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THE ENGINEERING AND MINING JOURNAL

VOLUME LXXXIV.

JULY TO DECEMBER

1907

HILL PUBLISHING COMPANY,
505 Pearl Street, NEW YORK.

The Engineering and Mining Journal

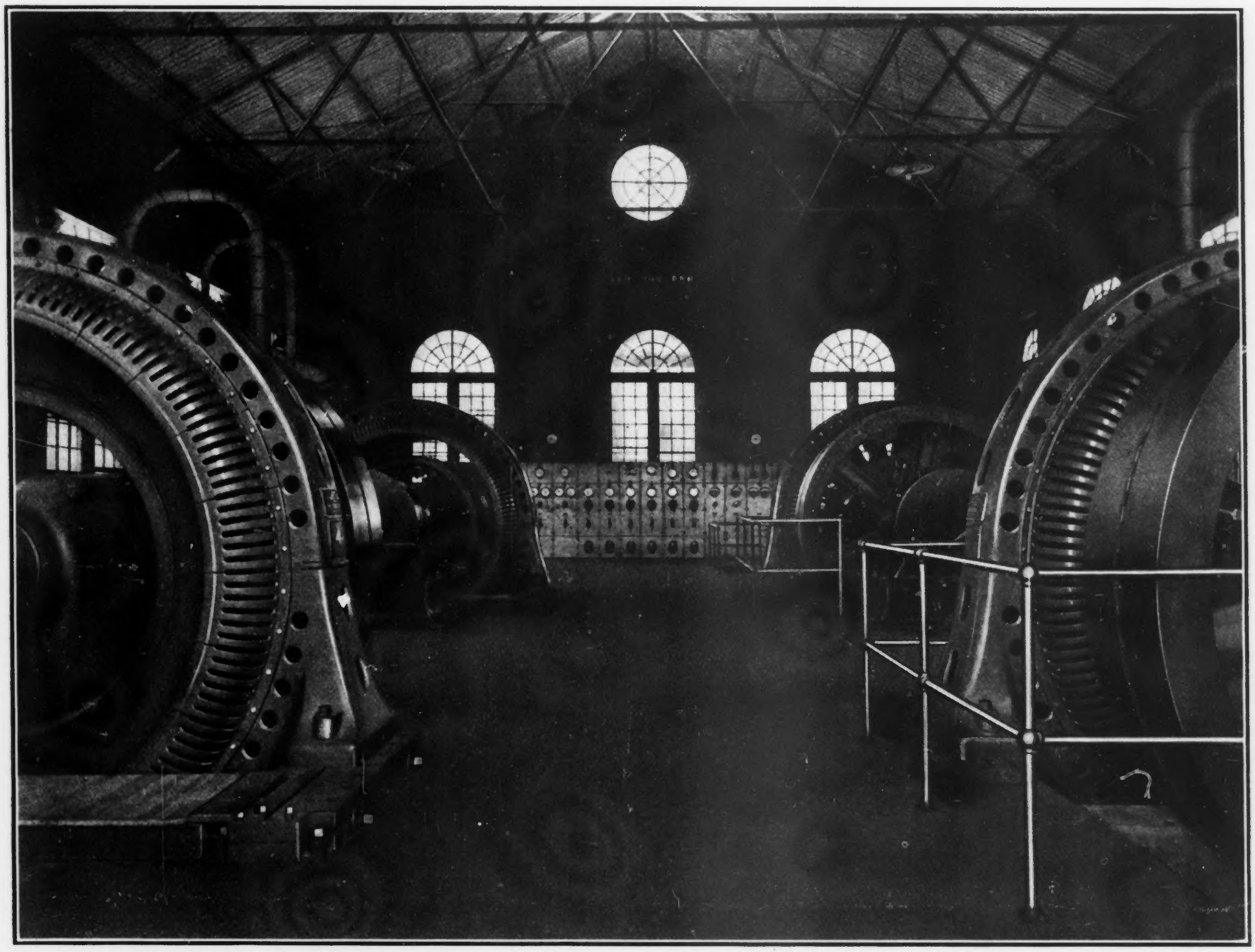
VOL. LXXXIV. NEW YORK, JULY 6, 1907. NO. 1

Alternating Current in Coal-mining Operations

A Number of Recent Installations Use This System; First Cost and Cheap Fuel Favor the Central Plant and Power Transmission

BY GEORGE R. WOOD*.

The advantages of the alternating current system in coal-mining work are most apparent in the case of a number of operations under one management, in which arrangement the items of first cost and operating expenses are both in favor of a central power plant with alternating-current transmission, as against a separate direct-current plant for each mine.



POWER PLANT, H. C. FRICK COKE COMPANY, YORK RUN, PENNSYLVANIA

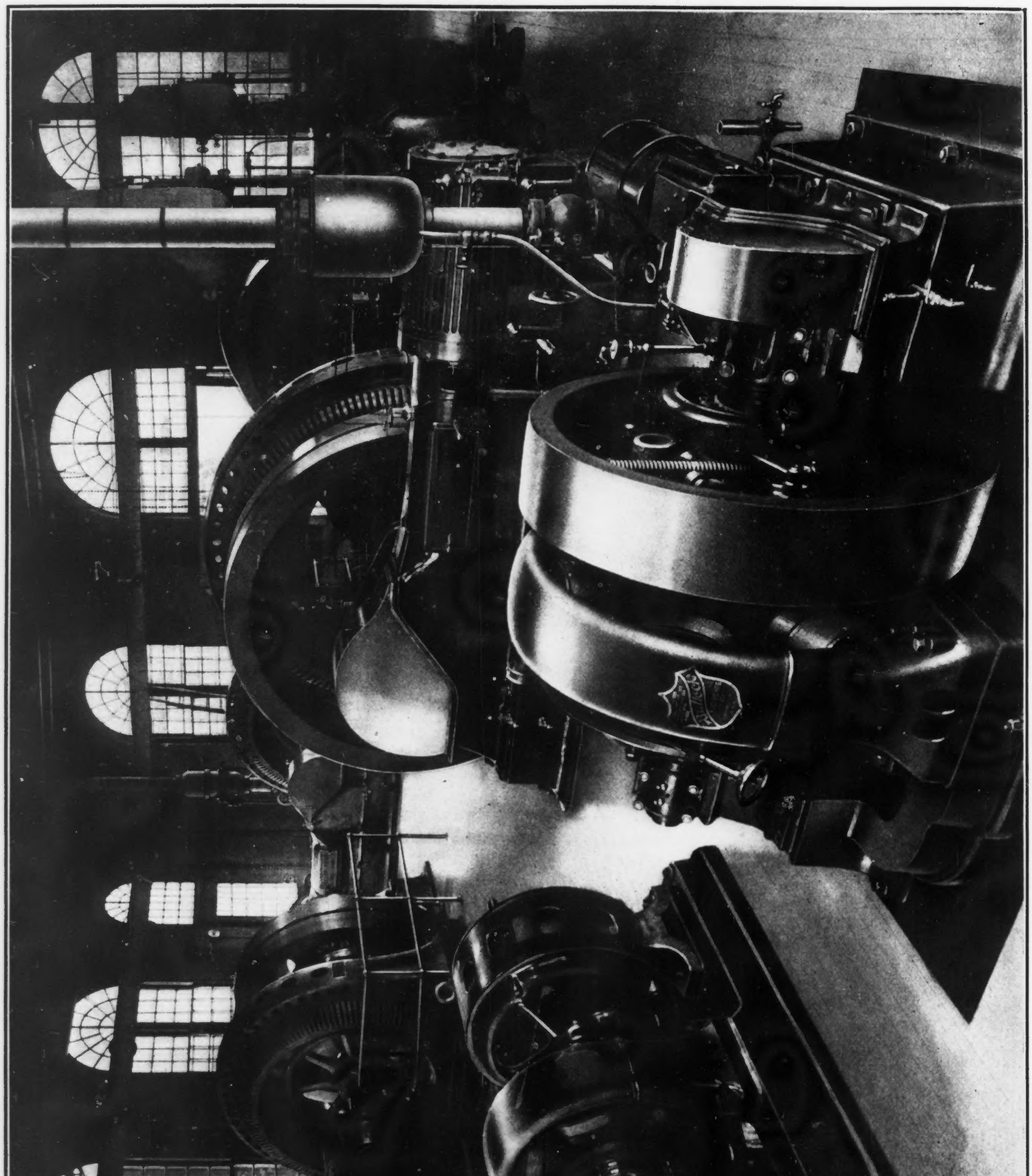
Costs of Installation and Operation

The first cost of installation will be lower, if the plant is of fair size, on account of the higher load factor, with less idle machinery, and lower kilowatt capacity installed for doing the same work. The cost of buildings and foundations per kilowatt will also be greatly reduced. Both steam and electric units in the central plant will be considerably larger, and on account of the higher load factor, compound engines using steam pressure of about 150 lb. will be an advantage. The use of water-tube boilers and compound engines will reduce the coal consumption to 3 lb. or less per i.h.p., and it is safe to count on one boiler horse-power per kilowatt of electrical capacity. The saving in fuel, supplies, labor and repairs will reduce the cost of power at the switchboard from an average of about 2½c. per kw. hour, in case of small D. C. plants, to 1c. or less in the larger central stations, in which case fuel will amount to about one-fifth, labor one-fifth, interest and depreciation one-third, and the balance, or about one-fourth the total expense, will be oil, supplies and repairs.

Low Voltage Preferable Underground

It is always desirable in underground work to operate at low voltage, preferably not exceeding 300 volts on trolley and machine lines. With transmission lines of 1½ to 2 miles, where this potential would require a large amount of copper, it is possible to use a balanced three-wire system with grounded neutral, giving 275

*Consulting electrical engineer, Park building, Pittsburg, Pennsylvania.



HARRISBURG CROSS COMPOUND ENGINES, AND 400-KW., 2200-VOLT, 5-CYCLE, 3-PHASE GENERATORS. YORK RUN PLANT, H. C. FRICK COKE COMPANY volts working potential with 550 volts metallic transmission, and several such systems have recently been installed; but unless there is a large number of small units connected, such as locomotives, mining machines, fans, etc., the balance in such a system is hard to maintain, and its full advantages are not realized.

The alternating-current system, however, makes it easily possible, by location of sub-stations convenient to the work, to operate at a low potential, without the excessive copper cost or high transmission losses inseparable from low-voltage individual plants. It is possible, in case the underground workings are extensive, to locate the sub-station, with step-down transformers and rotary converter, in the mine, or directly overhead, in case surface conditions permit, and advance with progress of the work. The D. C. three-wire system mentioned above is also possible, using 550-volt rotary converters, with neutral taken from T connected step-down transformers.

Bituminous Operators Slow to Adopt Alternating Current

Bituminous-coal operators in the past have been slow to realize the advantage of alternating current distribution, or of central plants as distinguished from individual power plants at each mine. The recent era of consolidation in almost all lines of manufacturing business has had its effect in the coal-mining industry, and it is generally due to this consolidation and to the operation of a number of mines under one management that the number of alternating-current plants has increased more rapidly in recent years.

There are several coalfields which present almost ideal conditions for a profitable central power-plant proposition. This is especially true in the Pocahontas field in southern West Virginia, where the extreme length of field along the railroad is not over twenty miles, with a width ranging from two to fifteen miles. There are a number of similar opportunities in the Pittsburg and Fairmont fields, but in all these cases there were a large number of small direct-current plants installed before the introduction and general use of alternating current. To install a central power plant under the conditions named would involve discarding a large amount of apparatus which is giving good service, and which is worth probably from one-half to three-fourths of its original cost. It would be entirely possible and economical to drive the direct-current generators in these plants by means of synchronous or induction motors, either through direct connection or by belts, but the investment in engines and boilers is so large that it would be difficult to persuade operators that such a change would be to their advantage.

Eastern Kentucky an Ideal Location for a Central Electric Power Plant

One of the best existing opportunities for centralization of electric-power generation is presented in eastern Kentucky, where there are several corporations holding large tracts of coal land and leasing same to individual operators. A power company, either owned outright by the land owners or by outside capital, would make it possible for lease-holders to operate economically without the expense of installing their own plant, and it would be easily possible for a power company to furnish electric current at less than any possible cost to small producers, and still at a price returning large profit to themselves.

As noted above, the conditions in mining work are quite different from those obtaining in connection with railway or large manufacturing plants. The cost of coal is always at a minimum, and by use of stokers it is possible to burn the refuse and waste coal from the mines, which can be profitably charged off at 60 to 70c. per ton. It is therefore inadvisable to go to any very great expense for turbines, condensers, etc., for the sake of best economy in steam production or consumption. This applies especially to bituminous fields. There is very rarely sufficient water available for condensing purposes, even were the advantages to be gained sufficient to justify this course.

Equipment of a Central Plant

The ordinary central power plant for mining works consists usually of direct-driven units of such capacity that the requirements of the field will not call for more than five or six units. The potential for which the generators are wound is commonly figured at 1000 volts per mile. The standard voltages, which are most readily obtainable from the manufacturing companies, are 2200, 3300, 6600 and 13,200. A few plants with other voltages have been installed, especially during the early days of this work. The generators are usually wound to deliver the desired voltage directly without requiring step-up transformers. This increases the strain on the generator insulation, but since these machines are all of the revolving-field type, with high-tension coils wound on a stationary armature frame, this item of insulation can be amply provided for. The additional cost and losses in the step-up transformers are thus avoided. Since the field coils of these alternators must be separately excited, small direct-current generators are provided, and it is usual to drive one of these by an independent steam engine, and one, with capacity for the entire installation, by an induction motor driven from the bus-bars. These exciters are usually wound for 125 volts, and the station lighting is often taken from them. The station switchboard will then include one or more exciter panels, one generator panel for each machine, and one feeder panel for each outgoing circuit. The generator current is handled in oil-immersed switches, in which the working parts and moving contacts are entirely under oil. In higher potentials these switches are located in separate brick or concrete cells and operated by means of wooden rods from the handle on the front of the panel. The equipment required for the generators in addition to these oil switches consists of an ammeter, volt meter, and indicating or recording wattmeters; power-factor indicators, frequency meters, synchroscopes, ground detectors, etc., are useful and in large plants it may be said essential.

