the shaft will be sunk deeper by the lessees, Connelly & McNulty.

The bad condition of the roads on this side of Mosquito range is retarding work in that section, as it is nearly impossible to haul timbers to the different claims. The London mine is shipping the regular quantity of ore and the two large tunnels, the New York and Moffat, are being driven ahead steadily.

The Garibaldi tunnel, California gulch, is in a little over 1,500 ft. and has a body of iron pyrite. The lessee, George Bray, is in correspondence with an Illinois outfit to take the ore for the sulphur, and if the railroads will make a fair rate the deal will be closed. He can ship 300 tons daily if the Illinois people will take it.

The Ready Cash, Iowa gulch, has resumed operations and is shipping a fair grade of ore that runs from 1 to 2½ oz. gold per ton. A year ago a pocket of ore was opened that ran 12 oz. gold per ton, from which considerable ore was shipped.

Salt Lake City. July 27.

The sampling of the Utah Copper Co.'s mine at Bingham is progressing upon an extensive scale. The investigations are being made by members of the staff of John Hays Hammond, the present work being under the direction of S. W. Mudd, and in behalf of the American Smelters' Securities Co. While the terms are not definitely known, it is claimed that the latter holds an option on a control of the stock at \$26 per share. In the work samples are taken about 15 ft. apart on the 800 ft. of underground workings.

The new Edwards' roaster at the Yampa smelter at Bingham has gone into commission.

The case of Col. E. A. Wall against the United States Mining Co. was argued in the Federal court before Judge Marshall this week, and the court took the matter under advisement. The Evans tunnel of the United States Mining Co. penetrates the Red Rover Mining claim, the property involved, and the defendant claims title to it on the ground of apex rights.

Butte. July 26.

United Copper is increasing its copper output. During the four months prior to July it operated its smelter on a small scale, keeping only two furnaces busy, but since July 1 it has been running two converters and three blast-furnaces and reverberatories. It is now installing another converter. The company is securing ore from the Rarus, Cora, Minnie Healey and Lexington mines, and is also buying from lessees of small claims. It has five drills prospecting the upper levels of the Lexington, and is obtaining only a small quantity of ore from this source. No attempt to pump the water from the lower workings of the Lexington have been made. It is flooded below the 550-ft. station. The shaft is about 1,500 ft. deep.

The Pittsburg Co. resumed the production of copper yesterday, and, barring accident to machinery, expects to operate its plant continuously. An accident to the blower and water-jacket prevented continuous operation last week. During the running period it turned out quite a batch of copper. The mines of the company are yielding ore of good quality.

The Cleveland & Montana Co. is preparing to drive a 600-ft. tunnel on its ground 6 miles southeast of Butte. It expects to tap veins of gold-bearing ore found on the opposite side of the mountain. The company is new, having been organized by Cleveland and Montana men recently.

The Montana Zinc Co. is again operating its mill, having resumed yesterday. President Wisner says he expects to run steadily, having, as he believes, overcome the minor difficulties heretofore encountered. He has arranged for a supply of ore from the Lexington. This ore carries

copper, zinc and lead, the zinc value predominating. Teams are delivering the ore.

The Blackrock Co., operating the Blackrock mine, is sinking its shaft. A depth of 450 ft. has been attained. Manager Heidel says sinking will be continued until a depth of 600 ft. is reached. The property is north of Butte and is a silver producer. It was formerly worked by W. A. Clark, who owns the controlling interest in it.

Boston & Montana is saving about 25 tons of copper precipitates per month from its precipitating plant. The product runs from 55 to 65% copper. The water comes from the company's principal producers.

The Boss Tweed & Clipper group of gold claims in Madison county is being worked by the Elling and Morris estates, and some good ore is coming from it. The first class, which averages \$50 per ton, is going to East Helena and the second is going through the Strawberry mill, near the mines.

The 300-ft. stack which Senator Clark is building at his reduction works, for the purpose of catching the mineral loss from the furnaces, is almost half finished. When complete it will have cost about \$150,000. This cost includes the building of the flue connection. Other improvements are being made at the plant. The Clark mines are yielding a large quantity of ore, more, in fact, than can be treated in the smelter. The excess output is going to the Washoe smelter.

Spokane. July 26.

Kennedy J. Hanley, after litigation lasting seven years, has received \$316,446 cash, in payment of judgments which he secured against the Empire State-Idaho Co. for ores extracted from the Skookum mine at Wardner, Idaho. The Empire State-Idaho Co. was merged into the Federal Mining & Smelting Co. about two years ago.

Mr. Hanley is still claiming about \$150,000 for ores extracted, in addition to the tonnage on which he recovered his judgment, and he has been found the legal holder of an eighth interest in the mine. The defence, at the end, was in part that the Empire State-Idaho interests are entitled to possession of the ore in the Skookum ground, by virtue of owning the apex on other claims. The courts, however, steadily refused to consider this contention, for the Empire State-Idaho had failed to include that assertion in its original pleadings.

The case has been one of the most celebrated in the mining history of the Northwest. Mr. Hanley bought an eighth interest in the Skookum claim when it was an undeveloped prospect. Soon afterward he put the deed in escrow, in a deal for the sale of it to F. Lewis Clark and Charles Sweeny, of Spokane. Hanley claims that they got possession of it by fraud from the hands of the trustee. He

promptly started suit and the Federal Court of Appeals finally gave him judgment against the Empire State-Idaho Co., to whom Messrs. Clark and Sweeny had transferred the property. The court held that before getting the option on Hanley's eighth, Clark and Sweeny, who were his partners in the Skookum, had refused to permit him to make an examination of the mine, and had kept him in ignorance of rich finds they had made. This conduct was termed by the court a gross fraud on Hanley's right as a co-partner. When it came to determining the amount of the judgment which should be paid him, many interesting points were involved. For most of the ore the courts finally allowed him an eighth interest on the smelter returns, without allowance for mining costs. This refusal of the courts to allow the defendant an offset for the expense of producing the ore, amounted to a penalty charged against the defense for misconduct in excluding Mr Hanley. This ruling gave Mr. Hanley about \$100,000 more than he would otherwise have received. He was represented by Myron A. Folsom, of Spokane.

President Fred. W. Bradley, of the Bunker Hill & Sullivan Mining Co., was the guest of honor recently at a dinner given by the Wardner Industrial Union. He spoke on the pleasant relations existing between his company and its employees, and then turned with bitterness to the attitude of "financial agitators," whom he considered worse than labor agitators.

Seattle. July 20.

Morris R. Hunt, for many years manager of charcoal blast-furnaces in Wisconsin and Michigan, has taken a long lease from San Francisco parties of the iron ore deposits on Texada island, in British Columbia, about 200 miles, by water, north of Seattle. This ore is a magnetite, averaging 62% in iron and within the bessemer limit in phosphorus. It is estimated that there are fully 1,000,000 tons of ore in sight. The deposit lies 400 ft. above and within 4,000 ft. of tide-water and a good shipping harbor. The ore will be taken out by open-cut mining. Mining machinery will be installed, and a gravity tram and ore docks built. Mr. Hunt is preparing to go into the blast furnace business on Puget sound, and the ore from the Texada mines will be used in the charcoal furnace that he is contemplating establishing. This ore can be shipped direct from the mine to furnace by vessels of large tonnage, with but one handling, and can be placed in the furnace at a cost within \$3 per ton.

A great deal of development work, showing satisfactory results both as to tonnage and quality of ore, has already been done on this property—which at the present time is the only large, developed and accessible high-grade iron ore property on the Pacific Coast.

Goldfield. July 10.

Ore of high value is being taken from the tunnel of the Shoshone-Polaris mine, which adjoins the Montgomery-Shoshone on the southwest side. Some of it is being bagged preparatory to shipment. The course of the vein, as far as it can be traced, shows that it extends for a distance of 1,900 ft. in the Montgomery-Shoshone property and 1,200 ft. in the Shoshone-Polaris. If, as the croppings on the mountains indicate and the experts believe, the vein continues through the holdings of the Montgomery Mountain Co. on the south end of the mountain, the last-named company will have 2,100 ft. of it, making the total length of the vein 5,100 ft. The tunnel on the property of the Montgomery Mountain Co. is now in more than 140 ft. The workings are already in ore of milling value, and the tunnel is being pushed as fast as the unusual hot weather will permit.

Another sensation is the new strike on Hobo Fraction, on the property of the Bullfrog Eclipse Mining Co. A few weeks ago Superintendent Lester, in prospecting over that portion of the company's property, discovered surface showings that panned unusually high. He thereupon decided to cut a trench to determine whether he had happened on a new vein. Each additional panning showed better than the one before, and it was immediately decided to sink an incline shaft, following the course of the orebody. The shaft has now reached a depth of 40 ft., and shows high values. The mouth of the shaft is near the summit of Bonanza mountain, which is steep at this point, and one of the questions to be solved before any ore can be made ready for shipment is, what is the most expeditious way to get it to the bottom. It will be necessary to make a trial before the ore can be sacked and carried to the level ground. Meantime the rich ore is being thrown out on the dump, and this will probably be continued until new arrangements can be made. The trend of the vein, as far as has been discovered, for no foot-wall has been reached, is from northwest to southeast. January Jones, of Goldfield, is president of the corporation and John S. Cook, of Goldfield, treasurer. The controlling stockholder is Senator T. L. Oddie, of Tonopah. He has associated Philadelphia capitalists in the company.

This strike on the Hobo Fraction is only one of a series of important ones that have been made on Bonanza mountain in the last three months. Ten distinct ledges have now been traced in the mountain—six in the Equitable group owned by the Gibraltar Mines Syndicate; three in the Eclipse properties, and the vein of the Denver mine. In the latter there is 5 ft. width of rich ore that can be traced down the side of the mountain for 400 ft., and there are croppings on the surface for 1,500 ft. So many shafts are being sunk on Bonanza

mountain and so much ore is being disclosed, that it now appears to be simply a quarrying proposition.

Toronto. July 22.

William Henderson, Canadian commissioner at the Liege exposition, reports that great interest is taken in the Canadian mineral exhibit, which has attracted many professors of geology and mining experts. A special visit was paid to this collection by the members of the International Congress of Mining Engineers, who appreciated the practical way in which the mineral resources of Canada are presented to the public. There have been many inquiries from firms who wish to purchase Canadian ores direct, more especially with regard to zinc, chrome, nickel, cobalt, asbestos, mica, phosphate, coal and corundum. The Hadfield Steel Foundry Co., of Sheffield, England, using \$2,000 worth of abrasives per month, will make a trial of Canadian corundum.

The construction of the plant of the Manitoba Peat Co., at Fort Frances, Ont., is well under way and the company expects to begin operations in August. An engine of 200 h.p. has been installed which will supply power for a 120-h.p. electric generator, the energy from which will operate the field appliances, including three excavators, three gatherers, three loaders and the tram cars for conveying the material to the works. The two main machinery buildings are almost finished. It is anticipated that the company can begin shipping peat briquettes to Winnipeg, the price to the consumer being about \$6.50 per ton.

Victoria, B. C. July 24.

The output of coal at the Crow's Nest Pass Coal Co.'s collieries in southeast Kootenay during the first half of the current year is given as under: Coal Creek, 207,764; Michel, 162,524; Carbonado, 47,080; total, 417,368 tons. A considerable proportion of this production was made into coke, the output of which was: Fernie ovens, 97,853; Michel, 95,072; Morrissey, 8,474; total, 201,399 tons.

Announcement has been made that the Dominion government, in response to the urgings of the Associated Silver-Lead Mines of British Columbia, and the Associated Boards of Trade of East and West Kootenay during the past two years, has at length determined to appropriate the sum of \$12,000 for the purpose of having an expert examination of the zinc resources of the province made.

The desire of those who have advocated having the examination has been enumerated as follows:

1. To obtain a report on the districts from which zinc ores are now being produced; the character and tonnage of such ores; the methods employed in their production and local reduction; cost of min-

ing and local reduction; where marketed, and at what cost, with freight charges.

2. To obtain an estimate and report on the tonnage and character of zinc ores which have been made available for production by mining development, and a report on local economic conditions, such as transportation facilities, which will govern their production.

3. To obtain a report on the location and, from an economic geological standpoint, the probable future of the undeveloped deposits; the local economic conditions, such as transportation, which will affect production therefrom; the character and metallic values of the ores so exposed; and analyses of ores, either taken by the expert making the examination, or under his direction, and of ores submitted for analysis by prospectors and claim owners.

Rossland.—The West Kootenay Power & Light Co., having its headquarters in British Columbia at Rossland, and its hydro-electric power station at Bonnington Falls, on the Kootenay river, and distant about 11 miles from Nelson, has placed an order with an eastern Canadian manufacturing firm for a large quantity of copper cable for the electric transmission line it is now building from the power station to the Boundary district, where it will supply electric power and light to mines, smelters and towns in and about Grand Forks, Phoenix and Greenwood. The *Rossland Miner* states that the order mentioned above is for 728,000 lb. copper-wire cable, and the cost \$131,000. In the construction of the transmission line and the enlargement of the power plant some 250 men are employed, and rapid progress is being made. The expectation is that the plant and line will be completed and in working order before the end of next winter.

London. July 22.

The troubles and trials of a straightforward mining man fighting against the supporters, of a share market are well exemplified by the case of J. H. Fawcett and the Etruscan Copper Estates. Your readers will, no doubt, remember my references to this company, and how, in spite of the condemnation of the property by every independent mining man, and by some in the employ of the company, the directors and those financially interested have joined in keeping up the work. I referred to Mr. Fawcett's resignation as mine manager and his public protest against Mr. Earle, the chairman, for saying that his resignation had nothing to do with the value of the mine. The sequel to this occurred this week, when Mr. Fawcett brought an action for slander against Mr. Earle, claiming damages for various utterances belittling the value of his advice and services. Mr. Fawcett won his case and was awarded £250 damages. Though Mr. Earle entered a de-

fense, there really was no answer, and the jury thought their time was being wasted by the defendant. As the truth of Mr. Fawcett's reports about the mine has been upheld by subsequent events, and as the policy now being pursued is exactly what was advised by Mr. Fawcett, it was obvious that the statements made by Mr. Earle were unjust. Mr. Fawcett was subjected to much shabby treatment. For instance, he never received his salary, due on resignation, until he issued a writ. A point in connection with the case, which may be of interest, is that Mr. Fawcett, in addition to receiving a regular salary, received also 1,000 shares for every year he served. A system of remuneration such as this serves the double purpose of making servants interested in keeping up the market and of pointing out to the shareholders that the servants have such confidence in the mine that they accept shares in lieu of cash salary. In Mr. Fawcett's case the payment by shares did not act as a bribe; but, as a general principle, it is best that a mine manager or consulting engineer to a public mining company should not have any contingent interest of this kind.