Since direct current is always required in mines, it is necessary to transform alternating current to direct, and for this purpose either rotary converters or synchronous motor generator sets may be used. A rotary converter is a machine wound to deliver direct current when suplied with alternating current, or will deliver alternating current when supplied with direct current, in certain proportions as to voltage. When desired to transform from A. C. to D. C. current, the A. C. voltage should be supplied at about 62 per cent. of the desired D. C. voltage, for a three-phase rotary, and practically all the plants installed to date employ three-phase current. This means that lowering transformers must be provided for use with rotary converters of such ratio as will give the desired A. C. secondary voltage. The switchboard necessary for this sub-station includes A. C. and D. C. rotary panels and necessary D. C. feeder panels. The A. C. rotary panel usually handles the high tension A. C. current, and is equipped with ammeter, volt meter, and power-factor indicator, together with automatic oil switch, which serves the purpose of circuit breaker in case of overload. The D. C. rotary panel is the same as a D. C. generator panel, including circuit breaker, main switch, ammeter and D. C. volt meter. The feeder panels are equipped with the usual switches and circuit breakers.

Synchronous motor generator sets are sometimes employed, in which case no step-down transformers are needed, since the synchronous motor may be wound for line voltage. This is a revolving-field machine similar to the generator; it must also be separately excited, and in this case it may be excited from the D. C. generator which it drives. The switchboard equipment would be practically the same as for a rotary.

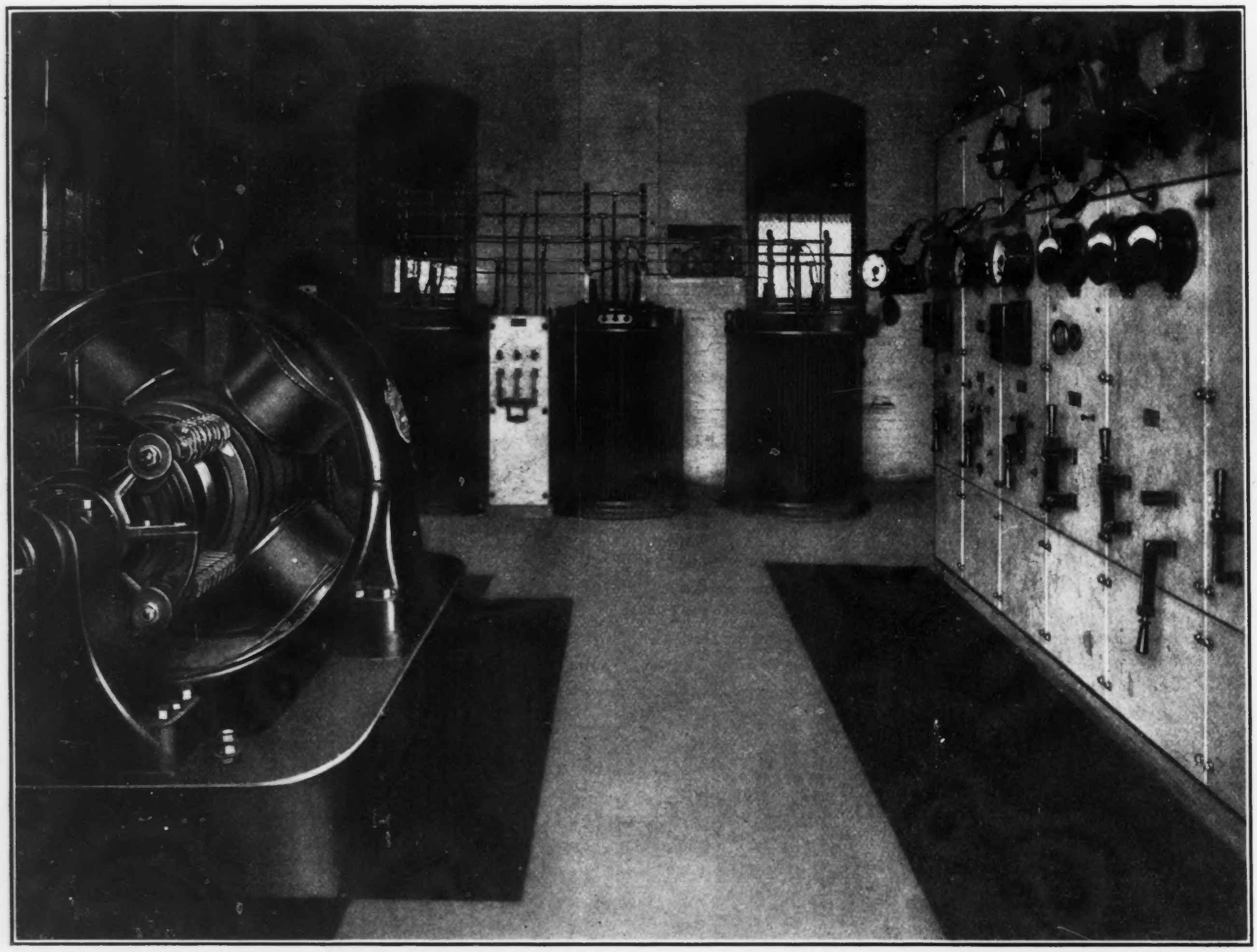
Underground Machinery

The underground machinery usually includes mine locomotives, which use series motors similar to those in street-railway service, with more turns per coil, reducing the speed to about eight miles per hour. The equipment of these locomotives, which vary from 3 to 20 tons in weight, is usually figured at about 10 h.p. per ton of weight, as it has been found advisable to over-motor these machines, thus avoiding a possibility of burn-outs from overload. Mining machines are now very largely employed, and are equipped with shunt or compound-wound motors ot from 12 to 20 h.p. capacity. Most of these machines make a cut 3½ ft. wide, 4 in. high and from 4 to 6 ft. deep. The cut usually requires about three minutes, and there is then a period of from one to three minutes required in moving the machine into position for the next cut. With a large number of machines installed, this reduces the load factor to about 50 per cent., and it is usually figured even less than this, on account of the time consumed in changing cutters and in moving from one room to another. As is the case with mining locomotives, this estimate must be made with full knowledge of the conditions of operation. Small electric pumps are also operated by direct current, using either shunt or compound-wound motors. In some cases these pumps are running but three or four hours per day, and in others almost continuously, so that the calculation for power required for these are also special for each mine. Large station pumps, in shafts or slopes, should be operated by induction motors, which may be supplied with current through insulated armored cable.

Advantages of the Induction Motor

Generally speaking, all outside motors should be of the induction type. It is usually possible to install transformers of such capacity as may be needed to operate all the induction motors at one mine, but where the line potential is not too high large induction motors may be operated on primary voltage; this is not advisable above 6600 volts. Induction motors are especially adapted for use on car hauls, mine fans, crushers, pumps, etc., and in general for any service which does not require frequent starting and stopping of the motor. Probably 75 per cent. of the trouble experienced with modern direct-current motors is with commutators or brushes, which trouble, of course, is all avoided with induction motors, which have no moving contacts. They will stand extreme overloads, and require practically no attention other than filling the oil wells occasionally.

The advantages of the induction motor for mining work are so marked that a number of plants have been installed at low voltage, for example, 550 volts, for the purpose of supplying apparatus of this character within short distances. These motors will operate under conditions of moisture and dust, where the direct-current motor would not answer at all. The work of driving conveyers, elevators and crushers is especially severe on account of the large amount of coal dust on and around this machinery, and since they all require practically constant speed, the induction motor is well adapted in every respect to the work.



ROTARY CONVERTER, VOLT TRANSFORMERS AND SWITCHBOARD, SUB-STATION, H. C. FRICK COKE COMPANY

For operating mine fans, where new mines are opened, the induction motor is not well adapted, since the speed of the fan requires constant increasing as the mine is extended. This, however, can be accomplished either by changing the pulley on the motor, or by so connecting the windings of the motor that the number of poles may be changed; for example, a 4-pole motor on 25-cycle current will operate at about 720 r.p.m. at full load, and by changing connections it may be readily converted into an 8-pole motor, operating at about 360 revolutions. The motor, of course, will give half the capacity at half the speed. A combination of a motor of this kind with a number of driving pulleys will often give all necessary speed variations on the fan. Induction motors are especially well adapted to driving mine fans after the mine is fully developed, on account of their reliability and the small amount of attention required. They are also particularly well adapted for driving centrifugal pumps for the same reasons.

The Use of Waste Gases Under Boilers

A number of plants have recently been installed using waste gases from bee-hive coke ovens under boilers. This is especially advantageous in coalfields where the percentage of volatile matter in the coal is higher than that required to coke the coal. In the Pocahontas and New River fields this is not the case, since the percentage of volatile matter does not as a rule exceed 18 per cent., but in the Pittsburg field and in the Alabama district the volatile matter will usually average above 30 per cent., and a large amount of power may be obtained by proper construction. For this purpose a large conduit is built along the ovens and short flues laid from each oven into this conduit. After the oven is charged, a cover is placed over the funnel head, and the gases and waste heat are conducted under the boilers. In some of the older plants an excess of air was admitted, and combustion was complete in the oven and in the flue, so that there was no flame in the boilers, simply a dull, red heat. In some of the later plants, with better construction and increased draft, combustion is completed in the boiler itself, and the results obtained are very much better. As high as 20 h.p. per oven connected has been obtained in one or two recent plants. Plants of this kind in connection with a central electrical power plant are expected to show very low power costs, since the attendance required is slight, with no fuel cost.

Recently Installed Alternating-current Plants

A brief description of some of the more recent alternating-current plants may be of interest, since these plants are typical of what is being done, and demonstrate the wide range of application of this system.

At Gary, West Virginia, the United States Coal and Coke Company, a subsidiary organization of the United States Steel Corporation, is operating eight coke works with a total of about 2200 ovens. One mine in the northern edge of the field is a shaft operation, and a steam hoist and steam fan are installed. In this mine, locomotives, pumps and mining machines are operated from the central electric power plant. All the remaining mines have drift openings, and are operated entirely from the central plant. This main power station is located at about the center of the field, and the maximum distance of transmission is at present about four miles. There are installed here two 740-kw. and two 400-kw. 6600-volt, 3-phase, 25-cycle generators, driven by cross-compound, non-condensing engines. The exciter equipment includes one 25-kw., 125-volt generator direct driven by a 40-h.p. vertical marine-type engine, and there are installed in addition one 25-kw. and one 50-kw. motor generator set. The motors on these sets are wound for 440 volts and are supplied through independent oil-cooled transformers stepping down from 6600 to 440. There are eight substations installed, one at each mine, in two of which are installed two rotary converters, the rest having one each. These rotary converters are 150-kw. capacity each, running at 740 r.p.m., and deliver

REAR VIEW OF SWITCHBOARD, YORK RUN POWER PLANT, H. C. FRICK COKE COMPANY direct current at 725 volts. Each rotary equipment includes three 55-kw., 6600- to 172-volt transformers, which are all of the oil-filled, self-cooled type, requiring practically no attention.

Method of Driving Mine Fans

The fans at seven of the works are motor driven through belts, using . 40-volt induction motors of from 20 to 150 h.p., and four of these, two of 100 and two of 150 h.p., are of the two-speed type with taps brought out from windings, whereby the motors may be run at half speed and power during development of the mines. At each works there are crushers, centrifugal and deep well pumps, and in one or two cases, car hauls and small electric hoists, all operated by induction motors. For supplying these induction motors there are transformers installed at each mine, most of which are 75-kw. capacity, stepping down from 6600 to 640 volts, with 2½-per cent. taps on primary to compensate for drop in transmission line. The centrifugal pumps mentioned have a capacity of 600 gal. per min. against 250 ft. head, and are driven by 75-h.p. motors. There are in operation a total of 60 induction motors with rated capacity of 4048 h.p., and 59 direct-current motors operating from rotary converters, with a total capacity of 2697 h.p., making a total connected capacity of 5745 h.p., with station capacity of 2300 kw. or 3067 h.p.

In connection with the main switchboard of this plant there are installed recording wattmeters on each generator panel, showing output of each machine; they are also installed on each feeder panel, recording the total amount of power supplied to each operation.

The York Run Plant of the Frick Coke Company

The York Run plant of the H. C. Frick Coke Company, also controlled by the United States Steel Corporation, supplies seven coke works with 2300-volt, 3-phase 25-cycle current. The central power plant is supplied from two boiler plants using waste heat from bee-hive coke ovens. These boiler plants are each at the center of a line of 50 bank ovens and are therefore 50 ovens apart, or approximately 700 ft. Each of these plants is drawing waste gases from 25 ovens each way, or a maximum distance of 350 ft. In each of these boiler houses are installed three water-tube boilers, with 3600 sq.ft. of heating surface each. The engine room contains four 400-kw. 2300-volt generators, driven by cross-compound, non-condensing engines at 150 r.p.m., and the exciter equipment includes one engine and one motor-driven generator of 50 kw. each. There are also in the main station two 200-kw. rotary converters, supplied from six 75-kw. 2200-260 volt, oil-cooled transformers, which rotaries supply direct current to the adjacent operations at 550-500 volts. In addition to this sub-station there are now installed three sub-stations, with one additional under construction, each containing a duplicate 200-kw. equipment. At each works direct current is used for operating mine locomotives, coke-drawing machines, and motor-driven coke larries, the latter of which are equipped with 20-h.p. series motors; large induction motors are used on fans and car hauls operated directly at 2200 volts, while small induction motors operating at 220 volts are used on conveyers, machine shop, etc., in connection with a three-wire lighting system.

A New Plant in the Fairmont, West Virginia, Field

In connection with the central power plant of the Fairmont & Clarksburg Railway Company, the Fairmont Coal Company is installing a number of sub-stations with a primary voltage of 22,000. Four of these sub-stations are now installed and supply direct-current power at 275 volts, operating locomotives, machines, small pumps, fans, etc. Induction motors are being installed on high-lift turbine pumps, these motors taking current at 2200 volts, supplied through independent step-down transformers. The same company in the Somerset county, Pennsylvania, field is now installing two 300-kw. 2300-volt generators with one sub-station in the power plant, also stepping up in the power plant to 6600 volts for transmission to a mine about 3½ miles distant. The rotary converters at this plant are 150 kw. each, delivering current at 275 volts, and on account of the thin seams of coal and rapid advance of the work it is expected to move these sub-stations forward from time to time, either locating them underground or supplying direct current from overhead through bore holes, thus avoiding long low-tension, direct-current transmission.

The Woodward Plant in Alabama

At Woodward, Alabama, the Woodward Iron Company is now installing a central electrical plant near its furnaces and will supply the boilers with waste blast-furnace gas. Three 400-kw., three-phase, 25-cycle generators are installed, driven by cross-compound, non-condensing engines at 150 r.p.m. This plant will operate at 3450 volts, transmitting a distance of two miles to two coal mines, in each of which the sub-station will be located at about 10,000 ft. underground, a total transmission of nearly four miles. These sub-station equipments will each consist of a 200-kw. rotary converter with three 75-kw. step-down transformers, and will operate at 275 volts D. C. In No. 1 mine, at a distance of 4000 ft. from the pit mouth, are located two 150-h.p. 3300-volt induction motors driving triplex mine pumps, with capacity of 700 gal. per min. each against 500 ft. head. These sub-stations and pump motors are supplied with current through high-tension armored cables, consisting of three No. 2 conductors with varnished cambric insulation and a double steel-band armor. This armor is protected from corrosion by an additional layer of jute saturated with asphalt. This cable is about 1¾ in. in diameter and is supported throughout by a 7/16-in. double galvanized steel messenger cable with clips at intervals of 3 ft. The rotary converters will supply a number of mine-haulage locomotives, also small mine pumps, delivering water to the main station pumps mentioned above. For water supply at the furnaces there will be installed two 12-in. turbine pumps, each of 3000 gal. per min. capacity against 125 ft. head. These pumps are direct driven through flexible couplings by 150-h.p. 3300-volt motors, duplicates of those installed underground. For supplying direct current for small locomotives, cranes, machine shop, etc., at the furnaces there will be installed two 110-kw. 275-volt D. C. generators direct driven by duplicate 150-h.p. 3300-volt motors. The usual exciter and switchboard equipment is provided.

Other Plants in Pennsylvania

At the mines of the Ellsworth Coal Company, Ellsworth, Penn., in anticipation of a central power plant, rotary converters have been installed for use as belt-driven, three-wire generators. These are standard railway rotaries delivering current at 550 volts. A neutral wire is obtained from the collector rings by use of inter-connected star connections of secondary windings of three small 2200-volt transformers. This neutral wire is permanently grounded and all machinery underground operates at 275 volts between either wire and the ground. When the central power plant is installed at a later date these rotaries will operate as such, with a neutral connection taken from the T-connected step-down transformers.

In the Connellsville district of western Pennsylvania the West Penn Railways Company operates a very extensive railway and lighting system and also furnishes power to a number of mining companies. In many cases this power is taken directly from the trolley circuits, but the Railways Company has in other cases installed for its customers synchronous motor generator sets. This latter method is preferable, since the fluctuations in voltage due to railway load are objectionable, especially where shunt- and compound-wound motors are used by the coal companies. With proper appreciation of the character of mining load, and ample provision for additional and increased demand, there should be quite a field for work of this kind in mining districts, since power companies should be able to furnish current much cheaper than an ordinary small plant could produce it.

At Ehrenfeld, Penn., there has been in operation for several years an alternating-current plant, supplying current to a sub-station about two miles underground. In this case rotaries were originally installed as belt-driven double-current generators, the A. C. current from collector rings being stepped-up to 5000 volts for transmission to the underground sub-station, while direct current from the commutators was fed into the mine trolley system at the pit-mouth. At a later date a larger generator was installed, and the rotaries supplied with A. C. current as customary.

The Cowanshannock Coal Company, near Yatesboro, Penn., have installed one 1500-kw. 6600-volt, 60-cycle turbine unit, operating at present one sub-station and a number of 6600-volt induction motors on fans and air compressors. These are the only motors of this type operating at such high potential, in the mining field.

Steam Hoist Still Preferred for Winding from Shallow Shafts

It will be noted from the above descriptions that electricity has supplanted steam in all departments of mining work, except for hoisting from shallow shafts, where the first motion steam hoist is still preferred. The recent development and repeated application of the Ilgner system to this class of work, as described in a recent issue of the Engineering and Mining Journal, and also as exemplified at the St. Nicholas pit of the Grand Hornu Company, in Belgium, obviates the necessity for steam hoisting apparatus, and the chief remaining argument against central power generation with shaft mines disappears.

In many districts in Pennsylvania, Ohio and West Virginia, the nature of coal and roof prevents the economical and safe use of chain type of undercutting machine, and the compressed air "puncher" type is required. When electric power is available, it is economical and convenient to locate a motor-driven compressor at the pit-mouth of each mine, the motor and compressor running at constant speed, and the air pressure being maintained constant by a choking controller throttling the intake. This arrangement saves piping, reduces losses, and requires no more attention than the ordinary steam-driven machine.

Many modern mining towns are now electrically lighted, both in streets and in miners' houses, reducing insurance and returning good income on the required apparatus. When alternating current is available, small single-phase transformers may be so located as to minimize the amount of secondary wiring required, and the regulation and consequently life of lamps will be much better than if supplied from a direct-current station.

In fastening buckets to an elevating chain, it is advisable to use the button-head and square-head bolts with a detachable sprocket chain. Flat-head bolts can be used for fastening belts, and are much better than lacing in many places.

The Future of West Virginia as a Coke Producer

By Neil Robinson*

With the history of the coke industry for the year 1906 closed, West Virginia has reason to regard this past year as marking one of the most important periods in her industrial existence. There was a large increase in production, and a number of new oven plants were constructed, but these gains were in response to the strong current demand, and not necessarily indicative of the position the State is to occupy in the future. The events of greatest significance that have marked the year may be referred to, briefly, as follows:

Supply of Coking Coal

The West Virginia coking coals were thoroughly tried out in by-product plants, and have been given a well-earned position as standards for that practice. Assuming that the bee-hive oven will ultimately be superseded by more economical types, it is gratifying to know that our coals will fully respond to the most exacting requirements of advanced coking methods.

In the report of operations at the St. Louis testing plant, by E. W. Parker, J. A. Holmes, and Marius R. Campbell, a map was included which shows with great accuracy every coalfield in the United States. Very few publications by the Geological Survey will receive greater attention from iron and steel makers and coal operators, than this map. When the coalfields there outlined are sub-divided into coking and non-coking groups, it will be found that the areas capable of supplying high-grade metallurgical coke are few in number, and comparatively small in acreage.

In the year 1905 there were 213 counties in the United States that produced more than 100,000 tons of coal, each, but there were only 21 counties that produced more than 100,000 tons of coke. Seven counties in Pennsylvania, with seven in West Virginia, and three in Alabama, furnished 81 per cent. of the entire coke output of the United States for the year 1905.

Statisticians throughout the world are gathering data for estimates upon the extent and tonnage of the unworked iron-ore deposits available for the future. Preliminary estimates have been made for the most important beds in this country, and E. W. Parker, statistician for the U. S. Geological Survey, has undertaken the vital work of investigating the fuel supplies that must be reserved for the reduction of the American ores.

*Charleston, W. Va.

Reserve Fuel for Iron Making

Within the next two years practically all of the undeveloped coking coal areas will be opened by railways that are now in process of construction, but where properties are so located that they can be operated in conjunction with iron and steel plants. it is probable that a number will be equipped for that purpose exclusively, and will not enter the general trade. The known ores in the Mesabi district will eventually require a fuel supply that will be equivalent to one coking-coal seam with a thickness of five feet, underlying a territory that shall be not less than 300,000 acres in extent. All the other orefields will require proportionate reservations. The U. S. Steel Corporation has already secured coal lands in this State to the extent of 50,000 acres, and other iron interests are preparing to take similar action in West Virginia, Virginia, and Kentucky, where realty prices have not as yet approached the Pennsylvania levels.

West Virginia has coking, gas, steam, and domestic coals of the highest grades, a good geographical location, and excellent transportation facilities. The State has an open water-way to Cincinnati, Louisville, St. Louis and other cities in the Mississippi Valley, by the Monongahela, Kanawha, and Ohio rivers; and, by the Baltimore & Ohio; Chesapeake & Ohio; Norfolk & Western; Coal & Coke; Wabash; Western Maryland; Toledo & Ohio Central; Deepwater-Tidewater, and other railway systems, so that our coals and cokes have established markets from the Atlantic Coast in the East to Nebraska in the West, and from Canada in the North to Mexico in the South.

The advantages possessed by West Virginia cover every factor that is essential for the permanent upbuilding of her coal and coke interests under all ordinary trade conditions, and this good position will be immeasurably strengthened by the movement for the direct affiliation of coal properties with iron mines and furnaces. At the same time, the manufacturing supremacy of the Pittsburg district will be conserved by any development here that will lessen the inter-state drain upon the Connellsville basin, and West Virginia may almost hope to grow with the friendly help of our powerful neighbor.

In mines where telephones are used care should be taken to keep the batteries in good condition, as they will gradually become exhausted by evaporation and continued use. When batteries show signs of weakening, they should be replenished. It is then best to empty the cells and wash all parts thoroughly; then recharge them with 4 oz. of sal-ammoniac for each cell and fill with clean water. When the telephones are placed in warehouses or other places where the batteries are likely to freeze during winter months, dry batteries should be used.

New Development in Coalfields of New Mexico

The Four Koehler Mines in the Largest Coal Area under One Ownership in the United States Yield 100 Tons Coal Per Hour Each

BY EDWARD K. JUDD*

Of the several distinct coalfields of New Mexico the one now showing the greatest activity is the Raton field, in Colfax county, near the northeastern corner of the State. The field extends uninterruptedly northward across the Raton mountains into Colorado, where it is extensively operated by the Colorado Fuel and Iron Company and by the Victor Fuel Company. On the New Mexico side the entire field, except the area of the Dawson Fuel Company (Phelps, Dodge & Co.) and one or two other relatively unimportant tracts, is controlled by the St. Louis, Rocky Mountain & Pacific Company, whose holdings include 299 square miles of coal land owned outright, and 513 square miles in which the company has the mining rights and whatever surface privileges it needs. This is the largest area of coal lands under one ownership in the United States.

INTERIOR OF KOEHLER MINE—HIGHT, 11 FT. AT FACE

Coal of the Raton Field

The coal measures lie near the bottom of the Laramie (lower Cretaceous), which comprises thick-bedded sandstones and shales. Along the eastern outcrop the strata dip 2 deg. to the west, but toward the center of the field they lie nearly flat, rising, on the west edge, in a steeper fold. The surface has been deeply eroded, whereby the coal seams are now exposed to advantageous development at numberless points. There are three workable seams within a vertical distance of 800 ft., but only the lowest, the Raton seam, has been or is now largely developed. The relative positions of the coal seams and the character of the Raton seam are shown in the accompanying columnar sections, which are reproduced from a report on the district by d'Invilliers and Griffith.

The character of the Raton seam is subject to wide variations as to thickness, quality and the position of bony streaks, but in general it has firm roof and floor, is but little disturbed by faults or folds, and is neither better nor worse as a fuel than the Colorado coal mined in large amounts to the north. Intrusive sheets of basalt occasionally are found in proximity to the coal, which they have, in such places, transformed locally into coke, anthracite or graphite.

In passing, it should be mentioned that the Rocky Mountain Company's coal is of good coking quality, though relatively high in ash. The Raton field in northern New Mexico and southern Colorado is the principal source of supply of coke in the West. Indeed, more than 70 per cent. of the coke produced in the western fields comes from that region. Analyses of the coal from different localities and of the coke are given in the accompanying table:

COMPOSITION OF COAL AND COKE.

	Water, Per Cent.	Volatile, Per Cent.	Fixed Carbon, Per Ct.	Sulphur, Per Cent.	Ash, Per Cent.
Raton Seam:					
Mine section.......	0.76	34.42	49.99	0.664	14.17
Lump coal.........	1.35	36.57	51.92	0.678	9.48
Washed slack......	1.26	36.22	50.13	0.713	11.68
Unwashed slack...	1.49	35.21	47.01	0.687	15.60
Tin Pan Seam:					
Mine section.......	0.95	38.46	48.88	0.612	11.10
Potato Cañon Seam:					
Mine section.......	1.93	36.59	52.11	0.523	8.85
Coke:					
Van Houten........	0.58	1.77	79.96	0.698	16.99
Tin Pan............	0.44	1.44	80.60	0.599	16.93
Dawson*............	0.92	2.32	78.27	0.652	17.84
Segundo, Colo.*....	0.38	2.20	78.58	0.640	18.20

*The last two cokes are tabulated for comparison.