I am sorry to record that the subsidiary venture of the English Crown Spelter Co., in Wales, has not turned out a success. As your readers are aware, the company's mines are situated in Italy, and they continue to yield satisfactory results. A few years ago, however, it was thought good policy to enlarge the sources of supply, and a substantial interest was taken in a sort of subsidiary or allied company, called the Welsh Crown Spelter Co., which had been formed to develop mines in the Carnarvonshire hills in North Wales. The Italian ores are shipped to Swansea for treatment, and the intention was that the Welsh ores should be mixed with them. An insuperable difficulty has been met with, owing to the complexity of the Welsh ores. Though the mixture of lead, zinc and iron sulphides is not so intimate as in many places, yet no practicable method of dressing has been found that would reduce the iron content sufficiently. The English Crown Spelter Co. has, therefore, decided to cease making further advances of capital to the Welsh company, and the latter has had to go into voluntary liquidation. The whole of the losses in connection with the Welsh venture incurred by the English company have been written off from revenue. Another matter of interest in the progress of the English Crown Spelter Co. is that at the smelting works at Swansea the Welsh smelting furnaces are gradually being changed into gas furnaces, with the result that the fuel bills are lower.

Sydney. July 1.

The gold yield from the three principal States in Eastern Australia, for the first five months of the year 1905,

amounts to 620,106 oz. fine, which is less by 70,801 oz. fine than for the same period in 1904. The decrease is distributed as follows: Victoria, 11,680 oz.; New South Wales, 35,277 oz.; Queensland, 23,844 oz. No new discoveries have recently been reported, and the industry gives general evidence of depression. A pleasing feature is the satisfactory results being obtained by the Mount Morgan Co., Queensland, and during this month an interim dividend absorbing £12,500 was declared. The Berry United Co. (Victoria) has successfully completed the sinking of a shaft to a depth of 600 ft., and this undertaking is thought to constitute a record in alluvial mining. At a recent meeting of the three important deep-lead alluvial companies, Moorlort (Victoria), controlled by Bewick, Moreing & Co., it was stated that satisfactory progress is being made in the unwatering of the northern end of the Berry lead. The pressure at the Loddon Valley mine has been got down to such a point that the wash should be reached at an early date. Mr. Dunn, director of the Geological Survey of Victoria, has furnished a very complete report on the Charlotte Plains deep leads. In May, 1902, when the present company took change of these mines, the pressure of water in the main drives was 98 lb. per sq. in., and by continuous pumping this has been reduced to 10 lb. per sq. in. In magnitude the present operations eclipse all previous deep alluvial mining in the State.

The output from the Broken Hill mines is being well maintained, and during the past four weeks the production of metals by the Broken Hill Proprietary Co. was as follows: 44,816 oz. silver, 5,331 tons soft lead, and 64 tons antimonial lead. The Broken Hill Block 14 has by the sale of preference shares wiped out existing liabilities, and a progressive policy of development is now to be entered upon. The management of the mine has been assumed by J. R. Godfrey, formerly government inspector of mines. The mine has been unwatered, and the mill is being placed in order. In order that the output of this mine may be increased, it is considered advisable to sink a new central shaft, which would involve an outlay of £25,000. To raise this amount, it is proposed to issue 20,000 shares at 25s., thus increasing the capital of the company to £130,000. The magnetic separating plant recently installed at the Junction North mine has not come up to expectations. A number of alterations and adjustments have been made by G. Ullrich, the designer, but it is gathered that although the metal recoveries are good, the present plant cannot be run at a profit. The case of C. V. Potter against the Broken Hill Proprietary Co., respecting infringement of patent rights for treatment of sulphide ores, is now engaging the attention of the courts. The rival

processes are known as the Potter (acid) and the Delprat (salt cake).

The underwriting of the whole issue of 700,000 shares in the New Chillagoe Railway & Mining Co. (Queensland) has been successfully accomplished, 500,000 shares being taken in London, and 200,000 in the Commonwealth. The new capital is to be utilized for providing concentrating and roasting plants to deal with the lower grade ores. The O. K. Copper Co., Cairns, has experienced a very satisfactory half-year, the profits distributed amounting to £8,500. This is the first North Queensland copper mine to declare a dividend. The Lloyd copper mine, Burraga (N. S. W.), treated 5,940 tons of ore during the month of May, which yielded 142 tons refined copper, or an average of 2.4%.

The further data supplied by the general manager of the Mount Lyell Mining Co., Tasmania, indicate that the orebodies in the North Lyell mine, which have been prospected at the 400, 600 and 700 ft. levels, will provide a considerable addition to the known ore reserves. The metal produced by this company during the last four-week period was: Copper, 601 tons; silver, 53,160 oz., and gold, 1,952 oz. fine.

Johannesburg. July 5.

One of the saddest fatalities in the history of Transvaal mining happened a few days ago at a colliery on the Vaal river. There have been many accidents where the loss of life was greater, but never have we had an accident where the men killed held such important positions as the victims who lost their lives at the Vereeniging Central mine. Mr. Bunkell, consulting engineer, Mr. Jones, manager, Mr. Davies, the surveyor, and Mr. Brown, mine captain, went below to investigate a fire that had broken out in the old workings. They were killed by gas. Some hours later, two miners, Price and Ross, with two Kaffirs, went to find the missing men. They also were killed. Workmen, both white and black, volunteered to enter the mine in order to rescue the men; but those in control, realizing that these offers, though heroic, were of no avail, wisely prohibited anyone from entering the mine.

By means of a 'sirocco' fan the mine was more or less cleared of gas. It was found that all the men had been killed by carbon monoxide gas, produced from a fire which had broken out in some old workings. The crushing of the pillars, which had been left too small to carry the weight of the strata, resulted in ignition of the coal and shale from spontaneous combustion, owing to the presence of iron pyrite and water. The great volume of gas produced traveled toward the upcast shaft. The two parties who lost their lives did so by going to the south. Had they returned the way they came in by the north-side workings, they might have escaped.

Salutary lessons can be learned, and I

believe will be learned from this most regrettable accident. It has been the boast that the collieries of this country are free from gas, and few, if any, of the modern appliances for gaseous mines are to be found on South African coal mines. Had the men who went into the mine where gas was known to exist been provided with hoods, the chances are that most of them would have come out alive. It is now recognized that there are dangers, even in Transvaal coal mines, and this sad accident at Vereeniging will make people more careful in the future.

The Transvaal list of accidents in mines will be an extra-long one this year. The explanations are simple. Thousands of raw Chinese coolies are now at work underground. Although precautions are taken, many of them have been seriously injured, either through curiosity or carelessness. A newly arrived coolie finds a detonator. He takes it to his room and commences picking out the powder. An explosion occurs and blows off his head. Opium smokers have been known to lie down in a skipway of an incline shaft while under the influence of opium. The skip has come along later on and mangled the sleeping coolie to pieces.

New coolies do not know the dangers of treacherous hanging, and in consequence quite a number are injured by falling rock. Nor are the white men working underground over-careful. Better mining regulations than those of the Transvaal do not exist, and if the workmen only obeyed them implicitly, accidents on the Rand would be greatly reduced. Many of the white men have only taken to mining recently, having been farmers and what not, before. They violate the regulations, and various accidents are the result. Only last week a candle, carelessly placed by a workman underground, set fire to a box of gelatin, weighing 50 lb. The gelatin burned for a few minutes. A number of men were in the immediate neighborhood, and all ran for their lives. They got jammed in a drive, 120 ft. around the corner from the burning dynamite, when the explosion took place. Men, buckets, rocks and cars were hurled down the drive. The rescue party found 14 men—five whites and nine Chinese—seriously injured. Five Chinese and one white man have since died. Strange to say, the explosion, though it caused all the wounds, killed no one. All the fatal damage was done by the burning dynamite. The five Chinese, who were in the immediate vicinity, died from burns, while a white miner, at an upcast shaft, half a mile away, was poisoned by the nitrous fumes from the burning dynamite.

The Chamber of Mines reports that in the month of May, in addition to the gold heretofore reported, the production from Rhodesian mines was 8,368 oz. silver, 52.38 tons lead and 6,697 tons coal. The number of natives employed was 6,538.

General Mining News.

Sunday Creek Coal Co.—Arrangements are made for the combination, under this name, of several mines in Ohio and West Virginia, and of two large shipping and handling concerns. The companies named are the Sunday Creek Coal Co., the Buckeye Coal & Railroad Co., the Ohio Land & Railroad Co., the Continental Coal Co., the Kanawha & Hocking Coal & Coke Co., the Boston Coal & Wharf Co. and the St. Paul & Western Coal Co. The headquarters will be in Columbus, O. John H. Winder has arranged the consolidation and will be president of the new company. The capital stock is \$4,000,000. The other directors are: C. W. Watson, president Fairmont Coal Co., Baltimore; S. P. Busch, vice-president and manager Buckeye Steel Casting Co., Columbus; C. L. Poston, Athens, O.; E. A. Cole, Columbus; H. H. Heiner, vice-president, Columbus; Alfred Hicks, president Allegheny Steel & Iron Co., Pittsburg; Louis G. Dailey, of New Jersey.

CALIFORNIA.

CALAVERAS COUNTY.

Westlake Mining Co.—This company has made the last payment to C. A. Werle for the New Buffalo gravel mine. The necessary capital to develop the mine has been advanced.

Gum Boot.—The owners of this mine, near Esmeralda, have bonded it to a company, of which John Campbell, of Murphy, is manager. The new company will do development work on a large scale.

Clary Gold Mining Co.—The new mill of this company, to be put up on the South Bank mine at Indian creek, is now being erected.

Bertola & Zugar.—These mines, near Sheep Ranch, have been bonded by C. Rigney, of El Dorado, to Los Angeles men, who will thoroughly exploit the gravel channel.

Reed's Mine.—At this mine, Central Hill, the underground connections have been made and better air will be available in the future.

KERN COUNTY.

Barbarossa.—A fourth interest in this mine at Amalie has been purchased by J. H. Roberts. B. F. Parlow owns the rest of the mine and the two owners will begin development work on a large scale at once.

MARIPOSA COUNTY.

California-Tennessee Gold Mining Co. At this mine, Indian Gulch, a hoist and 10-stamp mill are being erected. The shaft at the mine is down 200 feet.

Alice Gold Mining Co.—This company, at Hunter's Valley, Charles Ollinger, manager, is repairing and enlarging the

old shaft. After the mine is more fully opened a mill is to be erected.

NEVADA COUNTY.

Débris Dams.—The Blue Tent Mining Co. has applied for a license to mine by hydraulic at Blue Tent, and the Esperance Co., at French Corral, has also applied. A representative of the California Débris Commission is examining the sites of the proposed débris dams.

Eagle Bird Mining Co.—W. M. Wilson, superintendent of this mine, near Washington, has brought suit for some \$8,000 alleged to be due him as salary. Other claims against the company have been assigned to him. The pumps have been kept running at the mine for some time, but active mining operations have not been resumed.

Wright & Bailey.—The company organized to develop this property, near North San Juan, expects to begin operations early in August. A new plant will be provided.

Charronat.—This mine, at Canada Hill, idle many years, is now being unwatered, and the workings are now dry down to the eleventh station. When the drain tunnel was cleaned out, the Greenman mine, adjoining, was also drained, and it is now being operated by Samuel Barr and R. Rickard.

Meadow Lake District.—At the Excelsior mine (formerly the Hartley) at this district, the 10-stamp mill is crushing good ore. The Cook & Clark mine has been bonded to men who intend putting up a smelter.

Murchie Mining Co.—At this mine, Nevada City, the new 10-stamp mill has been started up, and the new 8-drill compressor has arrived. The shaft will be put down to 1,200 feet.

Stephens.—At the drift claim on Cement hill, owned by J. S. and John Stephens, a new 5-stamp mill has been started up. The gravel is cemented and must be crushed.

SAN DIEGO COUNTY.

Tourmaline Queen.—A rich strike of dark red tourmaline has been made by Frank Salmons in this mine at Pala. Some of the crystals are very large and pure.

Stonewall.—The water in this mine at Cuyamaca has been lowered to the 500-ft. level, and the bottom of the shaft—600 ft.—will soon be reached. A new gasolene hoist has been purchased.

Julian Consolidated Mining Co.—This company, at Julian, operating the Helvetia and High Peak mines, has shipped several carloads of new machinery for the improvement of the properties.

SAN LUIS OBISPO COUNTY.

Cambria Quicksilver Mining Co.—At the Rigdon mine, San Simeon creek, owned by this company, a tunnel is being driven at a lower point than previous

developments. A new furnace is being constructed.

COLORADO.

TELLER COUNTY—CRIPPLE CREEK.

Independence Consolidated.—It is reported that at the annual meeting of the stockholders of this company at Cheyenne, Wyo., the proposition to give an option on the property of the company to Messrs. Tutt, Penrose & MacNeil, of Colorado Springs, is being considered. As to whether this has been done cannot be learned.

Isabelle Mines Co.—The Empire State shaft of this company is producing some ore. This part of the property is being worked by the company, under the management of George Kilborn. The old Isabella workings, which are being operated under lease by Murphy & Co., are also shipping some ore.

Mary Nevin.—A good deal of interest is being shown in the district over the discovery of ore in the Mary Nevin, on Rose Bud hill. Some good ore has been found in this property, but the discovery is thought to be on the top of the ore-shoot and more sinking will be done before any attempt is made at production. The ore is supposed to be the continuation of the large orebodies found in El Paso. The extension of the district in this direction is being watched with interest. C. G. Jackson has charge of the lease.

Beacon Hill-Ajar.—Engineers have been at work making an examination of that part of El Paso workings adjoining this property, with a view to determining its value. It is charged by the minority stockholders of this company that the property was sold to El Paso at a price very much below what the showing warranted.

Altman Water Co.—This company is laying a new pipe from its pump station in Grasseley to Altman. This company furnishes most of the water used by the mines of the district.

GEORGIA.

LUMPKIN COUNTY.

Battle Branch.—At this mine, near Dahlonega, the owner, M. M. Rogers, is clearing the ground, in preparation for a stamp mill. The ore is showing up well.

Calhoun.—On this property, near Dahlonega, recent results have been good. A pocket recently struck yielded a number of nuggets.

Chestatee River.—Perhaps the best paying work in the district just now is that done by the dredges on the Chestatee. Nearly all the available ground is taken up. A large new dredge will soon be placed on the river. It will be owned by Capt. Breyman, of Dahlonega, who is having the machinery built at Toledo, Ohio.

Crown Point Gold Mining Co.—The directors have resolved to close down the mines and mill until a special meeting of the stockholders can be called.

IDAHO.

SHOSHONE COUNTY.

Morning Mine.—A force of 350 men is employed at mine and mill. It is at Mullan, Larson & Greenough being the owners. The 900 tons of silver-lead ore produced per day is concentrated, the concentrate shipments to the Helena smelters amounting to about 3,000 tons per month. No. 6 crosscut, starting just above the mill, has been driven over 9,000 ft., the heading being within 400 ft. of the Youlike vein. The Morning vein is parallel and will be reached farther on. This No. 6 level is 1,000 ft below the lowest workings which are reached by No. 5 level. An interior shaft is being sunk from No. 5 to connect the workings with No. 6, the latter to become the main channel for ore haulage to the mill.

Bunker Hill & Sullivan.—The output of the mine, at Wardner, runs about 9,200 tons per month, about 5,200 tons of which are shipped crude, about 4,000 tons being concentrates.