*Mining engineer, 55 Fulton street, New York.

Mine Operations

The Rocky Mountain Company's mining plants are situated at Brilliant, Van Houten and Koehler, all of which settlements are on the southeast outcrop of the coalfield, and to the west and southwest of Raton; each is connected by a separate spur to the Santa Fe railway or to the new line of 106 miles just built by the subsidiary St. Louis, Rocky Mountain & Pacific Railway Company, connecting with the Colorado & Southern, the Santa Fe and the El Paso & Southwestern, or to both. The older mine at Blossburg has been temporarily abandoned since its recent disastrous explosion. All of the mining operations are drifts.

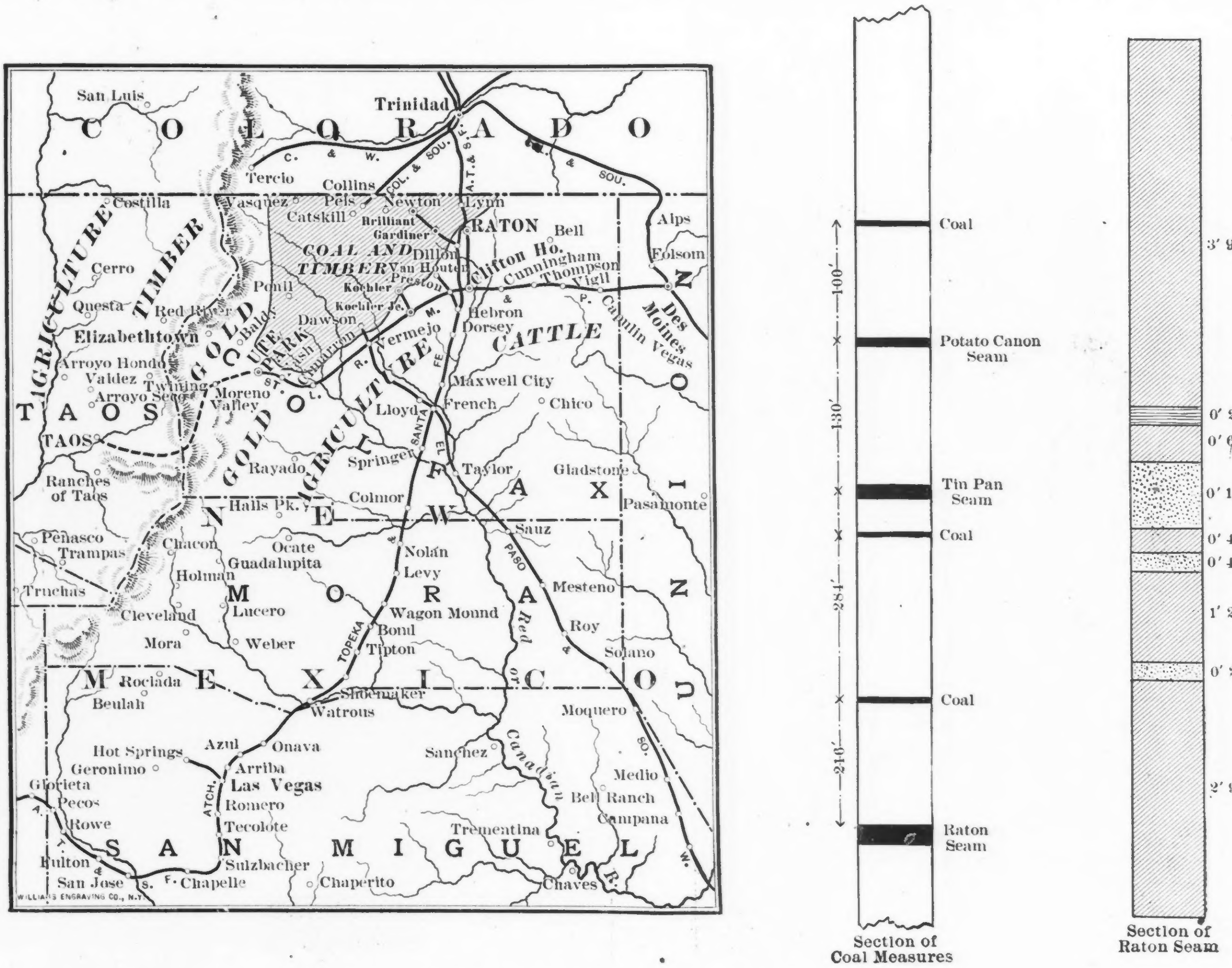
At Brilliant, started in 1905, two mines, facing each other on opposite sides of Dillon cañon deliver their output to the same tipple, the capacity of which is 100 tons per hour. The seam at this point is 5 to 7 ft. thick, and develops no gas. Mining is done by hand, but an electric haulage system is being installed, and the mine is ventilated by an electrically driven fan. The mine employs about 115 men.

At Van Houten the outputs of three mines converge at one tipple, whose capacity is 200 tons per hour. The seam here ranges from 5 to 11 ft. thick and is mined by hand and with black powder. Electric haulage is used in the mines, but outside, the loaded cars, carrying about two tons of coal apiece, run by gravity to the tipple. The mines are lighted by electricity and ventilated by a Guibal fan. Water has to be hauled in by the railroad in tank cars. The mine has a well equipped electric generating plant, with machine shops, etc., and employs 320 men.

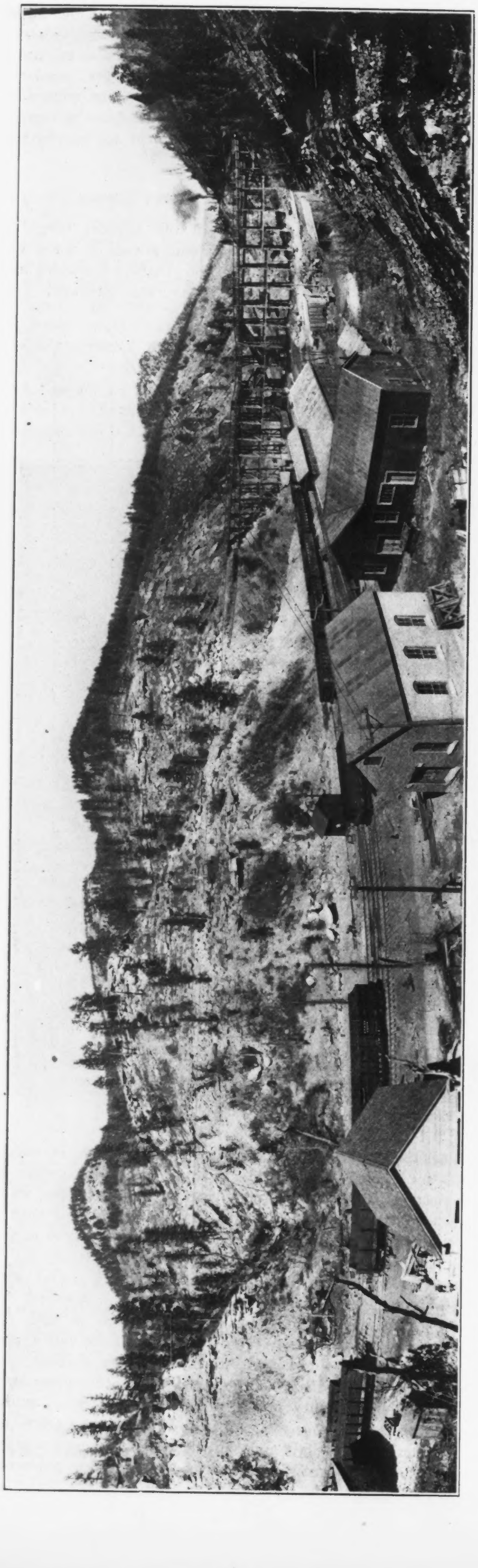
The Koehler is the newest and the largest of the company's operations. Work began there in the spring of 1906. Four mines, with a capacity of 1000 tons each in 10 hours, discharge over one tipple, to which the loaded mine cars are hauled over descending grades by electric locomotives. Electric gathering locomotives will soon be installed. To supply power for this haulage system, for lighting and ventilating the mine, and for operating a nearby washery and coking plant, an electric generating station containing two 500-h.p. Babcock & Wilcox boilers and two 150-kw., Westinghouse, direct-current generators, has been erected. Current is transmitted at 6600 volts to the mines, where it is transformed to 500 volts for consumption. The tipple is fitted with screens and with an Ottumwa loader for boxcars. A pipe line extends throughout the main and cross entries of the mine, in which water is maintained at a pressure of 40 lb.; the working faces and the walls and floor of the entries are regularly sprinkled to lay the dust. The mine now employs 150 men, but the force is rapidly enlarging and will number 400 men by the end of this year.

Water Supply System

The vicinity of the Koehler mines is arid, but an abundant supply of water for all the mining and washery purposes has been obtained by a unique method. The bottom of Crow Creek valley, in which the Koehler plant is situated, consists of gravel beds lying on an impervious stratum of shale. It was discovered that a considerable flow of water occurred at the bottom of the gravel, so a shaft, 50 ft. deep, was sunk through the gravel, and into the shale; from the bottom of the shaft crosscuts were driven in both directions, across the axis of the valley, and holes were then driven up through the shale roof, thus draining the water into the bottom of the shaft. A heavy pump was then put in to lift the water from the shaft and raise it 400 ft., through a 6-in. main, to a 2,000,000-gal. concrete reservoir on the hillside. From this the water is



MAP OF NORTHERN NEW MEXICO AND SECTIONS OF COAL MEASURES



TIPPLE, KOEHLER MINE, KOEHLER, NEW MEXICO

KOEHLER MINING CAMP, KOEHLER, NEW MEXICO distributed by a pipe as required, and the present supply affords about 200,000 gal. per day.

Washeries

In connection with its coking plants the Rocky Mountain company operates two washeries. The larger is at Koehler and the other, an older, at Gardiner, 3 miles from Raton, on the railroad to Brilliant. The Koehler washery, now just being completed, has a capacity of 1200 tons per 10 hours, and cleans the slack from the Koehler mines. Stewart jigs are used here. The washery at Gardiner has a capacity of 800 tons per 10 hours and draws slack from the mines at Brilliant and Van Houten. This washery was built two years ago, and is thoroughly modern; it employs the Century jig. No coal is crushed for coking, since lump coal is at present in greater demand than coke, and the ovens are sufficiently supplied by screened slack.

Coking Plants

Coke is made in beehive ovens of 13 ft. diameter, and the output per oven is estimated at 480 tons of coke per year; about 1.7 tons of coal make one ton of coke. The plant at Gardiner contains 186 ovens, of which 102 are only one year old; 70 men are employed. The plant at Koehler contains 200 new ovens, none of which has yet been fired; they are expected to go into full operation July 1, this year.

Markets for the Coal

At the present moment the principal demand for Raton coal and coke comes from the railroads, and the mines and smelting works near the Mexican boundary. To supply the smelters in this district, coke has been brought from as far as Pennsylvania, and the opportunity to secure a not greatly inferior fuel from northern New Mexico has gladly been grasped. The Colorado cokes are at a disadvantage in this consuming territory by reason of the heavy grades over the Raton mountains. The upper measures of the Raton coalfield yield an exceptionally good domestic fuel, and considerable demand for this purpose has already been established; with a slight diminution in freight rates this coal will be able to compete with the inferior Australian coals imported on the Pacific coast. The railroads, of which several large systems traverse the neighborhood, are important consumers of the Raton coal, and are finding it an economical substitute for fuel oil, as the supply of the latter becomes more and more insufficient. Lastly, the new St. Louis, Rocky Mountain & Pacific Railway, paralleling the northern boundary of New Mexico, gives access to promising mining territories in the vicinity of Baldy mountain, thereby creating additional coal markets. The three camps now working are producing coal at the rate of 100,000 tons per month, and an output of 900,000 tons for the year 1907 is conservatively predicted. For the year 1908 the yield of coal is expected to reach 1,400,000 tons and of coke 175,000 tons.

Coal in Alaska

According to a recent publication of the United States Geological Survey the coal-mining industry of Alaska is still practically undeveloped, the total production for 1906—the year of greatest output—being 6660 short tons, valued at $20,000. The most active mining operations have been on Cook inlet, in southwestern Alaska, on the Yukon, in Seward peninsula, and at Cape Lisburne, all undertaken to provide fuel for local use, by small coastwise or river steamers, at mining camps, and at canneries.

Alaskan coals have in recent years been the subject of a large amount of special investigation by the Geological Survey, and in addition much information concerning coal has been gathered each year since regular geological work was begun in Alaska, by survey parties working primarily on other problems. A brief summary of the results of these investigations illustrated by a map showing the distribution and area of coal and coal-bearing rocks, is included in the "Report on Progress of Investigations of Mineral Resources of Alaska in 1906," published by the Survey as Bull. No. 314. This summary, prepared by G. C. Martin, is not intended to be complete in itself, but it supplements more complete and comprehensive summaries which have been already published and to which reference is made, and is preliminary to more detailed discussions that will be published on the completion of investigations now in progress.

The work of the season of 1907 will include studies of the coal-bearing rocks of the southeastern part of the Territory and of the Yukon coalfields so far as they are accessible from Yukon river. Field work was begun early in May by W. W. Atwood, who is assisted by H. M. Eakin, and Mr. Atwood reports the work in southeastern Alaska already completed. It is believed that the investigations this year will add materially to existing knowledge of the coal resources of the Territory.

Coalite

Special Correspondence

Coalite, the new smokeless fuel now being made in England, is made by coking bituminous coal at a temperature not exceeding 800 deg., and in an atmosphere of steam under pressure. Some of the bituminous matter remains in the coal, so that coalite differs from coke by burning with a clear, bright flame. The residual products are, to a certain extent, similar to those obtained in coke and gas manufacture; but owing to the low temperature of the process, no hard gas carbon is formed. Instead of this, a product similar to natural bitumen is obtained, and it is hoped that it will prove useful as an insulating material for electric cables. Coalite has now a rival in the fuel placed on the market by the Scottish Smokeless Fuel Syndicate, of Glasgow. The merits of this semi-coked bituminous coal should before long be thoroughly brought to the notice of the public.

Sulphate of Ammonia in Great Britain

The production of sulphate of ammonia in Great Britain continues to increase. The output during 1906 was 289,391 long tons, as compared with 269,114 in 1905, and 245,990, in 1904. The largest proportion comes from illuminating gas works, the product from this source during 1906 having been 157,160 tons, which is about the same as during the two previous years. The production at the Scottish blast furnaces, where bituminous coal is used in smelting, was 21,284 tons in 1906. The Scottish shale distilling works produced 48,534 tons of sulphate of ammonia during 1906. The greatest increase was at the coke ovens, and the production rose from 20,848 tons during 1904, to 30,732 tons in 1905, and 43,677 tons in 1906. Producer gas manufacture accounted for 18,736 tons of sulphate of ammonia last year.

Cost of Laying Mine Tracks

A fair average itemized cost of laying mine tracks on a level road for one mile with 20-lb. rails is as follows:

31 3/7 tons rails at $35	$1,100.00
2940 lb. of 4x7/16 spikes at 2c	58.80
357 splice-joints at 22c	78.54
2640 cross-ties at 20c	528.00
Laying tracks	650.00
Total	$2,415.34

A similar itemized table for one mile of level road with 40-lb. rails is as follows:

62 6/7 tons rails at $35	$1,948.57
4690 lb. of 5x½ spikes at 2c	93.80
357 angle splice-joints at 35c	124.95
2640 cross-ties at 25c	660.00
Laying track	750.00
Total	$3,577.32

The variable point in these averages is of course in the cost of laying track, which is affected by cost of labor, location and other causes.

Centrifugal pumps may be either single or double suction as determined by the water entering the impeller from one side or both sides. The double-suction type is more suitable for very large capacities.

Wood versus Iron for Pipe Lines in Coal Mines

Wood Pipe Withstands Acid Water Better than Iron and the Cost of Furnishing and Laying is about 50 Per Cent. Less

BY JOHN H. HAERTTER*

As a conveyance for water, no other means is so extensively used as that of pipes. Wood pipe has been used for many years and has in almost every instance given good results. However, the merits of bored logs, "continuous wood stave pipe," and finally of the present "machine made wood stave pipe," are only individually known by those who have used them, and then only if they have carefully investigated, and noted under different conditions and at different intervals, the results. The recent discussions about and the increasing demand for machine-made wood pipe should be sufficient reason for arousing the manufacturer and engineer to a thorough investigation of its qualities, besides bringing to their attention, through the press, trustworthy data to enable them to set free any doubts they may now have.

The corrosive power of water has long been to the engineer, and to industrial or mining concerns, a most perplexing problem. Nowhere are its effects so numerous and destructive, both as to time and expense, as in and about the coal and metal mines of the world, and only the mining man himself can fully appreciate the many delays and aggravating circumstances with which he is so frequently confronted. To offset them, he must invariably be on the alert, keep on hand a duplicate of any special piece of machinery having the slightest connection with the use of heavy mineralized water lest a break occur and he is without parts quickly to replace it. It is also necessary to be constantly alert and to keep accurate record of all parts rapidly affected, so as to determine when their day of usefulness is over, and the time at hand to replace them with new material. How often the operator has been deceived in the probable length of service of certain parts and thereby seriously delayed. Besides this there occurs the unwarranted expense for what is in reality only temporary work, whereas the one great aim in all improvements is permanency. It can be unhesitatingly said that if the mine owner, operator or superintendent would carefully estimate the amount of machinery, piping, and fittings destroyed by water on the basis of production he would be amazed at results.

Impurities in Water.

Chemically pure water is rendered so by excluding the foreign matter or organisms which are contained in it, and is composed of two parts of hydrogen and one of oxygen (H_2O). However, all natural waters contain foreign ingredients such as carbonic and other acids, soluble minerals or organic substances. The different degrees of purity are, of course, dependent on the different localities in which they originate. Water possesses the quality of dissolving and holding in solution various soluble solids, due to the carbonic-acid gas which is contained in it. The lime in many waters is the scale-forming agent in metallic pipes, especially so where the grade of the pipe is slight and the current consequently slow, thereby requiring the use of pipes of larger diameter than would otherwise be necessary. Water coming from coal mines or sulphur deposits contains amounts of sulphuric acid sufficient to produce quick corrosion.

The impurities in water may be classified under three different heads; namely, corrosive, scale-forming and alkaline. The corrosive are:

Sulphuric acid	H_2SO_4
Carbonic acid	H_2CO_3
Sulphate of iron	$FeSO_4$
Calcium chloride	$CaCl_2$
Magnesium chloride	$MgCl_2$

Of these the most destructive is beyond question sulphuric acid, which is found in varying quantities in the mine waters of different localities. We find it destroying the valves, fittings, water chambers, plungers and column lines of pumps, T-iron rails, chute iron, the jackets or segments of revolving and shaking screens, and jig and conveyor line parts in the breakers.

Water containing more than 5 parts per 100,000 of free sulphuric or nitric acid is liable to cause serious corrosion, not only of the boiler itself, but of the pipes, cylinders, pistons, and valves with which it comes in contact.

I recall an instance where the water chamber of a new 16-in. and 30x10x18-in. compound duplex pump in service for a short time was eaten through in an unusually brief period. At first only a pin hole was detected by bubbles of water appearing, and it was concluded that the piece was defective and the cause laid to a sand hole. The hole increased rapidly in size and had to be wedged continually. A new chamber had been ordered promptly on detecting the pin hole and before it arrived from the manufacturer a chamber on the opposite or right-hand side of the pump gave a similar performance. The chambers were carefully examined and the proof of the destruction by the sulphuric acid was absolute. As a result the best and only thing to do was to keep a supply of two extra chambers for emergency, and also duplicate pump fittings. The water being pumped in this case was, however, extremely bad.

Advantages of Wrought-iron Pipes

Wrought-iron pipes have the advantages over cast-iron pipes of lightness, toughness, and pliability. These three items enter into the installation of a large pipe system to no small degree, the first resulting in less freight cost for transportation, and in ease of handling, which means so much more to mining industries where the pipe must be handled at great hights, as in a breaker, or reloaded and retransported to the inside workings. Its second advantage, that of toughness, allows it to be more roughly handled and renders it less liable to breakage in transport; the third, its pliability, adapts it for bending to any required angle, thereby dispensing with specially made fittings for such angles. The lighter weight per foot also allows it to be made in greater lengths, requiring therefore fewer joints.

Points Favoring Cast-iron Pipes

The mining man must, however, lay aside and disregard these advantages when he is so frequently confronted with the rapid corrosion and destruction of the pipe, and consider other conveyances. In point of strength, durability, facility of making connections, and probably capacity of delivery, cast-iron pipe is far superior to wrought. It is much heavier than wrought pipe but costs less per pound, and foot for foot the prices do not differ very much. The economy lies in the transportation and laying. As regards durability, I have long been convinced that wrought iron corrodes much more rapidly than cast. If any danger of corrosion is feared, wrought iron should rarely, if at all, be used. As to capacity of delivery much has been written and said about the flow of water through different pipes, and there remains considerable doubt as to what degree of accuracy the theoretical rules set down for cast-iron pipes can be relied upon, but practical experiments thus far seem to prove that the discharge of cast iron pipes is greater than that of lap-welded or riveted pipe, probably due to

*Lehigh Valley Coal Company, Wilkes-Barre, Penn.

the obstruction of the laps and the riveting, and unless the engineer makes a small per cent. increase in diameter for the lapped pipe, he is frequently disappointed with the results obtained.

Darcy in his experiments with pipes of different diameters established the fact that the nature of the inside surface of a pipe had a remarkable effect on the quantity and velocity by taking first a clean smooth pipe and then one having a dirty and rough surface and obtaining strikingly different results. His various experiments gave rise to the two classes of cast-iron pipes, "smooth" and "rough," and led to adopting a coefficient for the flow through each, that in the smooth being in all cases half of that in the rough.

From the fact that all pipes will in time become more or less rough, it is probably best to use the rough coefficient. While we have in mind the iron pipe it might be added that the prices of steel and cast-iron pipe have in recent years greatly advanced in price and the great demand for it renders the delivery in any great quantity uncertain.

For these reasons, the attention of industrial establishments and the mining companies throughout the country is being turned to the merits of wooden stave pipe. Most literature on the subject, and there is little of it published in recent years, treats of it, or at least mentions the use of wooden pipe as being in the experimental stage. Investigation by anyone interested will prove the contrary, and it is pleasing to know that during last year the subject was freely discussed, and it is hoped that this discussion will be continued and the actual tests and their results published.

The History of Municipal Water Mains.

For centuries past wood pipe has been used as a conveyer for water, long before cast-iron pipes were made, and constituted the supply mains and distribution systems for public water supply. In Rome the old sheet-lead pipes were replaced by wood pipe generations ago. In London the first city-water supply pipes consisted of lead and wood mains, and the lead was later on replaced by wood pipe. The first public water system installed in America was by the city of Boston, Mass., in the year 1652, and the wood pipes which constituted the mains were replaced with wood again in 1796, and later on, in 1848, with cast-iron pipe. Wood pipe constituted the distributing mains of New York City's first water supply. Wood pipes consisting of spruce pine logs bored out; mortised and tenoned at the ends, with wrought-iron bands fastened around each end, were used in building the mains of the first public water works of Philadelphia in 1799, and were in continuous use until 1844. Some were removed about 1819 and 1820 and sold to Burlington, New Jersey, and again used there as water mains in that water system which had been constructed of wood pipe in 1804. The city of Wilmington, Del., laid wood water pipe about 1816, and many of them are still in the ground.

American Society of Civil Engineers.

In a recent discussion paper on the durability of wooden stave pipe, T. Chalkley Hatton, hydraulic engineer, states that "several years ago while building a sewerage system in Wilmington, Del., some 300 ft. of wooden water pipe, buried 8 ft. underground were dug up. The pipe was a bored log of white pine, full of water not under pressure, and was solid throughout, although it was laid prior to 1837, how long before that time was not known. The joints were made by a tenon and spigot and were in excellent shape. The log had cracked in every case in two concentric rings about equi-distant and at right angles to the axis at several points; no cracks, however, extended through the body of the pipe. Every pipe was in this condition."

Cast-iron water pipe was first made in America by Samuel Richards at Philadelphia in 1819 or 1820, and sold to the City of Philadelphia for extending its water system and to replace the old wood pipes which were not of sufficient capacity to supply the increasing demand. At this early date the capacity of a wood pipe depended on the diameter of the log bored, the diameter of the bore seldom being over 6 in., more frequently 3 and 4, consequently, when it was learned that a pipe could be cast having an 8- or 10-in. diameter, the larger supply with one line of pipe consisted universally of cast-iron pipe from that time until steel pipe was manufactured.

Continuous Wood-stave Pipe

On the Pacific coast, as the States developed and a demand for water supply sprang up the obstacles were so insurmountable and the cost of transportation from the East so great, that municipalities and water promoters were practically prohibited from using cast-iron pipes. Inexhaustible forests of pine, redwood, and fir were at hand, and the making of wood pipe was revived, not by boring the logs, but by turning out staves of uniform width and thickness and binding them together with steel or wrought-iron bands, thus overcoming the previous difficulty of earlier days; the production of a pipe of any required diameter. The staves after being planed on both sides to a circle corresponding to the diameter of the pipe to be laid, the edges cut radial to the circle and with a bead left on one edge, were shipped to the point where the pipes were to be laid, and there built up into a continuous pipe by binding the staves together. The thickness of the wood staves was 1⅜ to 1⅞ in. and the bands were spaced to conform with the pressure which the pipe was expected to withstand. This constitutes what is known as "continuous wood stave pipe." It has been used for many years in the far West, particularly for irrigation. The principal cause of failure seems to be found where a space, although small, exists at the longitudinal joints, and the fibers of the wood are not in immediate contact; in many instances the ends of the staves contain cracks before being built into the wood. Thus, are found lodgment places for organisms whose destructive work is at once commenced. Unless the joints are perfectly matched and tight and in direct contact we have only to expect the ultimate destruction of the pipe, in due time. Another important feature frequently overlooked is the banding of the pipe. The bands were not formerly, but now are, coated with asphaltum pitch or some other preserving material and, it is claimed, are free from oxide. It is also claimed that the advantage of the system lies in the fact that with the material on hand it can be built on the ground, and then too by only partially skilled workmen. The statement may be correct so far as was intended, but we must not lose sight of the fact that while the material is waiting to be worked up into the pipe, organisms are finding their way into the staves and the steel bands are taking on a coat of rust. In this condition, they are dipped into the preservative and placed around the staves, when the rust is covered and the deteriorating effect already begun, allowed to continue. Furthermore it matters much as to what extent we consider the term, "partially skilled," for judgment must go hand in hand with it, besides the men very often work under unfavorable conditions.