Hecla.—Present output, amounting to 300 tons of ore daily, comes from the 300-ft. and 600-ft. levels and from the old adit levels on the mountain side. A level is being driven from the 900-ft. station to the orebody, which is in the quartzite. The above tonnage is concentrated at the company's Gem mill. The electric hoist, operating to 900 ft. depth, has been successful, and it is now being arranged to instal one of larger capacity that will be capable of operating to 2,500 ft. depth. An interesting feature at this mine is the system of igniting the fuse by electricity, in blasting, so as to fire shots in any rotation desired. The Hecla is at Burke. James R. Smith is president of the company, with James F. McCarthy as secretary and manager, J. A. Clay being electrical engineer.

Hercules.—This is one of the best producers of the Cœur d'Alene district, being situated two miles above Burke. A new mill, of 300 tons capacity, will soon be completed. It has the usual equipment for concentration, in addition to which magnetic separators will be installed for parting the zinc from the iron. At present about 900 tons per month of high-grade ore is being shipped in the crude. The mill will handle the lower grades.

INDIANA.

MARTIN COUNTY.

Iron ore is now being produced in Indiana. During the past week three carloads of iron ore were sent to Jackson, Ohio, having been mined from the Piedmore land, near Huron. If the ore pans out as well as predicted, it will open up a new industry. Charles Slates and Al-

bert Carrico, experienced iron men, are managing the new enterprise, but it is suspected that the Southern Indiana railroad is back of the test.

PERRY COUNTY.

American Cannel Coal Co.—This company, of Cannelton, has organized under a new 50-year charter, with a capital stock of \$100,000, and in addition to the already extensive coal-mining interests will develop the equally valuable clay deposits underlying all their land adjacent to the city. The directors are S. W. Dexter, Wm. Armstead, J. L. Ford and John Conway.

GIBSON COUNTY.

Freeman Coal Co.—The completion of the new shaft of this company marks the third shaft that has been sunk to the newly found vein of coal near Bicknell. The vein is over 7 ft. thick and 227 ft. below the surface.

MICHIGAN.

HOUGHTON COUNTY—COPPER.

Eric-Ontario.—Exploration work on this property, located between the Challenge and Winona mines, is being pushed as rapidly as can be done to good advantage. A permanent shaft will be started as soon as a favorable location is found.

ONTONAGON COUNTY—COPPER.

Mass Consolidated.—President Charles A. Lamb has completed an examination of this property and returned to Chicago. He says exploration work on the Minnesota group of cupriferous measures is progressing favorably. C shaft is producing some excellent rock from the Knowlton and Butler lodes, fully as good as that coming from the Evergreen in A and B shafts.

Michigan.—At the tenth level east of B shaft on the Branch vein, 1,000 ft. from the shaft, a huge mass of native copper is being uncovered. Several large chunks have been cut off, and it is believed that the mass will weigh 50 tons. Mass copper is frequently encountered in this mine, but the present one is larger than usual. The monthly output of mass and barrel work is 40 tons.

Mulock.—During the past few weeks exploration work has been under way at this property, near the Norwich. It is owned by R. P. Mulock, of Colfax, Ia., who recently inspected it. John F. Driess, of Ontonagon, has been in charge of the work. Two veins outcrop 400 ft. apart. One is 15 ft. wide, and has been opened by several test-pits showing copper. The outcrop was found in a small stream which traverses the property. The other lode is 6 ft. wide and carries some copper, although very little work has been done to prove it.

Norwich.—Drifting on the Norwich vein at this property, owned by the Copper Crown Mining Co., a St. Louis concern, is under way. A tunnel has been driven into the high bluff on the property for the purpose of opening several lodes.

Victoria.—Surface work at this property is being pushed as rapidly as possible. The power plant is nearing completion, the stamp-mill structure is going up, the foundation for the shaft-house and rock-house is completed, and material for the compressor building is on the ground. The erection of the shaft-house will be started at once. There is one shaft of large dimensions. A second will not be considered until the mill and compressor plants are completed and production begins. Underground operations will not be resumed until facilities for handling the product are provided, as it is officially stated that the present workings are large enough to supply 300 tons of rock daily for five years.

IRON—MARQUETTE RANGE.

Saginaw Mining Co.—This company has been organized to work the Saginaw-Perkins property at Norway. The late Peter L. Kimberly was heavily interested in the property, and three of the trustees of his estate were present at the organization, one being president of the company and the other two directors. The officers are as follows: President, George A. Baird, of Chicago; secretary, Elmer C. Jones, Iron Mountain; treasurer, George A. Baird, Iron Mountain; directors—John T. Jones, John C. Owley, Ira W. Bassett, George A. Baird and Elmer C. Jones.

MONTANA.

DEER LODGE COUNTY.

Allen Gold Mining Co.—The property is on French gulch, 16 miles from Anaconda and comprises 400 acres of placer ground and 27 lode claims. The formation is granite, with quartzite dikes. The veins are within the granite and on the contact of granite and quartzite. The ore consists of a heavy sulphide of iron and lead, carrying gold and silver, with not over 10% silica. The property has been developed by 5,500 ft. of work. W. R. Allen, of Anaconda, is manager, and announces his intention to erect a small smelting plant at the property. He is also doing some hydraulic work with giant and elevator on his placers. In all he employs 150 men.

LEWIS & CLARK COUNTY.

Whitlatch Mine.—F. L. Sizer, manager of this property, recently returned from Chicago, where he purchased equipment for a 20-stamp mill, air-compressor and electric motors, all of which will be installed as soon as possible. The mill will have amalgamating plates, concentrating tables and cyanide equipment for treating the tailing. The ore is considerably oxidized to the present depth of 500 ft. Two parallel veins have been opened and development is extensive to the 400-ft. level. The mill was purchased from the Allis-Chalmers Co., and the compressor from the Ingersoll-Sergeant Co., and the motors from the General Electric Co. All

will be run by electric power. The mine is within 4 miles of Helena.

Bald Butte Mining Co.—Within the half-year ending June 30, 1905, the main vertical shaft was completed to the 1,000-ft. station and 1,449 ft. of other development done. The mill crushed nearly 5,000 tons of ore in that time, yielding bullion and concentrates that sold for \$43,420. R. M. Atwater, of Helena, is consulting engineer, John Edgerton, secretary-treasurer. The mill tailings impounded will be cyanided. The property is near Marysville.

East Pacific Mining Co.—This company's property is near Winston, east of Helena. R. A. Bell, of Helena, is manager, with D. P. Little as superintendent. The mine produces a sulphide ore, carrying iron, lead, zinc, with gold and silver. A concentrator is being erected. The zinc-lead product will doubtless be shipped to the Montana Zinc Company at Butte.

BROADWATER COUNTY.

Blacker Mine.—John Tregoning, who has a bond and lease on this property, is making small shipments of ore to the Helena smelter that runs from \$12 to \$40 in gold, carrying 35% excess of iron. Its location is at Radersburg, 10 miles from Toston, the nearest railroad point.

NEVADA.

ESMERALDA COUNTY.

It is stated that the Tonopah Railroad is to be extended to Goldfield and Bullfrog. Surveys are completed, and the rails have been ordered. The extension will be built by parties interested in the Tonopah Mining Co., of Nevada, who own the road to Tonopah.

OREGON.

BAKER COUNTY.

Mayflower.—President S. R. Balkwell and Treasurer L. C. Dennis, of the Stampede Mining Co., owning the Mayflower mine in the Cornucopia district, in consultation with Engineer Geo. W. Boggs, have just closed contracts for the balance of the machinery with which to erect the new 10-stamp mill cyanide plant. A part of the machinery is already on the way, and it is the purpose of the company to have the mill in operation by October 1. Sufficient development work has been done in the mine to block out large ore-bodies.

Gold Coin.—In the Rye Valley district, the Gold Coin Mine Mining Co., a Pendleton, Oregon, institution, is engaged in the erection of a 40-stamp mill, 10 stamps of which will be put in condition at once and will be in operation by September 1. They are now working on a cement-gravel deposit, 43 ft. wide, between hanging and foot walls. The upper tunnel is in 200 ft.; at a point about 50 ft. from the mouth of the tunnel a winze has been sunk 75 ft. Both the tunnel and winze are in ore. The company is running two other tun-

nels on the vein, one 50 and the other 13 ft. below the upper tunnel. The ore from this property concentrates at the rate of 13 tons into one, which consists of black sand and carries some platinum. An assay of the samples sent to the Geological Survey a short time ago gave results of 9.98 oz. gold and 0.22 in platinum.

United Elkhorn.—Manager Edward I. Field, of this mine, is just completing the sinking of the main shaft 160 ft. deeper than the 300 level, and is now cutting a station on the 400 level. The mill is busy making concentrates, which are being shipped to the Sumpter smelter.

PENNSYLVANIA.

ANTHRACITE COAL.

Philadelphia & Reading Coal & Iron Co.—This company is preparing to start its new washery at Middle creek. This is the latest and one of the best washery plants in the anthracite country. It will employ about 100 men and ship some 25 carloads per day.

BITUMINOUS COAL.

Pittsburg Coal Co.—The affairs of this company are receiving a good deal of attention, though the stockholders are, apparently, deciding to accept the passing of the dividend without further protest. A statement is promised by the company, but has not yet appeared. It is understood that negotiations have been begun for the sale of part of the company's property to the United States Steel Corporation for \$10,000,000; but no particulars can be obtained. There are further rumors that the Steel Corporation is considering the purchase of a controlling interest in the company; but this is rumor only, and there is nothing to verify it. The property to be sold includes nearly all the coking coal owned by the company, and adjoins lands of the H. C. Frick Co., which is owned by the Steel Corporation.

COKE.

The Southern Connellsville Coal & Coke Co., which recently acquired the property of the Riverview Coal & Coke Co., in the lower Connellsville region, has awarded a contract for the erection of 200 ovens. The headquarters of the company are in Pittsburg.

UTAH.

JUAB COUNTY.

Tintic shipments last week aggregated 81 car-loads, the output being light on account of the midsummer holidays. The Centennial Eureka was the heaviest shipper, having sent 26 car-loads to the smelters.

Mammoth.—On the afternoon of July 3 the pumping plant of this company, located 22 miles west of Mammoth, was destroyed by fire, cutting off the water supply of the town as well as several of the mines of the district. A temporary plant was put in, and will be used pending the installation of a permanent one.

PIUTE COUNTY.

Annie Laurie.—The auxiliary power plant being built on the Sevier river, at a cost of \$25,000, is nearing completion. A new crusher has been added to the equipment of the company's milling plant at Kimberly.

Sevier Consolidated.—At a meeting of the stockholders, the directors were authorized to proceed with the equipment of the mine with a new 100-ton mill, which will be provided with cyanide and amalgamation departments. The company has operated a small experimental plant with satisfactory results for some time past. The officers of the company for the ensuing year are: Seymour W. Tulloch, Washington, D. C., president; W. E. Maison, Ogden, Utah, vice-president; Edgar H. Thornton, Ogden, Utah, treasurer; R. W. Foster, Kimberly, Utah, general manager.

SALT LAKE COUNTY.

South Columbus.—The main tunnel at this property is completed to the length of about 1,050 ft. At present the company is getting power for machine drills from the Columbus Consolidated compressor. It is possible that the company will take steps to provide a plant of its own later in the year. Arthur Snow, of Salt Lake, is manager.

Bingham Central.—This mine is being developed by a close corporation, consisting mainly of the managers of some of Bingham's largest copper companies and parties connected with the American Smelting & Refining Co. management.

Mystic Shrine.—This property, recently sold to the Intermountain Mining & Industrial Association, with headquarters in Denver, marketed two cars of high-grade lead-copper ore this week. Officials are considering the construction of a mill to treat the low-grade orebodies. L. J. Moser, of Salt Lake, is manager.

SUMMIT COUNTY.

Marsac Mill.—This old landmark is being demolished and the machinery consigned to the scrap heap. Considerable silver bullion and a great quantity of quicksilver have been saved from under the old plant.

Silver King Consolidated.—This company is now installing a 400-h.p. hoisting plant and is preparing to sink its triple compartment shaft deeper. It is now 800-ft. down. When the new hoist is in place the mine will be equipped as well as any other mine in the camp.

Ontario Tunnel.—The work of clearing this adit of the series of caves is still in progress, with nothing to indicate the end of them. Until all the obstructions are out of the tunnel nothing can be done toward continuing the tunnel into Daly-West territory.

TOOELE COUNTY.

Bingham West Dip.—This company has installed a new compressor plant and is pushing its long tunnel, which is destined

to tap the orebodies of Bingham at great depth, ahead. The adit is now into the mountain about 800-ft. Some ore has been encountered, but no large bodies of it.

Honerine.—A four-foot vein of high-grade copper ore has been encountered on the 1,500 level of this property.

Overland.—This mine at Sunshine, which is equipped with an extensive milling plant, has been sold to Denman Blanchard, of Boston, at receiver's sale to satisfy creditors. The property was bought in for \$37,500.

Stockton.—This company will resume operations with its 60-ton concentrating mill early in August, difficulty experienced over the disposition of tailing having been settled. The company has secured perpetual right in the cañon, so no further trouble is anticipated.

Black Diamond.—The directors of this company will probably take steps in the near future to provide milling facilities. The company has been sending considerable ore to the Honerine mill for treatment, paying \$2 per ton in treatment charges. W. C. Alexander, of Salt Lake, is manager.

UTAH COUNTY.

Syngnet.—The tunnel at this property in American Fork cañon has been completed to a length of 470 ft. It is expected the contact toward which it is directed will be encountered within the next 200 feet.

WASHINGTON COUNTY.

Paymaster.—Some high-grade copper ore has been encountered in this property recently. Considerable ore has been developed that would pay if the company had its own smelter. S. Adams, Jr., of Provo, Utah, is manager of the Paymaster company.

Utah & Eastern.—Work is progressing with the new tunnel through which the management expects to again open the orebodies, access to which was cut off recently by the caving-in of the incline shaft. The adit is into the mountain about 130 ft. Until the orebodies are made available again, the smelter will remain closed.

VERMONT.

ORANGE COUNTY.

Elizabeth Copper Co.—This company has recently been incorporated in New Jersey, with August Heckscher, of New York, as president, to take over the lease and option on the Elizabeth mine, at South Strafford, formerly owned by the Elizabeth Mining Co. After the failure of the old company, the work at the mine was resumed by Messrs. John N. Judson and Lewis G. Rowand, whose interests have now been transferred to the Elizabeth Copper Co. The Wetherill separator is to be applied to the separation of the chalcopryrite and pyrrhotite of this ore.

Ely.—It is said that this mine, at Cop-

perfield, which has been worked on a large scale by George Westinghouse, Jr., for several years past, is to be abandoned.

VIRGINIA.

CARTER COUNTY.

Limonite Mining Co.—This company is opening up a deposit of soft iron ore on the line of the Virginia & Southwestern railroad. An ore-washer has been completed, which is supplied with water from a reservoir, placed 200 ft. above the level of the washer, in which the water from several mountain streams is collected. Maj. A. D. Reynolds, of Bristol, Tenn., is manager.