All the above conditions relative to steel, iron and wood pipe, together with other reasons, the hydraulic or municipal engineer and industrial establishment must carefully study and weigh in the installation of a permanent water-supply system, while the mining man must go further for the reason already stated, namely, the destruction wrought by sulphuric acid in the great quantities of mine water he is compelled to handle. The rapid destruction of large quantities of pipe has of necessity led him to seek a more durable and cheaper material, and we come, therefore, to the "machine-made wood stave pipe" now extensively used throughout the anthracite and bituminous coalfields.

The pipe is made from carefully selected Canadian white pine, well seasoned, and free from sap or black knots. The bands used to bind the staves are of mild steel, from 1½ to 2 in. in width by about No. 18 gage, clean and free from rust or scale, and are coated during the winding with a protective coating of asphaltum, which thoroughly covers both faces of the band. In addition to this, after the pipe is wound, it is placed upon rolls which revolve through a hot bath of the same kind of coating which adheres to the outer surface of the wood and bands, effectually affording them protection from the decomposing and oxydizing influences contained in the water and soil through which they are laid. The bands are spaced according to desired pressure, and are spirally wound under sufficient tension to draw the staves tightly together. The pipes are thoroughly tested by the manufacturer before shipment with a high-pressure pump.

Up to a pressure of 200 lb., it has all the advantages over iron pipes. It is not rusted out or corroded by spring water and acids of other fluids, and is more durable; its cost is much less both in transportation and laying; it is less liable to freeze, and if frozen, less liable, from its elastic qualities, to burst. In Elmira, N. Y., during the winter of 1903-1904 the frost went unusually deep and cast-iron pipe was frozen at a depth of 5 ft., but in no instance was wooden pipe frozen; in some places the latter was only 3 ft. below the surface.

Adaptability of Wood Pipe.

According to the demand in the mining region, wooden pipe is adapted for the following uses, in the order of their importance:

1. Pine-stave water pipe for pump and suction lines, for disposal of sulphurous mine water inside, where pressure does not exceed 200 lb.
2. Hard-maple pipe for flushing old mine workings with culm or ashes from bottom of boreholes or from shafts to inside workings.
3. Fresh-water lines to or from reservoirs, for boiler feed, company-house supply, etc.
4. Pipes of small diameter, 3, 4, 5 and 6 in. for coal washing in breakers and washeries.

Its adaptability for the first mentioned use cannot be surpassed by any other pipe. This has been demonstrated time and time again where it has replaced the iron pipes after their destruction and given permanent service. Its uses for pumping must not be understood to apply to pumping in general. In the coal fields we have many small basins lying within a larger basin, and the constant aim is to reach with the main pumping system the lowest point of this larger basin. As development progresses and new territory is opened up the smaller and individual or local basins are encountered and our mining is on the dip, and small pumps are required to keep the openings free of water by pumping to the sump of the main pump, which throws the water through opening or boreholes to the surface, and it is the head of water which the main pumps work against which determines the class of material for the delivery pipe. The wood pipe is not to be recommended for a pressure exceeding 200 lb., and taking into consideration the pulsation of the pump and the pressure to overcome friction, good judgment would probably advise the use of a 200 lb. pressure pipe for a nominal pressure of 150 lbs. It may be mentioned here that the increasing use of centrifugal pumps, whereby the heavy pulsation is eliminated and a constant pressure attained, creates an additional point in favor of the more general use of wood pipe. However, for dip places such as slopes or planes newly opened up and for local basins, it has proven to be the needed article and is fast coming into universal use for this purpose.

The Use of Stave Pipes.

For culm or ash flushing, a stave pipe of hard maple is coming into general use. The filling of old workings, where first mining has been completed is extensively carried on in the anthracite coalfields, for the gaining of the pillars, and large quantities of pipe are in use for conveying the water and material to these workings. The culm or ashes are in nearly all cases conveyed by troughs from the breaker or boiler house to a borehole and down the borehole to the inside, and from here through pipe lines to the chambers to be filled. It has been the practice for some time to use 6-inch cast-iron pipe to carry culm to different parts of a mine being filled in, but for some time past the culm from several anthracite washeries has been carried through wooden stave pipe built to stand a pressure of 160 lb. per sq. in. It is stated that in many instances this pipe has already outworn four steel pipes or two cast-iron ones, and is just as serviceable as when installed. In service the interior surface becomes polished and the culm runs better than at first. At the Bellevue mine of the Delaware, Lackawanna & Western Coal Company, 5500 ft. of this pipe is in use, and the original cost was 50 per cent. less than that of steel or cast-iron pipe. This wood pipe was manufactured by A. Wyckoff & Son Sompany, Elmira. N. Y.

Effect of Mineralized Water on Wood Pipe.

The effect of heavily mineralized water on iron pipe is readily realized and its rapid destruction is a matter of short time. The solid particles of culm, and the cinders of ash, rubbing against iron pipe are constantly exposing fresh surfaces which the acid in the water promptly attacks, and its ability to withstand destruction is thereby greatly diminished; whereas wood pipe has been found to become smooth after some little time, and retains that quality, for the reason that the acid does not affect it. Were it not for the fact that the acid affects the fresh surface of the iron pipe, it would probably retain the smooth character just as the wood pipe, besides its life would undoubtedly be longer. This flushing of mine workings requires many changes and extensions in the pipe line to reach the workings as the work progresses, and the advantage of wood pipe in ease of handling, is readily seen.

Carrying Hot Ashes.

At a colliery near Pittston, Penn., ashes were conveyed from the boiler plant through a concreted ditch to the top of a shaft, thence down a 6-in. cast-iron pipe in the shaft to the inside. Very frequently the ashes were hot when the water was put on, and the mixture traveling for some distance was in a heated condition. After five weeks of service the pipe in the shaft, (which was approximately 200 ft. deep) from the top to a point midway down was found to be so badly affected that it was removed, and 6-in. wood pipe substituted. The cause was due to the heating of the acids in putting water on the ashes while hot, and these acids were still heated on entering the pipe, cooling only after they had gone part way through the pipe. The acids being heated, their destroying power was stimulated and the destruction of the pipe hastened. The wood pipe has been in service for several months and shows not the slightest deterioration. My belief that wood pipe is not affected on the inside by mine water is strengthened by the hard and preserved condition of mine timber taken from a mine flooded for years. The hard-maple pipe for culm flushing differs from the pine water pipe in being of greater thickness to withstand the culm friction, but it is much lighter and handled with much more ease inside the mines than any other conveyance that could be used. It is a matter of fact that the hard-maple pipe now in use is the result of a suggestion made some years since by a prominent anthracite mining official. The pipe was manufactured at his suggestion and a trial made, and the company for whom it was first made is today using it in large quantities.

Wood Pipe for Carrying Fresh Water.

Little need be said about wood pipe for fresh-water supply. The quantity of water discharged through pipes depends on the head, the length of the pipe, upon the character of its interior surface as to smoothness, and upon the number and sharpness of the bends. The lasting qualities of wood have been demonstrated many times by the existence of reliable data showing instances where the pipe has been in service for many years without apparent diminution in service. The pipe probably has, however, one advantage for fresh water over its other uses, namely, the constant pressure throughout and the continued saturation of the wood at all times. Its advantage over iron pipe, besides those already mentioned, lies in the velocity and quantity of water delivered after being in use for some time. Iron pipes will attain in time a rough surface, reducing the velocity and quantity, whereas wood pipes, known to have been in service for years, on removal show a smooth internal surface and only a slight increase in internal diameter. The coefficient of roughness N, deduced by Kutter, for the flow of water is:

$N = 0.009$ for well-planed timber in perfect order and alinement;

0.010 for glazed, coated or enameled stoneware and iron pipes;

0.013 for cast-iron pipes to provide for future deterioration of surface.

Wood Pipe Can be Laid Rapidly.

Another feature of wood pipe lies in the fact that it can be laid rapidly in rough open country, and curves can be made by slightly springing the joints, special bends being therefore unnecessary. Near Greensburg, Penn., when destructive floods visited the Pittsburg districts during the early spring of the present year, two carloads of 10- and 12-in. wood pipe were delivered on the ground by the manufacturers four days after the receipt of a rush order from one of the coal companies in that region, and hurriedly laid, resulting in the prevention of the mine being flooded for an indefinite period and in a considerable financial loss being averted. In Wilmington, Del., in laying a 24-in. wood-pipe line, T. C. Hatton found it very convenient and expedient to commence at both ends of the line, joining at the meeting place two pipes having butt ends by means of an iron clamp. It may be noted here that the Butler Water Company, of Butler, Penn., and the E. I. Du Pont Powder Company, Wilmington, Del., have recently laid six- and five-mile fresh-water supply lines of 24-in. wood-stave pipe, respectively.

Wood Pipe as a Conveyer for Mine Water.

For conveying mine water for coal-washing purposes, wood pipe has no equal, its long and extensive use in the coalfields, together with the results obtained being sufficient proof. In the middle and southern anthracite coalfields, where the seams are pitching, much rock and slate is loaded with the coal, and the product that goes to the breaker for preparation is accompanied by much refuse and must invariably undergo a thorough washing and jigging, requiring daily a large supply of water, dependent entirely on the amaunt of refuse, the condition of the coal, and the daily output of the breaker. Frequently a supply of fresh water cannot be obtained or the cost where it is obtainable is too high to permit of its being used for washing purposes, and mine water, which is of necessity pumped out of the mine, is conveyed to the breaker for use in washing. Its action on the chute iron, screens, and jig parts is known and a like effect on the many pipes used should therefore be self-evident.

During a recent conversation with a former mine official, I asked his views as to the merits of wood pipe for breaker and washery purposes, and received this reply, "Used under proper conditions and in its right place, I would have no other. At the National washery at South Scranton we had a 6-in. wood pipe connected to a bronze elbow on the pump which lifted mine water to the top of the washery, where two 4-in. branches of wood pipe conveyed the water to boxes which in turn supplied iron pipes running to the jigs The rapid destruction of the iron pipes caused constant renewals, while the wood pipe was in good condition after four years of hard service, when the washery was abandoned."

The Philadelphia & Reading Coal and Iron Company at its new Pine Knot colliery, near Pottsville, Penn., containing the most modern equipment, put 3-, 4- and 6-in wood pipes in the breaker for supplying the shakers and jigs in April, 1906. The line has, however, only been in use for three months, and, has not yet been used for mine water for the reason that, so far, an abundant supply of fresh water has been available. In reply to the writer's inquiry concerning the pipe in question, the master carpenter of the company, under whose direction the work was done, says "it is most too soon to determine whether it will be a success or not. The only effect I can see that acid water would have, might be on the steel bands holding the pipe together. Of course these bands are supposed to be protected. I have always felt it worth while trying." The piping put in includes also a wood pipe and fittings for spraying the coal on the loading line, replacing the iron pipes, probably an entirely new feature.

Causes of Failure in Wood Pipes.

Finally, it must be admitted that there have been failures in wood stave pipe, but they have, in almost every case, upon investigation, been found to be due to improper use and conditions. Failures in cast-iron and steel pipes have been many times recorded where the same reason existed. Each kind of pipe has its proper place and must be selected only after the conditions which determine which is the most desirable, have been satisfactorily studied.

The life of the wood stave pipe evidently depends upon two things: First, the necessity of keeping the pipe under pressure, such as will thoroughly saturate the wood; secondly, the life of the band which binds and holds together the staves. As to the first, there need be no doubt, for besides the instances quoted, many other cases might be mentioned to prove that the wood when subjected to complete and constant saturation will last a long time. As to the second item, the asphaltum coating, if properly applied, leads us to believe that the bands under proper conditions will also show lasting quality.

As said before, probably nowhere does the use of wood pipe demand so much attenton as in the coalfields. Used in the proper place and under proper conditions its advantages over iron pipe in and about the mines are many, and nowhere is its advantage for quick and cheap transportation and laying excelled. At a colliery in Dunmore, Penn., a 6-in. wood-pipe emergency line was recently laid from the head of the shaft to a natural channel for conveying mine water for washery purposes. The work was all done through rough, open country of hilly nature. The cost per foot for handling and laying was a trifle less than three quarters of one cent. Many instances might be stated where wood pipe has been put in at a small cost, particularly inside the mine where the pipe must be re-handled several times, and where it frequently requires several men to handle one iron pipe, and very often block and tackle. The laying of pipe in a mine on a heavy pitching place is a slow piece of work, and the advantage of the lightness of wood pipe is readily evident.

Cost of Laying Wood Pipe.

Wood pipe, judging from the increasing use in the coal regions by large and small companies, has passed the experimental stage, and has evidently come to stay. The all important fact is that, while it is for general purposes equal or almost equal to cast iron, under proper conditions, in the mining field particularly, it has many times excelled the latter. The difference of cost per foot for furnishing and laying wood pipe and cast-iron pipe varies according to conditions and location, but favors the wood pipe. However, if we take the average difference and compute it at 6 per cent. compound interest, we will find that if wood pipe only lasted a certain time this computed figure would relay the pipe and still net a better investment than cast iron. For example, the approximate cost per foot for furnishing and laying a 12-in. wood pipe is $0.96 less than for cast iron. The interest on this difference at 6 per cent. compound interest will relay the wood pipe in twelve years and it would then be a better investment than cast iron.

Modern Methods of Washing Bituminous Coal

How Washing Has Made Possible the Mining of Coal Containing Impurities. Description of a Modern Washing Plant

BY FLOYD W. PARSONS

It has been but a few years since operating coal companies and prospective investors refused to consider the development of any coal territory where the coal seams were known to contain a considerable quantity of impurities. The rapid advance in consumption and the decrease in the available areas containing clean coal beds, combined with the more modern methods of discarding impurities in coal, have caused a change in conditions until at the present time many seams are being profitably worked that were not considered commercially valuable a decade ago.

MIDLAND MINE, PHILIPPI, WEST VIRGINIA

It is a mistake to consider that any style of jig will successfully treat all coals; on the other hand, it is most essential to carry on preliminary experiments so as to secure a machine with a correct principle and a wide range of adjustment. Coal washing is entirely dependent upon the specific gravity of the various ingredients contained in the product and for this reason, if perfect separation is desired, it is necessary to use a solution with a specific gravity high enough to float the coal and low enough to allow the impurities to sink. Since modern practice and the requirements of economy have so far found the use of a chemical solution impracticable, the general scheme is to use water; at the same time having a mechanical agitator to stir the mass of coal and impurities in such a manner as to allow the coal to be worked upwards so that the impurities will sink below. The efficiency of a jig may properly be measured by its ability to make each particle arrive at its proper level, so that it can be removed mechanically.

Preliminary Considerations

Before deciding upon any special system of washing, or style of jig, it is advisable to consider carefully the various local conditions and the character of the product to be treated. It is most important to know whether the washed coal is to be used in the manufacture of coke or shipped for fuel purposes. It is also essential to consider the availability of a proper water supply and the character of the ground available for the location of the washery. In this connection also it is well to consider the cost of material, operation and repairs. Better results will also be obtained if careful laboratory tests are made. To do this, it is necessary to secure an average sample of the coal as it comes from the mine or a particular screen; this coal in its natural state is put through a 1.45 sp.gr. solution to cause a separation of the various ingredients. Similar samples of the coal are put through solutions having a specific gravity of 1.35 and less. Other experiments are made with crushed portions of the original sample by putting each size through the same specific gravity solution. Each sample is carefully analyzed for sulphur and ash before it is put into the solution; it is also important to analyze the sink and float of each sample after the solution process. If it is the operator's intention to use the coal for coking purposes, several carload lots should be accompanied to a washery where separate tests are made; the washed product is then re-shipped to the coke ovens and coking tests carefully undertaken.

The Midland Mine in West Virginia

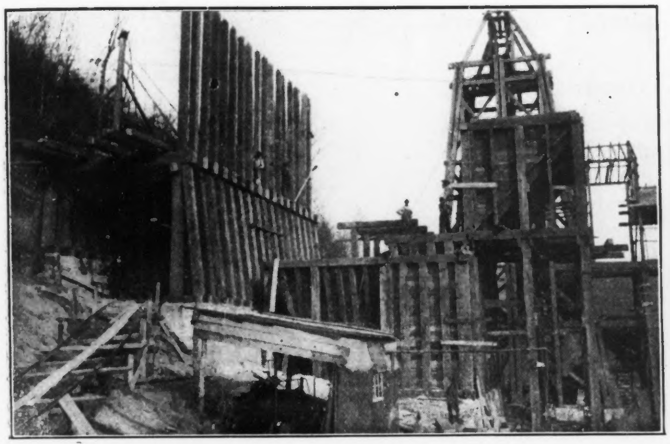
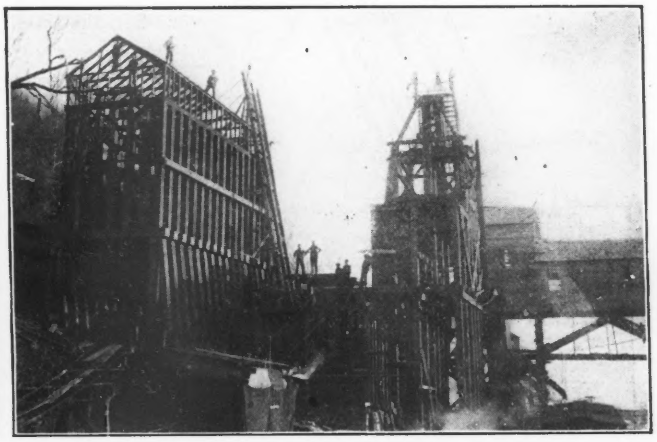
The new washery recently erected at the Midland mine, near Philippi, West Virginia, is a pioneer in that region. The coal seam worked at the Midland mine is known as the Upper Freeport and is reached by a 95-ft. shaft. The coal-bed in this locality is about 62 in. thick and contains one 7-in. parting of bone. The mine is yet in its preliminary stages of development; it is expected to use electric haulage and to mine coal with Sullivan electric machines. An extensive plant of beehive ovens is being completed, so that the larger part of the output will be used in the manufacture of coke. The coal in this vicinity runs high in sulphur and contains some phosphorus; an average analysis is as follows:

Moisture	0.63
Volatile Matter	29.90
Fixed Carbon	62.46
Ash	7.04
Total	100.00
Sulphur	2.60
Phosphorus	0.02
B.t.u.	13,900.00

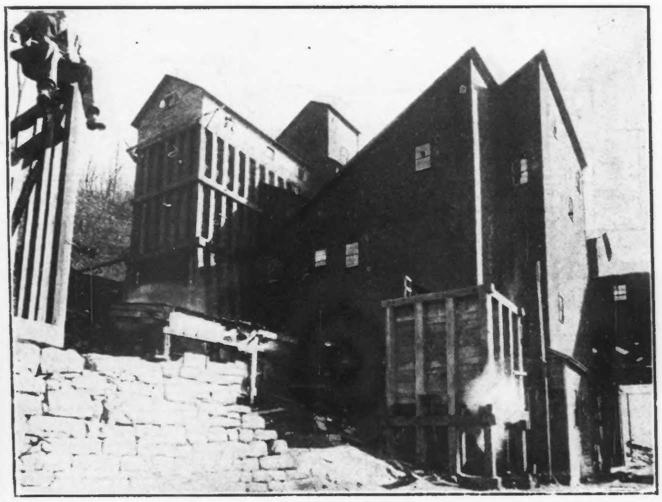
The Washing Plant

After the coal is hoisted and dumped by the self-dumping cages, the product is delivered from the tipple to a reciprocating feeder, which deposits it in the hopper of a crusher of the Pennsylvania type; here the coal is crushed below ½ in., and is conveyed by an elevator to the jig bin from which point it goes over the jig and is delivered as washed product to the washed coal elevator; the refuse from the primary jigs and the screenings from the washed coal being conveyed by the sludge elevator to a re-washing jig. The product from this last jig eventually reaches the washed coal elevator and is conveyed to the storage bin.

The crusher is of the hammer type and is fitted with eight rows of hammers. When the crusher comes to speed, these hammers assume a radial position with respect to the shaft, owing to centrifugal force, and in this position they swing above a curved screen. The coal is let in at the rear of this rotating drum and is beaten down against the screen until reduced sufficiently to pass the mesh. The capacity of this crusher is about 100 tons per hour at 675 r.p.m. The coal is sent to the crusher by means of a reciprocating feeder driven from the same engine. The crusher and feeder are located directly under the tipple and are not housed. The space occupied by them is about 7 ft. wide by 16 ft. long.

VIEWS OF WASHER PLANT UNDER ERECTION

VIEWS OF WASHER PLANT NEARING COMPLETION

The crusher exhausts its first product into a concrete pit, out of which rises an elevator which conveys the coal to the jig bins. This elevator is driven from the same engine as are the crusher and feeder. The engine used is an Atlas twin coupled, the cylinders being 11x16 in. and the speed 150 r.p.m.; the drives are through cotton belting to crusher and feeder, and cotton belting and roller chains to the elevator. The elevator is completely boxed in, while the engine is inclosed in a projection of this main washer building, the engine-room being easily accessible from the jig-room. The elevator above mentioned is about 60 ft. center to center and is of the "strap link" type, the chain being 16-in. pitch and working over square sprockets, two at the head and two at the foot of the elevator. Between the two strands of chain and attached to rods which extend through the chains on either side, are the buckets which are triangular in section, being 34 in. long by 10 in. projection by 16 in. deep. These buckets are attached to alternate links of the chain; the travel of this elevator at normal speed is 101 ft. per minute.

The Washery Building

This building has a ground space of 50 by 46 ft. including both engine rooms, and a maximum hight of about 50 ft. above main washer foundation. Under this roof are included the crushed coal bin, sludge bin, three jig tanks, sludge tank, slate tank, overflow tank, settling tank and all elevators and machinery excepting the distributing conveyor on larry bin. The width of the washer is made up of the two primary jigs, sludge tank, re-washed jig and slate tank, across the top of which extends the line shaft, which is driven at one end through belt connection to another pair of 11x16-in. engines.

The crushed coal bin is directly back of the primary jig and is so arranged that the coal feeds into the jig by gravity. Back of the re-washing jig corresponding to the crushed coal bin is the sludge bin which serves as a receptacle for the refuse and screenings from the first wash. The jig tanks are 5 ft. 4 in. by 8 ft. 4 in. by 15 ft. deep and in them are suspended the jigs. These latter consist of heavy wooden boxes 4 ft. wide by 7 ft. long and 4 ft. deep in the clear, and fitted on the outside with friction plates having contact with similar plates on the tank sides, thus assuring a practically water tight joint.

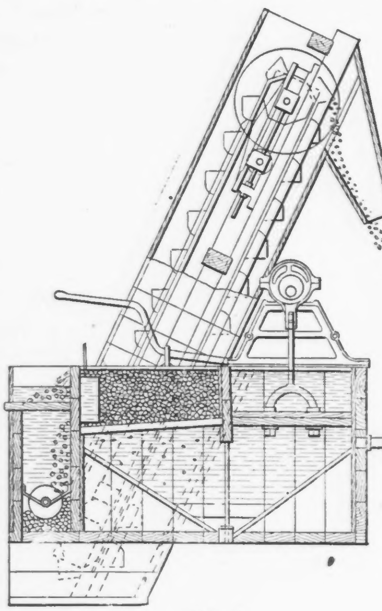


FIG. 1

In the bottom of each jig are 12 upwardly opening hinged valves, and 16 in. above this wooden bottom is secured a metallic screen of fine perforations which serves as a support for the material which is being washed. This screen pitches slightly toward the front of the jig where a portion of the box is cut away to permit passage of refuse to the tank below. The jig is cut down 3 in. for the full width in front to provide an overflow. By means of a train of steel gears driven from the line shaft and through a system of cranks and levers from which the jig is suspended, there is imparted to the jig a reciprocating vertical motion the stroke being adjustable from 2 to 6 in. and the downward stroke being accomplished in one-half the time required for the upward stroke.

Method of Operation

The coal to be washed is fed on the rear of the jig and gradually worked forward, filling the space above the screen. As the jig moves down, the valve above mentioned opens, an amount of water proportional to the stroke is forced up from the tank below, and continues upward, thoroughly agitating the mass of material. As the jig moves up, the valves close and the water is held in a quiescent state, while the material suspended in the jig settles in relation to its specific gravities. The coal, being lighter than the impurities, is left near the surface, and when the front of the jig reaches the level of the overflow sill, it passes out with the excess of water. Immediately in front of the jig is a slow-moving scraper-conveyor, the blades of which scrape over an inclined screen, below which is a chute for conducting the water and screenings back to the overflow tank, which is directly in front of the jig tanks and connected with them through inwardly opening hinge-valves. These scraper conveyors conduct the washed coal to the boot of the washed coal elevator, from which point it is conducted to the larry bin. The material which finds the level of the screen bottom of the jig is permitted to pass out through the slate gate and falls to the bottom of the tank, where it is picked up by spiral conveyors and conducted to the sludge elevator which rises out of a narrow tank at the side of the jig.