WEST VIRGINIA.

BROOKE COUNTY.

Advices received at Fairmount, W. Va., announce that C. H. Muercke, of Chicago, has purchased 4,000 acres of coal lands in Brooke county from the McCord estate at \$200,000. In addition to this property, the same purchaser has secured lands from the Frank Armstrong estate, Charles Snwertfelger, W. F. Counselman, J. S. Cheffey, Robert Miller, Nancy Wills estate, William Pitman, W. B. Hieks, Jas. Hukill, Philip Oram, Lee Wilson, C. and J. Bonar and T. C. Crouch. The lands are all in the vicinity of Wellsburg, W. Va., and it is thought that development work will soon be started.

WASHINGTON.

FERRY COUNTY.

Winnipeg.—Formerly known as the Hawkeye. A drift is being driven on the 240-ft. level. Some good bunches of ore have been found in this mine.

California.—Small quantities of good ore are being found on the upper levels. Prospecting is being conducted on the 300-ft. level.

Treadwell Group.—This consists of the Treadwell, Red Chief, Monitor, Red Cloud and Ironsides, situated on Missouri mountain, a mile south of the head of Lambert creek. It has been bonded to E. J. Delbridge, of Seattle, Wash. Several ore veins traverse the group in different directions, one of them having great width. They have been exploited by open cuts and shafts. The lowest depth yet attained is 18 ft. Ore samples assayed from \$3.90 to \$24 in gold and copper. Much of the ore found carries considerable iron. This property adjoins the Oversight group on the southeast.

Foreign Mining News.

CANADA.

NOVA SCOTIA.

Cape Breton Coal, Iron & Railway Co.—This company is opening new coal mines at Broughton, between Louisburg and Glace Bay in Cape Breton. The company is composed chiefly of English operators. T. Lancaster, of Sydney, B. C., is manager.

Standard Coal & Railway Co.—A party of surveyors has commenced locating a line of railway between Truro, Parrsboro and Maccan, for this company. The drilling at the coal property at Newville is progressing slowly, owing to the flow of water along the rock, but this trouble is likely to be superficial only. At 80 ft., what was supposed to be the old Barlow seam of coal, was struck. The hole was lost and a new one started. This serves as a tracer for the larger seam lying underneath, and as it was reached 100 ft. nearer the surface than at the first drilling, it is calculated that the large seam previously located will be cut in this hole at about 1,000 feet.

NEW CALEDONIA.

Exports of minerals from the colony for April and the four months ending April 30 are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons:

	April.	Four mos.
Cobalt ore.....	373	3,539
Nickel ore.....	6,481	35,655

Exports of chrome ore in April are not given; for the three months ending March 31 they were 18,399 tons.

NEW ZEALAND.

Exports of gold from the colony, in April and the four month ending April 30, are reported by the Mines Department as below, in ounces of bullion:

	1904.	1905.	Changes.
April.....	24,959	39,084	I. 14,125
Four months.....	150,042	163,059	I. 13,017

The bullion reported this year was equal to 154,906 oz. fine gold. Silver exports for April and the four months were, in ounces:

	1904.	1905.	Changes.
April.....	71,110	93,082	I. 21,972
Four months.....	336,305	287,882	D. 48,423

The greater part of the silver comes from the Hauraki mining district.

Coal Trade Review.

NEW YORK, August 2.

ANTHRACITE.

The condition of the hard-coal market in the city remains, without any features of interest, at the dull level it has now occupied for some weeks. Most of the local dealers are well stocked, but consumers are not at all interested in the 10c. discount now available, and will wait, probably until September before laying in their further supplies. At the mines, however, a great deal of interest is felt in the necessity for closing down operations at many points for indefinite lengths of time.

From our correspondent at Seranton, we learn that the anthracite coal companies are planning to shut down their mines a great part of this month. The mines of the Lehigh Valley Co. were shut down for 10 days last month, but President Thomas says that he expects them to be idle more than half of August. The larger

operating companies, it is believed, will act in unison on this matter, and it is probable that all will agree to remain idle during the greater part of August. The companies are selling little of their production this month, while the storage yards are being filled as rapidly as possible. The Reading has opened its storage yards at Abrams and the Lehigh Valley is ready to use two yards, now under construction. The companies have large quantities of coal on hand, which they hope to clear out during the temporary cessation of work, at the same time making extensive repairs and alterations at almost all the collieries.

As to the possibility of a strike next summer in the anthracite fields, nothing whatever can be said definitely. Mr. Mitchell is making a tour of the field for the purpose of preparing the members of the union to make a determined stand at the expiration of the present wage agreement, but he denies the necessity for a strike and cannot himself say whether or not the mine workers will be involved in one. The best informed men in the trade are equally ignorant, so that statements from any source as to the inevitableness of labor disturbance next summer must be taken with caution.

Wholesale prices received another advance of 10c. per ton at the first of this month, and for the month of August will remain at \$4.65 for broken and \$4.90 for domestic sizes, f. o. b. harbor shipping points. Steam sizes are in good supply at the same prices 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 slow, but a few signs of improving business a little later are visible. At this time shippers are working principally upon contracts on hand, transient trade being of very small volume. The low ocean freights that have prevailed, although they are strengthening a little at this moment, are inducing shipments in certain quarters, and most consumers, if they have sufficient storage room, are making considerable headway toward laying in their winter supply, and are making substantial economies at the present freight rate. Prices on the low-grade coals are weak, but for ordinary steam grades \$2.25@\$2.30 are the apparent quotations.

Trade in the far East is taking on a fair amount of coal, although the demand is not strong. Trade along the Sound is showing signs of improvement; during the last two weeks, it has been affected by unwillingness on the part of some consumers to take on new supplies during the time that they are taking stock. New York harbor trade is quiet, and is confined almost exclusively to contract business. All-rail trade remains unchanged with a fair business. Transportation from mines to tide is slower than it has been, and is

somewhat under schedule, although with the present dullness in the trade, little objection is heard on this account. Car supply is up to demands.

Vessels in the coastwise trade are in good supply, particularly the large ones. Philadelphia quotes as follows: To Boston, Salem and Portland, 60c.; to Providence, New Bedford and the Sound, 50c.; to Lynn and Bangor, 75c.@80c.; to Newburyport, 80c.; to Portsmouth, 65c.; to Bath, 70c.; to Saco and Gardner, 90c. and towages. New York harbor charges 50c. to around the Capes.

Birmingham. July 31.

The production of coal in Alabama is still on the increase, and reports are to the effect that the aggregate daily output is better than it has been in two years, not forgetting the first part of last year, when the production was exceptionally heavy. There will hardly be any cessation in the coal operations in this State this year. The yellow fever epidemic at New Orleans will not interfere with the coal business.

There is considerable development about to be started. The Louisville & Nashville Railroad Co. has let the contract for a 20-mile extension into Walker county to reach the property of the Pratt Consolidated Coal Co., the largest independent coal concern in the State today. This extension will be constructed within six months, and by the time it is completed a dozen new mines will have been opened up and everything will be in readiness to start the shipment of coal. The Frisco system is building an extension in Walker county also, to reach the new Bessie mines of the Sloss-Sheffield Steel & Iron Co. and other development which is about to start up in that section. The Southern railway is figuring on the construction of an extension, also in Walker county, to reach coal mines. The coke production in this State is holding its own. The Alabama Consolidated Coal & Iron Co. is pushing the work on 100 coke-ovens under construction at Lewisburg, in Jefferson county. Good prices prevail for the product, and the demand is strong.

Chicago. July 31.

In general, the coal trade may be said to be somewhat better than it was a week ago, though the improvement is slight. The bituminous trade, so far as Western coals are concerned, has settled back into its normal condition of too much produced for the good of the trade; summer dullness is apparent everywhere also. The improvement is chiefly in Eastern coals, notably smokeless, which seems to be gaining favor steadily with consumers.

Dealers in Western are confronted with the need of stiffening credit in order to preserve profit in sales. The Chicago Track Dealers' Association has taken summary measures toward weeding out

the unprofitable buyers of coal and will hereafter refuse to sell to anyone who does not show good standing as a customer. Competition has been too keen for the wholesaler heretofore to draw the line of credit rigidly, and there has been consequently a large and constant loss from bad customers.

The demand for credit has increased this season, with the reluctance of dealers to stock up with large amounts. This is especially true of anthracite, which is selling slowly; probably more slowly than in any year since the adoption of the system of graduated discounts. Anthracite, however, has taken a turn for the better with the last week of July, but the improvement is no doubt only temporary; the trade expects that with the opening of August three weeks of dullness will follow. A notable feature of the anthracite buying is the large number of orders for small tonnage each.

Hocking is a coal in large supply and relatively small demand; in consequence the market has been weak and promises so to continue for several days. Actual sales of Hocking have been made as low as \$2.65, though most of the business has been done at \$2.75@\$2.90.

Youghiogeny is in light request, with prospects that the demand will be better this week. Three-quarter brings \$2.85@\$2.95. Smokeless is holding well up to the standard prices of \$3.05@\$3.15, for run-of-mine.

Illinois and Indiana coals bring \$1.70@\$1.90 for lump; \$1.60@\$1.80 for run-of-mine, and \$1.30@\$1.40 for screenings. The probability is that Western coals will weaken still more, with the output from the mines exceeding the demand constantly.

Cleveland. Aug. 1.

The coal trade is still in the dumps, with evidences of over-production and a weak market as a consequence. Run-of-mine steam coal is selling at 85@90c. at mines, with Lake three-quarter coal in fair demand only at \$1.90 f. o. b. boats at Lake Erie ports. There are growing evidences that the movement up the lakes this year is not to be as great as it was a year ago; due in the main to the competition of the western mining sections. The buying of coal for northwestern shipment has been a little heavier of late, but not as heavy as might have been expected. The Lake carrying rates are steady at 50c. to Milwaukee and 30c. to the head of the lakes, tonnage being abundant.

The best demand seems to be for slack, which, notwithstanding the good supply of it, is still holding firm at 50c. for the Pennsylvania product at the mine and 60@65c. at Ohio mines.

The coke market has been much easier, but it is now fairly strong again, prices stiffening some. For a time the better grades of 72-hour coke were selling as

low as \$2.25@\$2.35, but the market is now stronger, and the bottom on the standard grades is \$2.40 at the oven, although a few of the off-cokes are selling still as low as \$2.25. The foundries are beginning to buy a little more freely. The furnaces are getting their coke for \$1.90@\$2 per ton.

Pittsburg. Aug. 1.

Coal.—Another rise in the rivers enabled shippers to send out yesterday and today over 8,000,000 bush. of coal. Many empty coal boats and barges have been returned, and there will be steady employment for the river miners for some time. Most of the railroad mines are in operation and heavy shipments are being made to lake ports. Prices continue weak, and sales are on a basis of 95c.@\$1 for run-of-mine. It developed during the past few days that negotiations are on between the Pittsburg Coal Co. and the United States Steel Corporation for the sale of its coking coal properties. The Pittsburg Coal Co. owns about 8,000 acres of coking coal adjoining holdings of the H. C. Frick Coke Co., which is said to be equal to the best in the Connellsville region. The company owns but 635 ovens, and has sold the product up to Jan. 1 at profitable prices. The coal is said to be too valuable to sell for steam purposes, and one reason assigned for passing the dividend recently was to utilize the money in building about 5,000 coke ovens. The entire property has been offered to the Steel Corporation at about \$1,300 an acre, or for the round sum of \$10,000,000. If the deal is concluded, the coal company will resume the payments of dividends, but the price received for the coking property will be applied to the redemption of bonds.

Connellsville Coke.—Prices continue firm at \$1.85@\$2 for furnace, and \$2.35@\$2.50 for foundry. The production in the Connellsville region for the week was 244,919 tons, a decrease of 1,873 tons compared with the previous week. The shipments aggregated 10,988 cars, an increase of 530 cars, distributed as follows: To Pittsburg and river points, 4,185 cars; to points west of Pittsburg, 5,557 cars; to points east of Everson, 1,246 cars.

San Francisco. July 27.

Trade continues quiet. Domestic fuel is depressed at this season. Fuel oil seems to be in better demand than steam coal, which is rather slow.

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.

Aug. 2.

Exports of coal and coke from the United States for the six months ending June 30 are reported by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1904.	1905.	Changes.
Anthracite.....	1,124,295	1,207,985	I. 83,690
Bituminous..	2,788,417	3,151,079	I. 362,662
Total coal.....	3,912,712	4,359,064	I. 446,352
Coke.....	268,968	296,066	I. 27,098
Totals.....	4,181,680	4,655,130	I. 473,450

The coke went chiefly to Mexico, with some shipped to Canada also; the latter being taken by blast furnaces in Ontario. The coal exports were distributed as follows:

	1904.	1905.	Changes.
Canada.....	2,796,670	3,179,234	I. 382,564
Mexico.....	500,542	491,783	D. 8,759
Cuba.....	235,332	251,550	I. 16,218
Other West Indies..	139,887	165,906	I. 26,019
France.....	9,311	651	D. 8,660
Italy.....	47,075	37,962	D. 9,113
Other Europe.....	35,309	13,739	D. 21,570
Other countries..	148,586	218,239	I. 69,653
Total.....	3,912,712	4,359,064	I. 446,352

The greater part of the exports are to adjacent countries—Canada, Mexico, Cuba and the other West Indies. The coal to other countries goes principally to South America. Exports to Canada in detail were as follows:

	1904.	1905.	Changes.
Anthracite.....	1,107,429	1,189,073	I. 82,244
Bituminous..	1,689,241	1,989,561	I. 300,320
Total.....	2,796,670	3,179,234	I. 382,564

The increase in anthracite this year was 7.4%, and in bituminous 17.8%; making a gain of 13.7% in the total exports.

Imports of coal into the United States for the six months ending June 30 are reported by the Bureau as below:

	1904.	1905.	Changes.
Canada.....	639,947	656,442	I. 16,495
Great Britain.....	40,997	25,571	D. 15,426
Other Europe.....	50	113	I. 63
Japan.....	29,622	33,136	I. 3,514
Australia.....	108,558	63,020	D. 45,538
Other Countries..	977	158	D. 819
Total.....	820,151	778,420	D. 41,741

Of the coal imported this year, 6,730 tons were classed as anthracite; the balance was bituminous. With the exception of some Nova Scotia coal which comes to Boston, the imports from Canada were British Columbia coal, received at California ports. There was a large decrease this year in Australian coal, which comes to California. Nearly all the Japanese coal is received in Manila.

Iron Trade Review.

NEW YORK, Aug. 2.

A lull in new business is on, so far as pig iron is concerned. This is due, in part, to the fact that the larger consumers supplied themselves for a time in the recent active period; in part, perhaps, to the desire of buyers to check the disposition of furnace-men to put up prices. On

the other hand, no tendency appears to press sales.

In finished material there has been more activity. Orders for ships, bridges and steel cars, recently placed, ensure a demand for structural material and plates; while the manufacturers of agricultural machinery seem to be confident of good crops, as they have been large buyers of bars and other material.

July, it is understood, has beaten all records in the shipment of iron ore down the Lakes, though the exact figures have not yet been received.

It is reported that a large rolling mill, for structural steel, will be erected on Staten Island, in New York bay. The firm of Milliken Brothers is interested in the project; they are large contractors and builders.

Exports and Imports.—Exports of iron and steel, including machinery, from the United States, for June and the six months ending June 30, are valued by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1904.	1905.	Changes.
June.....	\$11,681,020	\$11,820,655	I. \$139,635
Six months.....	60,994,544	67,600,273	I. 6,605,729

The increase in June was 1.2% only; for the half-year the gain was 10.8%. The chief items of the iron and steel exports for the six months were as follows, in long tons:

	1904.	1905.	Changes.
Pig iron.....	\$21,713	\$44,372	I. 22,659
Billets, blooms, etc...	174,084	98,319	D. 75,765
Bars.....	28,900	29,636	I. 736
Rails.....	134,947	128,936	D. 6,011
Sheets and plates.....	14,990	34,659	I. 19,669
Structural steel.....	21,203	38,976	I. 17,773
Wire.....	34,682	42,016	I. 7,334
Nails and spikes.....	45,851	50,469	I. 4,618

There was a heavy decrease in billets, ingots and blooms; while rails show a small decrease, owing to the heavy exports in June of last year. The more important gains were in structural steel, sheets and plates; nails and wire also show fair increase. Exports of iron ore for the six months were 7,619 tons in 1904, and 54,556 tons in 1905; an increase of 46,937 tons, most of it going to Canada.

Imports of iron and steel into the United States for June and the six months ending June 30 are valued as follows:

	1904.	1905.	Changes.
June.....	\$2,030,798	\$2,646,258	I. \$615,460
Six months.....	11,132,201	12,979,982	I. 1,847,781

The increase in May was 30.3%, showing a large increase for the month; for the half-year the gain was 16.6%. The chief items of the imports for the six months were as follows, in long tons:

	1904.	1905.	Changes.
Pig iron.....	44,012	93,843	I. 49,831
Billets, blooms, etc...	6,618	8,257	I. 1,639
Scrap iron and steel..	8,438	9,522	I. 1,084
Bars.....	8,995	15,761	I. 6,766
Rails.....	30,447	9,796	D. 20,651
Wire-rods.....	7,659	8,057	I. 398
Tin-plates.....	34,780	36,034	I. 1,254

Rails were the only item showing a decrease. The larger proportional gains were in pig iron and bars.

Imports of iron ore for the six months were 163,176 tons in 1904, and 433,686 tons in 1905; an increase of 270,510 tons.

A considerable quantity of Spanish ore has been imported this year, besides Cuban ore. Imports of manganese ore were 23,460 tons in 1904, and 109,703 tons in 1905; an increase of 86,243 tons—a very large gain.

Birmingham. July 31.

While the pig-iron market is not as active as it was during the third week in the month, there is strength to it yet and prices are holding the advanced position, with a further increase indicated. No. 2 foundry is now quoted at \$12 per ton, flat, and quite a number of sales have been made at that price. Much iron has been disposed of for delivery during the last quarter of the year, while a few inquiries have been received by the Southern manufacturers for iron to be delivered during the first three months of 1906. There is to be an immediate improvement in the production. Second Vice-President J. W. McQueen, of the Sloss-Sheffield company, authorizes the statement that No. 2 furnace at North Birmingham, which has been out of blast for the past two months for repairs, will be placed in operation during this week. The two furnaces of the Tennessee Co. at Bessemer, Ala., now idle, will be started up in about two weeks. The Tennessee Co. is also assembling raw material at Oxmoor furnaces, a few miles south of Birmingham. The Sloss-Sheffield Steel & Iron Co. sold over 100,000 tons during July, while the Tennessee Co. has done quite as well, if not better. The Alabama Consolidated Coal & Iron Co. has sold its probable make for the next two or three months and more. The Woodward Iron Co. had to go slowly during the past two weeks on account of a large aggregate in sales before that time.

The following quotations are given: No. 1 foundry, \$12.50; No. 2 foundry, \$12; No. 3 foundry, \$11.50; No. 4 foundry, \$11; gray forge, \$10.50; No. 1 soft, \$12.50; No. 2 soft, \$12.

Cast-iron pipe works and the steel industries in the Birmingham district show no change in conditions, activity being noted on all sides. M. E. Duncan, representative of the American Car & Foundry Co., was in the Birmingham district during the past week investigating sites for the location of a car-building plant to cost at least \$1,000,000. Mr. Duncan will report as to his findings on conditions in this district to his board of directors. There is no doubt that this concern will come to the Birmingham district.

The Alabama Steel & Wire Co. will shortly start up two more of its woven-wire machines. This concern is manufacturing a lot of cotton tie billets for the Sheffield rolling mills.

Rumors that Southern coal and iron concerns are to be merged, which were recently revived in the East, are not confirmed in this section, higher officials of

the various companies said to be interested announcing that there is nothing doing.

Chicago. July 31.

To all appearances, the boom in iron has struck the Western metropolis for good, at a time when the normal condition of trade would dictate two months more of dullness. Sales of both Northern and Southern iron have been heavy in the last week. Southern today is quoted at \$12 Birmingham, as a minimum, or \$15.65 Chicago; this is an advance of \$1 over the minimum quotation of last week. Northern iron is quoted at \$16.50 minimum, with the probabilities that this figure represents a less price than will be quoted on sales of the present week.

The heavy demand for iron, both Northern and Southern, indicates a general desire of the trade using iron to close contracts and to run as far as possible with contracts into 1906. Sales for the last week have included, according to reports, a large tonnage in the next year; this is due chiefly to the demand of the trade for satisfactory assurances of the business of the future.

Probably 100,000 tons of iron have been sold in the last week. This total, it is needless to say to those conversant with the Chicago trade, is 50 to 100% in excess of the normal demand for iron at this season. The prospects are that fully as much iron, if not more, will be sold in the coming week.

Northern iron is comparatively steady, on account of the small quantity remaining unsold for the balance of the year. The agitation and the fluctuation are in Southern irons, with the sales running small in volume but large in number.

Coke is recovering somewhat, with 72-hour Connellsville quoted at \$5.15 and southern cokes about 50c. less. The supply is fully adequate to demand.

Cleveland. Aug. 1.

Iron Ore.—Estimates of the movement down the lakes during July are that the total figures will be over 5,000,000 tons. This will establish a new monthly record for the lakes. This also occasions a revision of the estimates of the total movement for the year, many making it at 28,000,000 tons. There is a possibility ahead of a cut in the Lake carrying rates, although nothing has been done so far, freights holding steady at 75c. from Duluth to Ohio ports; 70c. from Marquette, and 60c. from Escanaba.

Pig Iron.—Buying is dull, and the only thing that enlivens the situation is the appearance of inquiries for material for delivery through the remainder of the year and the early part of next year. Foundry iron is stronger, with No. 2 quoted at \$14.25 for immediate shipment, and \$14.50@ \$15 in the Valleys for advanced delivery. The bessemer, basic and

malleable trades are also stronger, with the market firm at \$14.25 for immediate shipment, and holding steady at \$14.75@ \$15 for future delivery. The southern producers are offering material here at \$12 Birmingham, to which is added the \$3.85 freight rate to make up the Cleveland quotation.

Finished Material.—About the only change in the market here has been the marking up of bar iron, which has advanced \$2 a ton, on good buying and higher scrap prices, to 1.60c. Youngstown. Most mills are again basing on that center. The consumers of structural are taking more material than of late, and have been getting most of it from the smaller mills, paying premiums of \$3 to \$5 a ton for what they need. The general trade is strong.

New York. August 2.

Pig Iron.—Sales of foundry iron have fallen off somewhat from the active movement of the past two weeks. There is a good business in sight, however. Northern furnaces are not making concessions, while Southern makers are holding for an advance.

For Northern iron in large lots we quote: No. 1 X foundry, \$16.25@ \$16.75; No. 2 X, \$15.75@ \$16.25; No. 2 plain, \$15@ \$15.75; gray forge, \$14.25@ \$14.75. Virginia foundry is \$16.90 for No. 1 and \$16.40 for No. 2. Southern iron has been pretty well sold, and is now held on a basis of \$12, Birmingham, for No. 2. For large lots here on dock we quote: No. 1 foundry, \$16@ \$16.50; No. 2, \$15.50@ \$16; No. 3, \$15@ \$15.50; No. 4, \$14.50@ \$15; No. 1 soft, \$16@ \$16.50; No. 2 soft, \$15.50@ \$16; gray forge, \$14@ \$14.50.

Latest sales of warrants on the Produce Exchange show for September and October, \$15.10 bid, \$15.25 asked for regular warrants; \$15.20 bid, \$15.40 asked, for foundry warrants.

Cast Iron Pipe.—Orders indicate a good fall trade, with several large contracts under negotiation.

Bars.—Bar iron is selling well, but in a small way only. Quotations are 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.

Structural Material.—Considerable business is noted, mostly in small orders coming to jobbers. Premiums are being asked for early deliveries. Beams under 15-in. are 1.745c. for large lots; over 15-in. 1.845c.; angles and channels, 1.745c., tide-water delivery. Large orders are going, but are negotiated directly with mills.

Plates.—Plates are still in demand 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. Light rails are less active, prices

ranging from \$20.50 for 35 lb., up to \$24.50 for 12-lb. rails.

Old Material.—The market is more active, and prices are higher. No. 1 railroad wrought brings around \$16@ \$16.50; No. 1 yard wrought, \$14@ \$14.50; machinery cast, \$13.50@ \$14. There is demand for heavy steel melting scrap, and sales are made at \$14.50@ \$15. These prices are on cars, Jersey City, or other terminal delivery.

Philadelphia. August 2.

Pig Iron.—The pig-iron market has been rather quiet during the past two days, and it is explained that some of our large brokers have advised their customers not to manifest any anxiety to increase their purchases for the present. Sales for several days past have fallen below the usual average, and as all consumers, big and little, have an abundance of iron on hand and as most of them have large contracts placed, there is no occasion for increasing stocks at present. A period of dullness is probable and will do good. The furnace people have taken a notion to advance prices from 50 to 75c. without any good cause, and they will be taught a lesson which they need. At the same time they are not at all anxious to make sales and will simply await developments. Large purchases have been made in the South of foundry and forge iron. Large orders have been placed for bessemer within a short time by Western steel companies. Eastern smelters are now in the market for a large quantity of material, but they have contented themselves up to present writing by simply asking for quotations and letting the matter rest. Consumers of forge iron are fairly well supplied at present, but there is a prospect today that the builders of freight cars, who recently secured large orders, will be in the market very shortly and our forge-iron people are waiting to hear from them. A fair quotation for pig iron may be given at \$17.50 for No. 1 X; \$16.50 for No. 2 X; \$15@ \$15.25 for standard gray forge; \$15.25 for basic; \$20.25 for low phosphorus; \$16 for Southern No. 2 by rail.

Billets.—The billet market keeps up its activity and some offers have been made for supplies by Eastern consumers lately at \$26. Small lots are selling at \$27.

Muck Bars.—Our muck-bar people would be glad to pick up business at \$28 f. o. b., but they are not doing anything to speak of.

Bars.—It has been whispered around that the car-builders will shortly be in the market for a large amount of iron. The mills are fairly busy, but all are anxious to add orders to their books, though they are not willing to shade prices.

Sheets.—Our mill people are doing a good business in all kinds of sheets, but

the storekeepers report a fluctuating retail demand.

Pipes and Tubes.—The pipe and tube industry is exceptionally active, and new business is coming to hand almost daily.

Plates.—The plate mills are catching a good deal of business. Two orders for Pacific steamships have been recently placed, for which a large quantity of material will be wanted. There are a number of smaller requirements in hand.

Structural Material.—There is keen competition for some of the large orders. Rather exaggerated estimates are being currently reported as to the business, but it is known that the amount is very large.

Steel Rails.—There is quite a demand for steel rails, the orders for the past week footing up, some say 70,000 tons, others putting the figure a little less. A moderate tonnage for light sections is being placed.

Scrap.—Everything in the shape of desirable scrap in this market has been cleaned up. There is more wanted than can be had, and prices have become rather nominal because of the inability to promise buyers the amounts they must have. The dealers are not able to get all the stuff that is wanted, and they are naming prices a little above what they hope to get.

Pittsburg. August 1.

There was a decided improvement in the pig-iron market during the past week and prices are advancing. While no particularly large sales have been made, the total tonnage was heavier than for several weeks. The furnaces in the Valleys and the Pittsburg district are in operation and stocks are not accumulating. One large independent interest is out of the market for the present, and is shipping the product of its furnaces as rapidly as it is turned out. The largest sale of bessemer iron was 10,000 tons to a foundry interest at \$14, Valley furnaces. Other sales in lots of 1,000 and 500 tons, aggregating about 10,000 tons, were at \$14.25 and \$14.50, Valley. Bessemer iron is now quoted at \$14.50, Valley, and it is confidently believed that \$15 will be the minimum price by September 1. A sale of 3,000 tons of basic iron was recently made a \$14, Valley, but 25c. a ton above that price is now asked. Several sales of 1,000 ton lots of foundry No. 2 have been made at \$15.10 and \$15.35, Pittsburg, and a sale of 1,000 tons of gray forge was made at \$14.35, Pittsburg. Several other sales of forge amounting to over 2,000 tons in small lots are reported, at prices ranging from \$14.50 to \$14.85. Most of the buying has been for early shipment, and from the number of inquiries received there is every indication that an active buying movement will begin before the opening of the fourth quarter. Prices

are expected to be much higher than now prevail.

A scarcity of billets and sheet-bars has developed and three large producers are in the market. As noted last week the Jones & Laughlin Steel Co. is negotiating for 10,000 tons of bessemer billets for August delivery in exchange for steel scrap. The Lackawanna Steel Co. is inquiring for 14,000 tons of open-hearth billets and the Republic Iron & Steel Co. is in the market for 2,000 tons of small bessemer billets. As a result of the heavy demand prices have advanced and billets are now quoted at \$24 and sheet-bars at \$25 and \$25.50. Additional orders for merchant-steel bars have been placed and the sales of the past two weeks aggregate over 100,000 tons. The bulk of the buying was for the agricultural implement trade and deliveries extend through next June. All orders were taken at the regular price of 1.50c. established on February 28. This price could have been shaded a couple of months ago, but consumers delayed placing orders in anticipation of a reduction. The contracts just closed, however, are guaranteed against decline. Steel rail orders continue to be placed and last week fully 100,000 tons were booked and include 30,000 tons from Gould lines. Fully one-half of this tonnage will be rolled at the plants of the Carnegie Steel Co. It is believed that more than 200,000 tons of rails could be booked at once, if the mills could guarantee delivery early in the fall. It is said that premiums have been paid for rails to insure delivery before September 1. The total rail tonnage placed so far amounts to over 1,750,000 tons and it is likely the 2,000,000-ton mark will be reached before the end of the year. All the plate and structural mills are behind in deliveries, and one large independent interest last week rejected several orders for structural material. The Pennsylvania Railroad Co. is inquiring for 1,800 steel cars for delivery next year, and contracts may be placed in a short time. This will add 180,000 tons to the plate business for 1906. The steel-car-making companies are booked to their capacity through the year. Merchant pipe is one of the few dull lines, but the boiler-tube trade shows decided improvement. There is considerable interest in a proposition to build a pipe line from the Kansas oilfield to Port Arthur, Tex., a distance of 650 miles, and will require a great tonnage of steel pipe. It was reported today that arrangements for carrying out the project may be concluded this week.

Pig Iron.—Fully 20,000 tons of bessemer iron were sold in this district within the past 10 days and sales of basic, foundry and gray forge aggregate about 10,000 tons. Quotations this week are as follows: Bessemer, \$14.50, Valley, but the bulk of the recent sales were at 25c. and 50c. below that figure; foundry No. 2, \$15.10@15.36, Pittsburg; gray forge, \$14.50@14.85, Pittsburg.

Steel.—The scarcity of billets and sheet bars has stiffened prices, and bessemer and open-hearth billets are quoted at \$24, or \$3 above the pool price, and sheet bars are \$25@25.50, or from \$2 to \$2.50 above the pool-price. Merchant-steel bars are firm at 1.50c. and plates at 1.60c.

Sheets.—There is a slight improvement in the sheet market and prices are firmer. Black sheets are quoted at 2.40c. and galvanized at 3.45c. for No. 28 gauge.

Ferro-manganese.—The market remains about the same, \$49@50 a ton being quoted for 80% domestic.

Cartagena, Spain. July 15.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that the shipments were one cargo, 4,200 tons dry ore, and three cargoes, 8,050 tons manganiferous ore, all to Great Britain. There is continued inquiry for ores for forward delivery. Freight rates continue low; 5s. 9d. has been done from Cartagena to Glasgow; 5s. 6d., Cartagena to Rotterdam; 7s. 9d., Almeria to Philadelphia.

Quotations are unchanged: 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. Manganiferous ores, same terms, range from 9s. 9d. for 35% iron and 12% manganese, up to 14s. 6d. for 20% iron and 20% manganese.

Pyrites.—Iron pyrites, 40% iron and 43% sulphur, are quoted at 10s., f. o. b. shipping port.

Heavy Chemicals and Minerals.

NEW YORK, Aug. 2.

Acids.—The market continues even and prices unchanged.

Boric, crystals.....per lb.	.10
powdered.....	.10 1/2
Carbonic, liquid gas.....	.12 1/2
Hydrofluoric, 30%.....	.03
48%.....	.05
60%.....	.11
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'l, 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

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

Exports of copper sulphate from the United States in June were 1,764,046 lb. in 1904, and 863,282 lb. in 1905; a decrease of 900,764 lb. this year.

Sulphur and Pyrite.—Prime sulphur (both Louisiana and Sicilian) is quoted in New York, Boston and Portland at \$20; in Philadelphia and Baltimore at \$20.50. Pyrite continues unchanged at 10@11c. per unit of sulphur for lump ore, with 25c. additional for breaking to fur-

nance size; 9.5@10c. 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. Market even, with no stocks accumulated.

Imports of brimstone in June were 14,007 tons in 1904, and 3,857 tons in 1905; a decrease of 10,150 tons. Imports of pyrite, invoiced for its sulphur value, were 32,873 tons in 1904, and 32,707 tons in 1905; a decrease of 166 tons.

Nitrate of Soda.—Spot is quoted at \$2.22½@2.17½ for this year's; and at \$2.07½@2.12½ for next year. The market in general is the same, with freights firmer.

Imports of nitrate in the month of June were 23,236 tons in 1904, and 20,612 tons in 1905; a decrease of 2,624 tons this year.

Foreign Trade.—Imports of heavy chemicals into the United States for the month of June were as follows, in pounds:

	1904.	1905.
Bleaching powder.....	5,602,031	8,646,014
Potash, chlorate.....	3,315	1,118
Potash, muriate.....	6,610,628	11,694,692
Potash, nitrate.....	1,667,150	887,589
Other potash salts.....	2,055,821	4,775,925
Caustic soda.....	179,390	142,626
Sal soda.....	616,500	24,054
Soda ash.....	1,401,881	1,309,749
Other soda salts.....	842,860	515,926

There were increases in bleaching powder and in all the potash salts except the nitrate, or salt peter. The soda salts generally show decreases.

Exports of acetate of lime for the month were 6,259,245 lb. in 1904, and 5,929,897 lb. in 1905; a decrease of 329,348 lb. These exports are to Germany.

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	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.

Exports of phosphates in June were 86,384 tons in 1904, and 87,861 tons in 1905; an increase of 1,477 tons. Of the exports this year, 84,583 tons were crude phosphates, and 2,778 tons prepared or manufactured. The chief shipments were to Germany, 23,806 tons; Italy, 16,116 tons; France, 12,403 tons; other European countries, 29,842 tons.

Imports of phosphates into the United States in the month of June were 14,512 tons in 1904, and 5,135 tons in 1905; a decrease of 9,377 tons this year.

Metal Market.

New York, Aug. 2.

Gold and Silver Exports and Imports.
At all United States Ports in June and Year.

Metal.	June.		Year.	
	1904.	1905.	1904.	1905.
G'ld Exp	\$1,522,544	\$4,030,882	\$68,449,393	\$39,851,590
Imp	4,886,233	2,137,952	43,763,726	16,598,354
Exc Silv. I.	\$3,363,689	E. \$1,892,920	E. \$20,685,667	E. 23,233,236
Exp	4,416,684	4,744,625	26,367,699	25,081,266
Imp	2,752,401	2,301,596	13,775,600	15,118,941
Exc	E. \$1,658,233	E. \$2,449,929	E. \$12,592,999	\$9,962,325

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 29, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$5,000	\$51,816	\$449,894	\$106,102
1905.....	37,919,943	845,445	18,480,684	2,273,513
1904.....	63,730,392	3,622,821	23,583,394	565,488
1903.....	32,161,549	3,588,020	11,972,272	1,174,900

All the gold exported for the week went to Nassau; the silver to London. Imports, both gold and silver, were from Mexico and South America.

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending July 29 gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discounts.....	\$1,697,338,100	\$1,144,847,400
Deposits.....	1,204,965,600	1,199,744,900
Circulation.....	38,962,900	48,804,600
Specie.....	272,182,900	224,830,700
Legal tenders.....	86,048,100	90,411,500
Total reserve.....	\$357,231,000	\$315,242,200
Legal requirements.....	301,241,400	299,936,225
Balance surplus.....	\$55,989,600	\$15,305,975

Changes for the week this year were increases of \$18,480,700 in loans, \$4,640,200 in specie, \$1,302,500 in legal tenders, \$22,346,700 in deposits and \$356,025 in surplus reserve; a decrease of \$108,600 in circulation.

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.....	\$224,830,700	
England.....	190,107,050	
France.....	586,675,120	\$221,262,130
Germany.....	188,505,000	62,835,000
Spain.....	74,365,000	111,975,000
Netherlands.....	31,914,000	31,246,000
Belgium.....	15,960,000	7,980,000
Italy.....	120,540,000	16,637,000
Russia.....	547,660,000	29,545,000
Austria.....	236,185,000	64,855,000

The returns of the Associated Banks of New York are of date July 29 and the others July 27. 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 July 20 are re-

ported by Messrs. Pixley & Abell, as follows:

	1904.	1905.	Changes.
India.....	£5,482,138	£3,878,141	D. £1,603,997
China.....	368,489	687,770	I. 319,281
Straite.....	58,103	2,800	D. 55,303
Totals.....	£5,980,730	£4,568,711	D. £1,340,019

Receipts for the week were £167,000 from New York. Exports were £1,370 to Port Said and £4,200 to India; a total of £5,570, all bar silver.

Indian exchange has been a little easier, under the large offerings of bills. The Council bills offered in London were taken at an average of 16.01d. per rupee. Silver purchases for India have fallen off, but there has been some buying for Continental account, reported to be for Russia.

Silver continues steady without special feature, closing at 27¼d. in London.

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-Aug.	Sterling Exchange.	Silver.	
		New York, Cts.	London, Pence.			New York, Cts.	London, Pence.
27	4.86½	58¾	27½	31	4.86½	59¼	27½
28	4.86½	58¾	27½	1	4.86½	59¼	27½
29	4.86½	59	27½	2	4.86½	59¼	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-Aug.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
27	15 @15	14½	68	32½	4.60	5.55	5.40
28	15 @15	14½	68	32½	4.60	5.55	5.40
29	15 @15	15	68	32½	4.60	5.60	5.45
31	15 @15	15	68	32½	4.60	5.60	5.45
1	15 @15	15	68	33	4.60	5.60	5.50
2	15 @15	15	68	33	4.60	5.60	5.50

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

Copper.—Consumption continues on a very large scale and orders are being placed for delivery up to the end of the year. While the demand has been readily

met, prices have again advanced, and we quote Lake copper at 15¼@15¾c.; electrolytic in cakes, wirebars and ingots, 15⅞@15¼c., in cathodes 14⅞@15c.; casting copper at 14¾@14⅞c.

Business in London in the speculative sorts has also shown quite an increase during the past week, and prices at one time crossed £69. The standard market in London closes, however, somewhat easier at £68 5s. for spot, £68 10s. for three months.

Refined and manufactured sorts we quote: English tough, £69 10s.@£70; best selected, £72 5s.; strong sheets, £79; India sheets, £75; yellow metal, 6¾d.

Our special correspondent reports that exports of copper from Baltimore for the week ending August 1 were 2,426 long tons.

Copper Imports and Exports.—Exports of copper from the United States, for the six months ending June 30, are reported by the Bureau of Statistics of the Department of Commerce and Labor; the figures given are in long tons, of 2,240 lb. each:

	1904.	1905.	Changes
Copper.....	113,770	130,769	I. 16,989
Copper ore, etc.....	9,005	15,852	I. 6,847

The contents of copper ore are not given. Estimating them, chiefly on the basis of values, we find that the total exports this year were equivalent to 133,756 tons of fine copper. There was a large increase—8,925 tons—in the June exports. Exports to China this year have been 26,568 tons.

Imports of copper and copper material into the United States for the six months ending June 30, with re-exports of foreign material, were as follows, the figures giving the equivalent, of all material, in long tons of fine copper:

Copper.	Metal.	In ore, etc.	Total.
Mexico.....	22,886	5,835	28,721
Canada.....	5,269	3,303	8,572
Great Britain.....	4,423	.....	4,423
Other countries.....	966	1,096	2,062
Total imports..	33,554	10,234	43,778
Re-exports.....	482	.....	482
Net imports....	33,062	10,234	43,296

The net imports were less than the exports given above by 93,460 tons. The ore and matte received from Mexico this year reached a total of 42,479 tons, carrying 5,835 tons of copper; from Canada and Newfoundland, 92,632 tons, carrying 3,303 tons of copper. The Mexican receipts were largely matte, while those from Canada were chiefly ore. The receipts from Great Britain included a quantity of copper bars sent here to be refined.

Tin.—There has been a great deal of speculation in this article in London, and prices were carried up to £152 5s. for spot, £150 10s. for three months. At the close the quotations are cabled as £151 10s. for spot, £150 for three months.

Domestic consumers have been buying as little as possible at the present level of prices, which have been ruling at 33@33½c.

Statistics for the month of July show an increase in the visible supplies of 500 tons.

Imports of tin into the United States for the six months ending June 30 are reported as follows, the figures being in long tons:

	1904.	1905.	Changes.
Straits.....	9,516	10,994	I. 1,478
Australia.....	165	202	I. 37
Great Britain.....	19,154	9,289	D. 865
Holland.....	363	294	D. 129
Other Europe.....	198	392	I. 194
Other Countries.....	17	64	I. 47
Total.....	20,413	21,175	I. 762

The increase in direct receipts of Straits tin was greater than the decrease in the imports received through British ports. The metal coming here from Great Britain is chiefly Straits tin. There was a total increase of 3.7% this year. The month of June showed a decrease of 466 tons.

Lead.—A good business is doing at the last quotations, which are 4.60c. New York, 4.52½c. St. Louis.

The London market was somewhat quieter during the week, declining to £13 17s. 6d., but at the end of the week a better feeling prevails and the market closes firm at £14 for Spanish lead, \$14 2s. 6d. for English lead.

Imports of lead in all forms into the United States, with re-exports of imported material, for the six months ending June 30, are reported by the Bureau of Statistics as follows; the figures being in short tons:

	1904.	1905.	Changes.
Lead, metallic.....	5,655	2,343	D. 3,312
Lead in ores and base bullion.....	50,565	49,942	D. 623
Total imports..	56,220	52,285	D. 3,935
Re-exports.....	42,237	48,415	I. 6,178
Net imports.....	13,983	3,870	D. 10,013

Of the total imports this year, 47,009 tons were from Mexico and 4,581 tons from Canada; the balance from other countries. Exports of domestic lead were 71 tons in 1904 and 79 tons in 1905; an increase of 8 tons this year.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of July 15, that silver has been 14.25 reales per oz., and exchange, 33.21 pesetas to £1. Pig lead is 72.50 reales per quintal; equal, on current exchange, to £12 4s. 3d. per long ton, f. o. b. Cartagena. Shipments for the week were 165 tons argentiferous and 65 tons desilverized lead, all to Marseilles.

Spelter.—The demand from galvanizers is very heavy indeed, and can only be met with difficulty at this time, because smelters are rather chary about selling, owing to the high prices for ore which are prevailing as a consequence of the floods in Joplin. The market closes firm at 5.60@5.65c. New York, 5.45@5.50c. St. Louis.

The London market has ruled steady throughout the week, and closes somewhat higher at £24 for good ordinaries, £24 5s. for specials.

Exports of spelter from the United States for the six months ending June 30 were 1,321 short tons in 1904, and 1,574 tons

in 1905; an increase of 253 tons. Exports of zinc ore were 14,544 tons in 1904, and 11,698 tons in 1905; a decrease of 2,846 tons. Imports of zinc ore are not reported separately.

Antimony.—There has been a further advance in price, especially for near deliveries. The requirements for ordnance purposes in Europe have reduced the imports, and it looks as though there would be a scarcity of this metal for some time to come. We quote: 13½@14½c., depending upon brands and deliveries.

Imports of antimony into the United States for the six months ending June 30 were as follows, in pounds:

	1904.	1905.	Changes.
Metal and regulus...	2,042,110	2,439,192	I. 397,082
Antimony ore.....	1,500,823	1,100,357	D. 400,446

There was a decrease of 13.3% in ore, but an increase of 19.4% in metal. No ore was received in June, but imports of metal were large—990,804 lb. for the month.

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.

Exports of nickel, nickel oxide, and nickel matte from the United States for the six months ending June 30 were 2,235,665 lb. in 1904, and 5,011,377 lb. in 1905; an increase of 2,775,712 lb. Imports of nickel ore were 4,382 tons in 1904, and 6,842 tons in 1905; an increase of 2,460 tons.

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 wire, 90c.; and cones, \$1 per gram.

Imports of platinum into the United States for the six months ending June 30 were 3,920 lb. in 1904, and 3,782 lb. in 1905; a decrease of 138 lb. this year.

Quicksilver.—Quicksilver is again a little easier, and large quantities can be had at \$40.50 per flask; small orders are placed at \$41@41.50. 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.

Exports of quicksilver from the United States for the six months ending July 30 were 929,916 lb. in 1904, and 613,349 lb. in 1905; a decrease of 316,567 lb. this year.

Manganese Alloys.—Prices for manganese alloys in Germany are given by Paul Speier as below. The prices are for orders of not less than 500 kg., delivered in Bremen, and are as follows, per 100 kilograms:

	Marks.
Manganese Copper, No. 1, 30% Mn.....	265
No. 2, 28% Mn.....	175
No. 3, 20 to 25%.....	165
Manganese Tin, No. 1, 55% Mn., no iron.....	365
No. 2, 55% Mn., some iron.....	225
Manganese Nickel, No. 1, free of iron.....	450
No. 2, traces of iron.....	270

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 90% Ingots.....	33@37c.
No. 2, 99% Ingots.....	31@34c.
Rolled Sheets.....	4c. up.
Aluminum-Bronze.....	20@23c.
Nickel-alum.....	33@39c.
Bismuth.....	\$2.10
Cadmium, f. o. b. Hamburg.....	77c.
Chromium, pure (N. Y.).....	80c.
Copper, red oxide.....	50c.
Ferro-Molybdenum (50%).....	\$1.00
Ferro-Titanium (20@25% N. Y.).....	75c.
Ferro-Chrom. (74%).....	12 1/4 c.
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
Tantalum acid (N. Y.).....	50c.
Thallium, f. o. b. Breslau, Germany.....	65@70c.
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 29.

The highest price reported paid for zinc ore was \$51 per ton for three bins of zinc ore in Joplin, one in Carterville and one in Neck City. The assay basis price ranged from \$44 to \$48 per ton of 60% zinc, averaging \$46 per ton. It was a general advance of \$1.50 to \$2.50 per ton, and one bin of ore was advanced \$7.50 per ton. An increase in price of \$8 per ton in six weeks, on all grades of ore, has been made. A year ago zinc sold at \$40 per ton, and an assay basis of \$32 to \$34 per ton.

The lead market continues very active, with choice bins commanding \$61 per ton and ordinary grades selling at \$60. A year ago the highest price was \$54 per ton.

A second flood this week followed that of last week; many of the same mines were again flooded, and the continuous downpour of rain, amounting during the month to nearly 12 in., by a Government record, has so saturated the ground that the mines have an extraordinary drainage problem at hand. Additional pumps have been ordered by telegraph, wherever they could be secured, as the local supply has been exhausted. Every operator having an increased amount of water is preparing to attack it with all the energy it is possible to display, and it is probable that, under these circumstances, they may be able to reclaim the mines earlier than was at first expected; but, at the best, there are mines that will not be outputting in four and six weeks, and some of them two months.

Following are the shipments of zinc and lead for the week:

	Zinc, lb.	Lead, lb.	Value.
Joplin.....	2,417,320	199,410	\$65,210
Carterville-Webb City.....	2,317,140	803,330	77,340
Duenweg.....	462,790	91,130	13,370
Galena-Empire.....	1,111,840	141,170	29,780
Neck City.....	406,260	.....	9,550
Aurora.....	728,190	.....	12,190
Granby.....	440,000	35,000	7,650
Alba.....	460,300	.....	10,810
Prosperity.....	165,620	103,190	6,900
Central City.....	131,920	.....	3,030
Carthage.....	54,350	.....	1,270
Oronogo.....	474,070	38,750	11,870
Spurgeon.....	95,000	6,010	1,190
Reeds.....	62,280	.....	1,430
Diamond.....	61,940	.....	1,420
Beef Branch.....	57,800	6,360	740
Zincite.....	25,910	6,820	800
Sherwood.....	40,900	4,890	1,060
Totals.....	9,519,630	1,435,060	\$255,630
Seven months.....	287,905,830	34,842,350	\$7,400,040

Zinc value, the week, \$212,640; 7 months, \$6,396,075.
Lead value, the week, \$42,990; 7 months, \$1,003,065.

The average price of zinc ore for the week was \$44.67; of lead ore, \$59.88 per ton. The following table shows the average monthly prices of zinc and lead ores in Joplin, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1904.	1905.	Month.	1904.	1905.
Jan.....	33.33	52.00	Jan.....	55.55	61.50
Feb.....	33.63	52.77	Feb.....	56.37	57.62
March.....	35.40	47.40	March.....	57.20	57.20
April.....	35.75	42.88	April.....	58.00	58.00
May.....	34.87	43.31	May.....	57.77	58.27
June.....	32.93	40.75	June.....	56.60	57.80
July.....	33.37	43.00	July.....	53.00	58.00

Platteville, Wis. July 31.

The quotation for zinc ore is steadily advancing, the price at Joplin, Mo., being the basis; on an assay basis, \$44 per ton for 60% ore is being paid. Lead ore was the same as for the previous week, running from \$50 to \$56 per ton, with a strong tendency.

Mining Stocks.

New York. Aug. 2.

Speculation is still largely of a professional nature, and the public interest is not marked. The greatest interest shown has been in the copper stocks, and Amalgamated has risen, making an exception to the rule that when copper goes up, Amalgamated goes down—which has frequently proved true. There was some activity in United Copper in the outside market, and the stock advanced sharply, closing at \$33 3/4 for the common, and \$75 for the preferred.

The industrial stocks showed some activity, and advances were made in United States Steel. American Smelting & Refining also gained, on report that the dividend on common will be increased.

Some business was done in the Southern iron shares, which were generally firm, Sloss-Sheffield closing at \$86 1/2, and Tennessee Coal, Iron & Railroad at \$89. Virginia-Carolina Chemical closed at \$34, a slight decline.

Upon the whole, the market is stronger than it has been, but without special reasons.

Boston. August 1.

It has not been quite the old-fashioned bull market in copper shares, but it is not far from it. There has been activity throughout the entire list, and speculation the past week has run largely to the low-priced issues, such as Tecumseh, Michigan, Rhode Island, Franklin and, latterly, Trinity and National. Copper stocks of the better class hold firm, but have not participated in the boom to any great extent. The action of Copper Range Consolidated has created quite a bit of discussion, and no official explanation is forthcoming, but it looks like a case of washing to keep the price from going up. For seven days the total dealings in Copper Range foot up almost 48,000 shares, and the stock has gone off \$1.75 to \$71 in this time. It is thought that this is the result of spite on the part of Lawson, who was thwarted by inside interests some time ago in his attempt to mark the price up. There was not the market then that there is now, and inside interests, it is thought, would not be adverse to see a higher price for the stock. Greene Consolidated carried out the promise made by its local sponsors last week that a better market would be seen. The price has advanced \$3.25 to \$26.50.

The speculation in Tecumseh has been extra heavy, and the advance phenomenal. As a matter of fact, the price almost doubled during the week, rising from \$4.25 to \$8, with a slight setback. Allouez continues well in the foreground, and the way the price is maintained indicates the confidence the management has in the late developments. The price is up \$3.12 1/2 to \$31. It is expected that stamping of the rock at the Centennial mill will begin very shortly. Franklin is up \$2.25 to \$12.50, and, in sympathy, Rhode Island rose \$1.50 to \$3.50 and National \$1.12 1/2 to \$3.37 1/2. Michigan rose \$1.50 to \$15.75 on heavy trading, but profit-taking caused a \$1 reaction. Trinity took on a little activity, and rose \$1.37 1/2 to \$9.87 1/2, but subsequently fell back to \$8.50. United States rose \$1.37 1/2 to \$34, losing a part, and United Copper is up \$3.25 to \$34. The 50,000 shares of preferred stock were listed on this exchange today, and sold at \$75.50 this forenoon and \$77 later.

Centennial sagged \$1.37 1/2 to \$21.50, as have some other stocks; later it rallied to \$22.75. The second \$2 of the Centennial \$4 assessment, called earlier in the year, is payable August 10. Atlantic holds around \$18.50, but Isle Royale has lost \$1.50 to \$22.50, later recovering \$1. Mohawk stiffened \$1.25 to \$54, but reacted to \$53.50, while Old Dominion rose \$1.50 to \$29 per share.

Colorado Springs. July 28.

It has been a quiet week on the local exchange and prices have not varied much. El Paso gained about 2c., selling today for \$1.27 1/2, but trading in this stock has not been active. No Findley

sold during the week. Elkton has shaded off a fraction, selling on today's market for 40½c. Isabella is selling at 29c.; Portland remains at \$2.25; United Gold Mines is selling for 13¼c.; Gold Sovereign for 9¼c. During July the following dividends have been declared: Portland, \$300,000; El Paso, \$39,000; Vindicator, \$44,000; Jerry Johnson, \$25,000; Strong, \$20,000; Findley, \$12,500; Elkton, \$12,500; Granite, \$12,500; Dillon, \$6,250, and Stratton's Independence is expected to add \$125,000 to this amount, making a total of \$606,750 for the month.

San Francisco. July 27.

Trading in the Comstocks has been slow, but prices fairly steady. Ophir has hung around \$6.75. Hale & Norcross sold at \$1.90; Consolidated California & Virginia at \$1.30; Best & Belcher at \$1.20. It looks like dull times for August, a chippers' market, in fact.

The Tonopahs are better than that, showing some real trading; but they are less active than they have been. Tonopah of Nevada sold at \$14; Montana Tonopah, \$3; Tonopah Belmont, \$1.20; Gold Anchor, 95c.; North Star, 55c.; Original Bullfrog, 25c. per share.

Oil stocks have been dull. Independence sold today for 25c., and Occidental for 3c., with no other transactions reported.

Dividends.

Company.	Payable.	Rate.	Amount.
Alaska Mexican.....	July 28	\$0.30	\$54,000
Alaska Treadwell.....	July 28	1.00	200,000
†Amalgamated Copper.....	Aug. 28	1.25	1,933,750
Associated Oil.....	Aug 1	0.01½	315,000
Cambria Steel Co.....	Aug. 15	0.75	675,000
†Dillon Gold.....		0.01	12,500
Jamison.....	July 18	0.03	11,700
Jerry Johnson.....		0.01	25,000
N. Y. & Hond. Rosario.....	Aug. 1	0.10	15,000
†Penn-Wyoming, Copper.....	July 1	0.004	50,000
Pocahontas Col. pfd.....	Aug. 1	1.50	22,500
Quincy, copper.....	Aug. 24	3.00	300,000
St. Mary's Mineral Land.....	Aug. 1	1.00	139,930
†Tennessee C. & I., pfd.....	Aug 1	2.00	4,960
†Tennessee C., I. & R., com.....	Aug. 1	1.00	225,536
Tonopah, of Nev.....	Ans. 22	0.25	250,000
U. S. Steel, pfd.....	Aug 30	1.75	6,304,919

*Monthly. †Bi-monthly. ‡Quarterly. †Semi-Annually.

St. Louis. July 29.

	High.	Low.
American Nettle.....	.25	.10
Center Creek.....	\$2.00	\$1.50
Central Coal & Coke.....	64.00	63.00
" " pfd.....	79.00	78.00
Central Lead.....	153.00	150.00
Columbia.....	1.00	.25
Con. Coal.....	31.00	29.00
Doe Run.....	120.00	118.00
Granite Bimetallic.....	.40	.36
St. Joe.....	16.50	15.00

LONDON. (By Cable.)*

	Aug. 1.
Camp Bird.....	£ 15 s. 0.
Consolidated Gold Fields.....	6 10 0
De Beers.....	16 15 0
Dolores.....	1 9 6
East Rand.....	7 13 1½
El Oro.....	1 1 3
Esperanza.....	2 4 9
Modderfontein.....	9 5 0
Rand Mines.....	9 8 9
Rio Tinto.....	67 7 6
Simmer and Jack.....	1 12 6
Tomboy.....	1 2 6

*Furnished by Wm. P. Bonbright & Co., New York.

STOCK QUOTATIONS.

NEW YORK.		Week Aug. 2.		
Name of Company.	High	Low	Clg.	Sales
Amalgamated.....	85½	82½	84½	200,230
Anaconda.....	117	108	115	18,800
Arizona Consolidated.....	30½	30	30½	1,000
British Col. Copper.....	7	6	7	8,190
Federal Min. & Smelt.....	109	105	109	1,100
Federal Preferred.....	94	91	93½	1,500
Greene Copper.....	26½	23	25½	62,900
Greene Gold.....	5	4	4½	14,500
Mitchell.....	6	5	6	8,500
Tennessee Copper.....	30	29	29½	1,000
Union Copper.....	14½	1	1	13,800
United Copper.....	32	30	30½	23,800
United Copper, Pref.....	78	74	74½	2,960

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.....	125½	117½	120½	165,600
Am. Smelting & Ref., Pf.....	124	98	121	7,400
Colorado Fuel & Iron.....	46½	44	45	12,800
National Lead.....	104	104	105	10,000
National Lead, Pf.....	105½	104	105	1,600
Pittsburg Coal.....	16	12½	15½	4,800
Pittsburg Coal, Pf.....	57½	45	57	6,800
Republic I. & S.....	21½	20	20½	10,300
Republic I. & S., Pf.....	84	82	83½	12,600
Tenn. Coal & Iron.....	91½	85	88½	61,650
U. S. Red. & Ref., Pf.....	67	66	67	1,820
U. S. Steel.....	35½	33½	35	224,100
U. S. Steel, Pf.....	104½	101½	103	156,050

BOSTON.

Allouez.....	31	27½	30½	4,094
Amalgamated.....	85	83½	84½	86,757
Atlantic.....	18½	18	18½	1,518
Bingham.....	31½	30½	31	2,871
Boston Consolidated.....	8½	8	8½	3,005
Calumet & Hecla.....	660	662	675	148
Centennial.....	23	21½	21½	3,970
Mercur.....	.60	.57	.58	1,293
Copper Range.....	72½	71	71	38,068
Daly-West.....	14½	14	14	530
Franklin.....	13	10½	11½	4,744
Granby.....	7½	6¾	7½	7,390
Green Con. Copper.....	27	23½	26	14,477
Guanajuato.....	4¾	4¾	4¾	1,150
Isle Royale.....	23½	23	23	1,265
†Mass.....	10	9	9½	1,675
Michigan.....	15½	14½	14½	6,810
Mohawk.....	54	52½	53½	1,361
Old Dominion.....	29	28	28½	1,832
*Oceola.....	101½	100	100	1,118
Parrot.....	27½	25½	25½	950
Phoenix.....	1.50	.75	1.00	1,415
Quincy.....	108	105	105	121
Shannon.....	8½	7¾	7¾	2,966
*Tamarack.....	126	125	125	285
Tecumseh.....	8	5½	7	15,247
Trinity.....	9½	8½	8½	6,292
United Copper, com.....	34	31½	32	6,590
*†United States.....	33½	31½	32½	13,109
*Utah.....	46½	45½	46	4,138
Winona.....	118	116½	117½	224
Wolverine.....	13½	13	13	953

* Ex-dividend. † 1st Installment Paid. ‡ Ex. Rights.

BALTIMORE.

Alabama C. & I.....	79	79	79	20
Consolidation Coal.....				
Georges Creek C. & I.....				

PHILADELPHIA.

Cambria Steel.....	28¾	27¾	27¾	13,866
Pennsylvania Salt.....	107	107	107	50
Philadelphia Co.....	48½	43	43	7,747
Tonopah.....	14½	13¾	13¾	1,880

PITTSBURG.

Crucible Steel.....	11¼	10¾	10¾	1,000
Crucible Steel, Pref.....	63½	61½	61½	1,339
O. Tonopah.....	36	31	36	1,100

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg.
Elkton.....	41	41	40	40
El Paso.....	126¾	127½	126¾	126¾
Portland.....	210	225	210	215
Vindicator.....	80	81	80	80

SAN FRANCISCO.

Best & Belcher.....	1.20	1.30	1.15	1.25
Bullion.....	.40	.40	.40	.40
Caledonia.....	.42	.49	.42	.47
Confidence.....	.94	.96	.93	.96
Con. Cal. & Va.....	1.25	1.35	1.25	1.35
Hale & Norcross.....	1.85	1.90	1.85	1.90
Mexican.....	1.30	1.35	1.30	1.30
Occidental Con.....	.87	.87	.87	.87
Ophir.....	6.75	6.62½	7.25	7.25
Savage.....	.68	.71	.68	.71

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	58.915	26.760	27.163
August.....	57.806		26.591	
September.....	57.120		26.349	
October.....	57.923		26.760	
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	14.888	12.505	15.005	57.256	66.887
Aug.....	12.343		12.468		56.952	
Sept.....	12.495		12.620		57.645	
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.	Month.	1904.	1905.
Jan.....	28.845	29.325	July.....	26.573	31.760
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.	Month.	1904.	1905.
Jan.....	4.347	4.552	July.....	4.192	4.524
Feb.....	4.375	4.450	Aug.....	4.111	
Mar.....	4.475	4.470	Sept.....	4.200	
Apr.....	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.....	5.067	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.....					

DIVIDENDS.

Gold, Silver, Lead, Quicksilver and Zinc Companies—U. S.

Name of Company and Location.	Authorized Capital	Shares.		Dividends.		
		Issued.	Par Val. \$	Total to Date.	Latest.	
					Date.	Amt.
Alaska Mexican, g. Al'ka	\$1,000,000	180,000	5	\$1,185,381	July 1905	\$.30
Alaska Tr-adwell, g. Al'ka	5,000,000	200,000	25	7,860,000	July 1905	1.00
Amalgamated, c., Mont	155,000,000	1,530,879	100	30,807,629	Aug. 1905	1.25
Am.Sm.&Ref.,com. U. S.	50,000,000	500,000	1-0	4,375,000	July 1905	1.25
Am Sm & Ref. pf. U. S.	50,000,000	500,000	100	18,516,553	July 1905	1.75
Anaconda, c. Mont	30,000,000	1,200,000	25	25,350,000	May 1905	.75
Annie Laurie, g. Utah	5,000,000	25,000	100	440,061	Apr. 1905	.....
Arizona, c. Ariz	3,775,000	.....	.....	6,186,826	Apr. 1905	.....
Atlantic, c. Mich	2,500,000	1-0,000	25	990,000	Feb. 1905	.02
B. & H., l. z. Mo	400,000	400,000	1	20,000	Feb. 1905	.01
Boston & Montana. Mont	3,750,000	150,000	25	43,025,000	July 1905	10.00
Bunker Hill & Sull. Ida	3,000,000	300,000	10	4,596,000	July 1905	.50
Butte & Boston, c. Mont	2,500,000	200,000	25	1,801,000	Feb. 1904	1.00
Calumet & Arizona c. Ariz	2,500,000	200,000	10	2,500,000	June 1905	2.00
Calumet & Hecla, c. Mich	2,500,000	1,000,000	25	89,850,000	June 1905	10.00
Camp Bird, g. Colo	5,500,000	820,000	5	2,050,104	May 1905	.18
Center Creek, l. z. Cal	1,000,000	10,000	10	170,000	Oct. 1904	.10
Central Eureka, g. Colo	4,000,000	400,000	10	587,159	May 1905	.07
Century, g. s. l. Utah	150,000	150,000	1	30,000	July 1904	.02
C. K. & N., g. Colo	1,500,000	1,431,900	1	229,104	Dec. 1904	.01
Continental, z. Mo	550,000	22,000	25	121,000	July 1905	.50
Copper Range Con. Mich	38,500,000	383,781	100	767,562	July 1905	1.00
Creede United, g. Colo	500,000	500,000	1	120,000	Dec. 1904	.03
Cripple Creek Con g. Colo	2,000,000	2,000,000	1	180,000	Mar. 1905	.00
Daly West, g. s. l. Utah	3,600,000	180,000	20	4,751,000	June 1905	.60
De Lamar, g. s. l. Ida	400,000	67,180	5	2,926,370	May 1905	.72
Dillon, g. Colo	1,250,000	1,250,000	1	21,875	July 1905	.01
Doe Run, l. Mo	1,500,000	15,000	100	752,072	Apr. 1905	1.50
Dutchess, g. Colo	1,000,000	1,000,000	1	20,419	Feb. 1904	.01
Elkton Con., g. Colo	3,000,000	2,500,000	1	1,491,961	May 1905	.00
El Paso, g. Colo	2,500,000	2,450,000	1	902,250	July 1905	.03
Fed. Sm. com. Idaho	10,000,000	50,000	100	478,750	June 1905	2.50
Federal Sm., pf. Idaho	20,000,000	100,000	100	1,251,250	June 1905	1.75
Findley, g. Colo	1,250,000	1,250,000	1	50,000	May 1905	.01
Gemini-Keystone. Utah	500,000	5,000	100	1,250,000	Mar. 1905	10.00
Gold King Con. Colo	5,750,370	5,750,370	1	1,407,504	May 1905	.01
Gold Sovereign. Colo	2,000,000	2,000,000	1	10,000	Jan. 1905	.00
Grand Central, g. Utah	25,000	250,000	1	1,006,250	Apr. 1905	.05
Hecla, s. l. Idaho	250,000	1,000,000	25	350,000	Apr. 1905	.01
Homestake, g. S. D.	21,840,000	218,400	100	13,568,950	June 1905	.50
Horn Silver, g. s. c. z. l. Utah	10,000,000	400,000	25	5,462,000	Mar. 1905	.05
Iron Silver. Colo	10,000,000	500,000	20	3,300,000	June 1905	.10
Jamison, g. Cal	3,900,000	390,000	10	202,100	July 1905	.03
Jerry Johnson. Cal	2,500,000	2,500,000	1	25,000	July 1905	.01
Kendall, g. Mont	2,500,000	500,000	5	780,000	July 1905	.05
Liberty Bell, g. Colo	700,000	130,349	1	169,441	Oct. 1904	.15
Lightner, g. Cal	125,000	102,255	1	280,358	May 1905	.05
Lucky Budge, z. Mo	40,000	400	100	46,800	Apr. 1905	12.00
Lyon, z. l. Mo	50,000	4,585	10	2,117	Jan. 1905	.20
Mammoth, g. s. l. Utah	10,000,000	400,000	25	1,980,000	Nov. 1904	.05
Mary McKinney, g. Colo	1,000,000	1,000,000	1	567,000	Oct. 1904	.03
Mines Co. of Am. U. S.	2,000,000	2,000,000	1	975,000	May 1905	.01
Mont. Ore Purch. Mont	2,500,000	81,000	25	4,104,000	May 1905	4.00
Monument, g. Colo	300,000	300,000	1	27,124	Apr. 1905	.01
Nat'l Lead, pf. U. S.	15,000,000	149,040	100	14,084,280	June 1905	1.75
Nevada Keystone, g. Nevada	1,000,000	638,877	1	61,790	Feb. 1904	.03
New Century, z. Mo	150,000	150,000	1	21,000	July 1905	.62
New Idria, g. Cal	500,000	100,000	5	760,000	July 1905	.30
New Jersey, z. U. S.	10,000,000	100,000	100	7,500,000	Feb. 1905	3.05
New Star, g. Cal	2,500,000	250,000	10	931,356	July 1905	.30
Northern Light, g. s. Utah	2,000,000	400,000	5	20,000	Feb. 1904	.05
Old Gold. Colo	2,101,150	2,101,150	1	10,506	Mar. 1904	.05
Ophir, g. s. Nevada	302,400	100,800	3	1,797,400	July 1904	.25
Oseola, c. Mich	2,500,000	96,150	25	4,821,200	July 1905	2.00
Oustomah, g. Cal	250,000	250,000	1	12,500	Mar. 1904	.05
Parrot, c. s. Mont	2,300,000	229,850	10	6,232,625	June 1905	.50
Pennsylvania, g. Cal	5,150,000	51,500	100	269,475	May 1905	.10
Penn-Wyoming. Wyo.	10,000,000	100,000,000	1	50,000	July 1905	.01
Portland, g. Colo	3,000,000	3,000,000	1	6,157,080	July 1905	.10
Quicksilver, pf. Cal	4,500,000	43,000	100	1,931,411	May 1905	.50
Quill, g. Wash	1,500,000	1,500,000	1	15,000	Apr. 1904	.01
Quincy, c. Mich	2,500,000	100,000	25	15,220,000	Aug. 1905	3.00
Red Bird, g. s. c. l. Mont	1,500,000	300,000	5	72,000	Dec. 1904	.01
Rob Roy, z. Mo	15,000	14,325	1	3,375	Dec. 1904	.03
Rocco Homest'k, l. s. Nevada	300,000	300,000	1	94,000	Jan. 1904	.01
Sacramento, g. Utah	5,000,000	1,000,000	5	213,000	Aug. 1904	.01
Salvador, g. s. l. Utah	200,000	200,000	1	6,500	Aug. 1904	.01
St. Joseph, l. Mo	6,000,000	375,000	10	4,059,500	Dec. 1904	.15
Silver Hill, g. s. Nevada	180,000	180,000	1	46,800	Mar. 1904	.05
Silver King, g. s. l. Utah	3,000,000	150,000	20	9,150,000	May 1905	.60
South Swansea, g. s. Utah	300,000	300,000	1	170,500	Apr. 1904	.01
Spearfish, g. S. D.	1,500,000	1,500,000	1	165,500	Jan. 1905	.01
Standard Con., g. s. Cal	2,000,000	178,394	10	4,160,331	Sept. 1903	.10
Stratton's Independ. Colo	5,500,000	1,000,000	5	4,505,863	May 1905	.12
Tamarack, c. Mich	1,500,000	60,000	25	8,700,000	July 1905	2.00
Tennessee, c. Tenn	5,000,000	175,000	25	437,500	Jan. 1904	1.25
Tomboy, g. s. Colo	1,500,000	300,000	5	1,316,000	Dec. 1904	.24
Tonopah of Nev. Nevada	1,000,000	1,000,000	1	500,000	July 1905	.25
Uncle Sam. Utah	200,000	200,000	1	75,000	July 1905	.01
United Cop. Com. Mont	45,000,000	450,000	100	450,000	July 1905	1.00
United, c. pf. Mont	5,000,000	50,000	100	750,000	Nov. 1904	3.00
United, z. l. com. Mo	5,000,000	92,400	5	27,490	Oct. 1903	.05
United, z. l. pf. Mo	1,000,000	19,556	25	172,647	Jan. 1905	.75
United (Cripple Ck) Colo	5,000,000	4,069,100	1	280,071	Apr. 1905	.00
United Verde, c. Ariz	3,000,000	300,000	10	17,085,322	Dec. 1904	.75
United States, g. s. c. Utah	21,500,000	480,000	25	780,000	July 1905	.15
Utah, g. Utah	1,000,000	100,000	10	225,000	June 1904	.01
Utah Con., c. Utah	1,500,000	300,000	5	3,636,000	July 1905	2.00
Wendicator Con., g. Colo	1,500,000	1,100,000	1	1,302,000	July 1904	.03
Wash No. 2, g. S. D.	500,000	147,900	1	234,679	June 1904	.03
Wolverine, c. Mich	1,500,000	60,000	25	2,070,000	Apr. 1905	5.00
Work, g. Colo	1,500,000	1,500,000	1	15,000	May 1905	.00
Yellow Aster, g. Cal	1,000,000	100,000	10	583,789	Feb. 1904	.15

Coal, Iron and Other Industrials—United States.

Name of Company and Location.	Authorized Capital	Shares.		Dividends.		
		Issued.	Par Val. \$	Total to Date.	Latest.	
					Date.	Amt.
Ala. Con. C & I, pf. Ala.	\$2,500,000	\$24,638	100	\$905,265	May 1905	\$1.75
Allis-Chalmers, pf. U. S.	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
Alma Oil. Cal	400,000	400,000	1	67,600	Nov. 1904	.03
Amer Ag Chem., pf. U. S.	20,000,000	181,350	100	6,286,790	Apr. 1905	3.00
American Cement. Pa.	2,000,000	200,000	10	820,000	July 1905	.30
American Coal. Md.	1,500,000	50,000	25	1,620,000	Mar. 1905	1.25
Associated Oil. Cal	21,000,000	21,000,000	1	630,000	Aug. 1905	.01
Bon Air C. & I, pf. Tenn	2,500,000	18,803	100	249,757	Oct. 1904	1.50
Cambria Steel. Pa.	50,000,000	900,000	50	9,150,000	Aug. 1905	.75
Caribou Oil. Cal	100,000	80,000	1	39,200	Apr. 1905	.07
Central C & C, com. Mo	5,125,000	51,250	100	1,089,375	July 1905	1.50
Central C & C, pf. Mo	1,875,000	18,750	100	960,933	July 1905	1.25
Central Oil. W. Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil. Cal	500,000	450,000	1	68,500	June 1905	.01
Col. & Hock C & I, Ohio	7,000,000	69,244	100	173,066	Feb. 1905	.25
Consolidated Coal. Ill.	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidated Coal. Md.	10,250,000	102,500	100	7,356,650	Feb. 1905	4.00
Empire S & I, pf. N. J.	5,000,000	23,700	100	498,000	July 1905	1.50
Esperanza Oil. Cal	125,000	125,000	1	2,400	Oct. 1904	.01
Fairmont Coal. W. Va.	12,000,000	120,000	100	600,000	Feb. 1905	3.00
Four Oil. Cal	500,000	300,000	1	96,406	May 1905	.01
General Chem. Com. U. S.	12,500,000	74,103	100	1,300,507	Dec. 1903	1.25
General Chem., pf. U. S.	2,500,000	100,000	100	3,475,178	July 1905	1.50
George's C'k Coal. Md.	2,500,000	22,000	100	1,188,000	July 1904	3.00
Home Oil. Cal	100,000	100,000	1	507,500	Oct. 1904	.02
Ill. Crude Oil. Cal	200,000	200,000	1	12,500	Dec. 1904	.01
Imperial Oil. Cal	1,000,000					