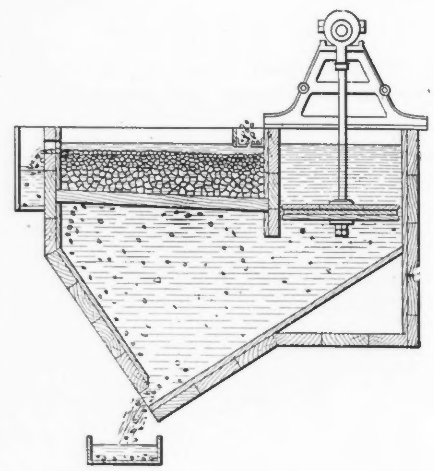


FIG. 2

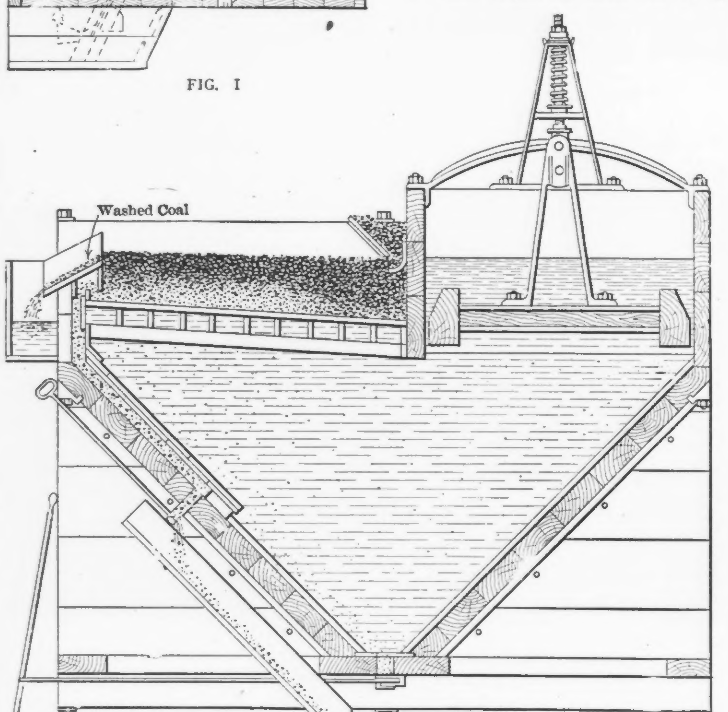


FIG. 3

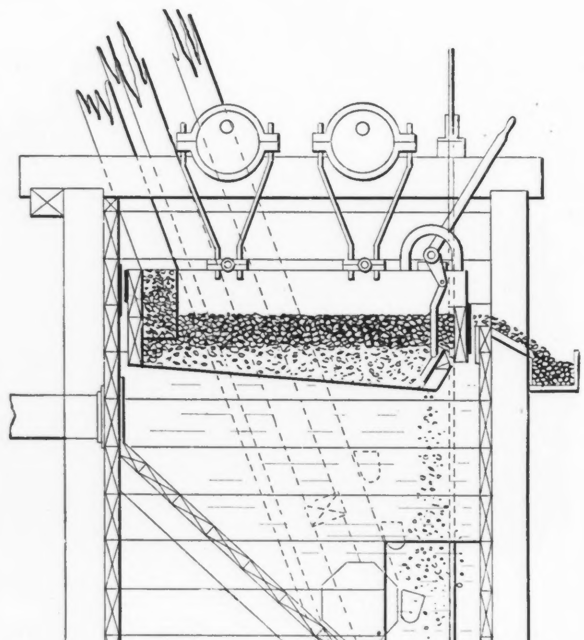


FIG. 4

The screenings from the scraper conveyors settle to the bottom of the over-

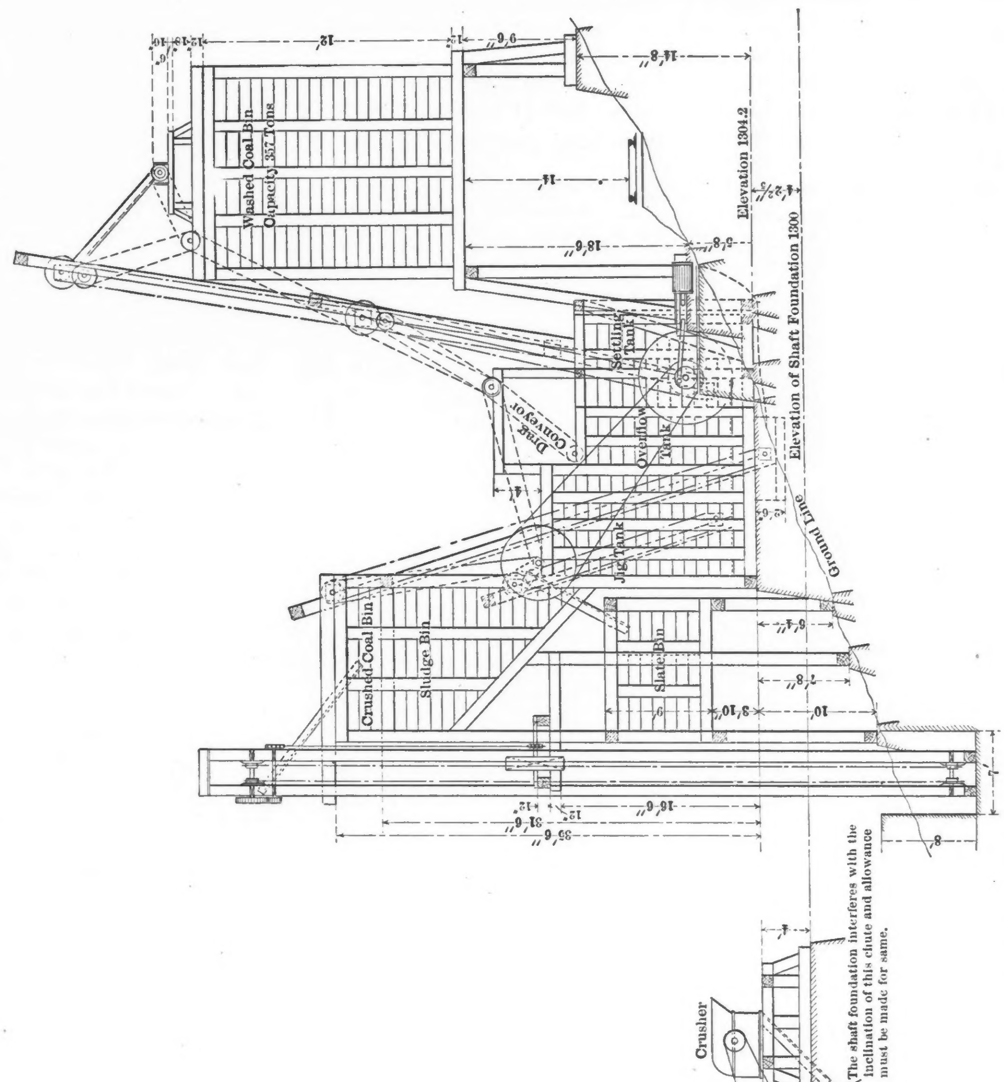
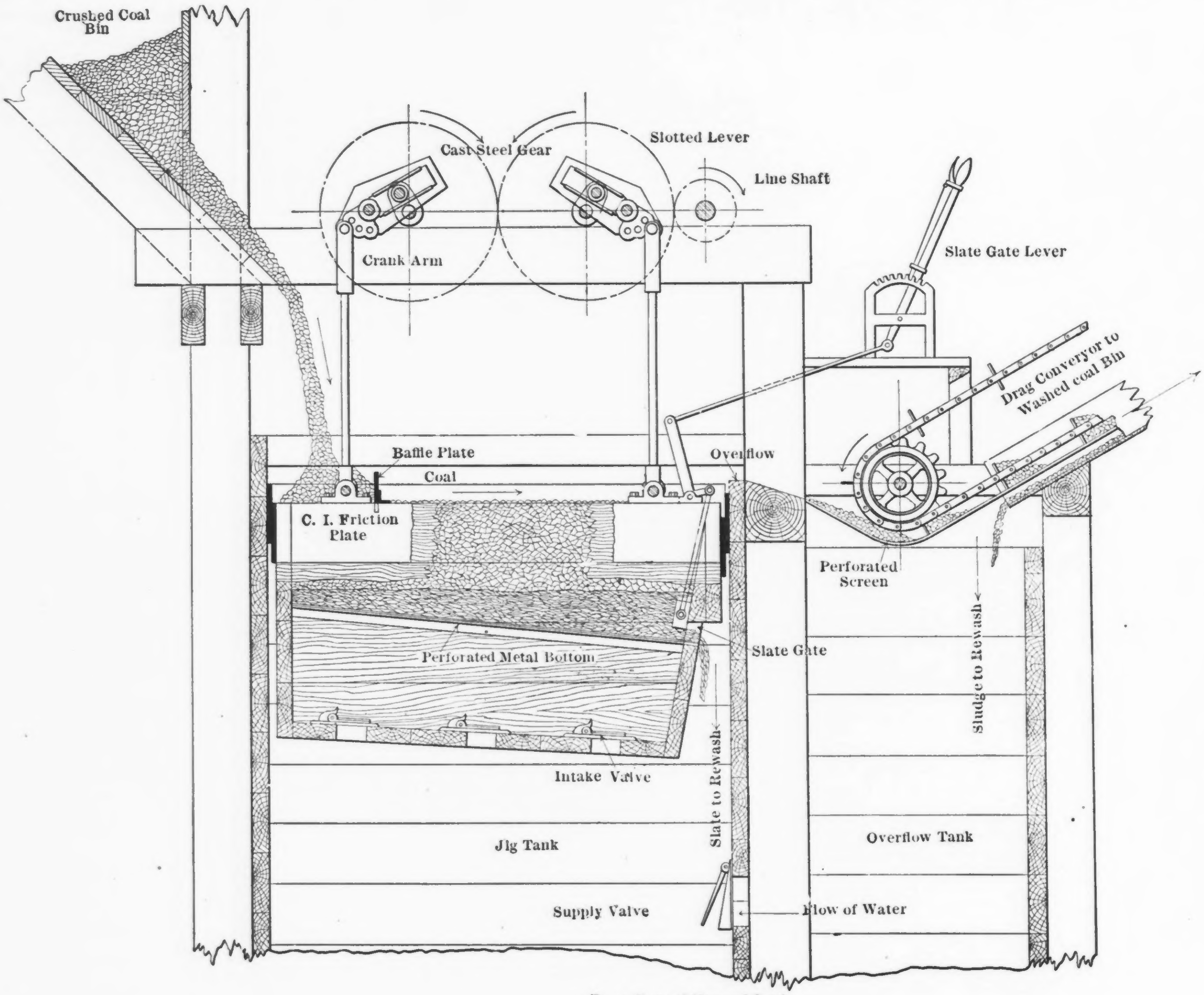


FIG. 5. ELEVATION OF WASHER PLANT

flow tank and are conducted by a second conveyor to the sludge elevator. This latter elevator deposits its load in the bin back of the re-washed jig, after which this product is again re-washed and any coal which it contains recovered. This jig exhausts its coal into a large settling tank, from which it is collected by a slow-feed elevator and deposited along with the primary wash in the washed coal elevator. The refuse from this jig sinks to the bottom of the tank, and is conveyed by gravity to the slate or refuse elevator and discarded. The water from the primary overflow is re-admitted to the jig tank on the upward stroke of the jig, and the



Jig at Start of Upward Stroke

FIG. 6

cycle thus completed; in other words the jig is made to pump its own water. The re-washing jig recovers its water from the settling tank in a similar manner.

The sludge, slate and washed coal elevators are similar to the dry coal elevator previously described, but the buckets are perforated. On top of the larry bin is a conveyor for distributing coal. All elevators and conveyors are driven from the line shaft through chain drives. The capacity of the washeries as above described is 700 tons daily.

Cost of Operation

As to the cost of operation, the actual figures collected from practice show the following:

THREE-JIG MACHINE WASHING 700 TONS PER DAY.

One fireman (night) per day........	$2.00
One fireman (day) per day.........	2.25
One foreman per day..............	3.00
One jig man.....................	2.25
One engineer (Attends crusher).....	2.50
Four gallons of oil at 50c..........	2.00
Six tons coal for boiler at $1.00.....	6.00
Pumping water (charged part to washer)	1.50
3½ per cent. refuse-24 tons at $1.00	24.00
Total	$45.50
Per ton of final product........	6.5c.

To this should be added 0.5c. per ton for depreciation. Quantity of refuse is not usually figured in; in this case if refuse is not figured the cost per ton of washed coal will be 3½c. For much of the information contained above, and the plans of the Midland Washery, I am indebted to Harvey Cory, general manager of the Pittsburg Coal Washer Company, through whose courtesy my visit to the mine was made possible.

Coal-mining Rights in Canada

The Canadian government has caused to be published in the *Canada Gazette* the new regulations for the disposal of coal-mining rights in the provinces of Manitoba, Saskatchewan, and Alberta, and in Yukon territory, Northwest territories, the railway belt in British Columbia, and within that tract in the Peace River district containing 3,500,000 acres acquired by the Dominion from British Columbia. Such rights will no longer be sold, but may be leased for a term of 21 years at an annual rental of $1 per acre payable in advance. Not more than 2560 acres will be leased to any one applicant. In addition to the rent, a royalty at the rate of 5c. per ton of 2000 lb. will be levied and collected on the merchantable output of the mine.

The Scottish coal miners have renewed their demand to the Conciliation Board for a 12½ per cent. advance in wages.

How May Quality of Steel Rails Be Improved?

The Frequent Breakages of Bessemer Steel Rails. Suggested Improvements in Process of Manufacture to Prevent Failures

BY HENRY M. HOWE*

After making all reasonable allowances for newspaper exaggeration, the great number of breakages of steel rails is so serious a thing that we may well consider what steps can be taken to improve the quality of rail steel, with a view to fitting it better to endure the very trying conditions to which it is exposed.

It is not a sufficient answer to point to the small number of deaths caused by rail breakages. That the number of deaths is so small is a matter of sincere congratulation, but it is none the less a matter of good fortune, pure and simple. It can hardly be questioned that breaking rails do threaten to derail trains, not every time, not one in ten, if indeed one time in a hundred. But the threat is there, and if rail breakages should continue as frequent in the future as in the past, it is extremely probable that some one or more of them will cause great loss of life. That only one in a thousand of those who drink Croton or Schuylkill water is actually stricken with typhoid fever is neither proof that the water is safe to drink, nor justification for neglect to take every practicable precaution to better it.

Impatient with bessemer rails as they are now made, it is easy to brush the bessemer process aside on paper, and say, "Away with it, come let us have a better." We may have to do this, to replace the bessemer process with the basic open-hearth, if not soon, perhaps in the not very distant future. I refer of course to the use of the bessemer process for rail making, because for making tubes, small castings, and certain other products, it has a decided advantage over the open-hearth process. But it is not to be supposed that the owners of our costly bessemer plants will sacrifice them in a lump without considering carefully whether their processes cannot be so improved that bessemer steel rails can endure safely what is now required of them.

In the present paper I will first point out how it is that the open-hearth process offers to solve the rail problem, and I will then propose two means of improving the quality of bessemer rail steel. The first of these is lessening segregation by (1) liberal use of aluminum or its equivalent; (2) by extremely slow casting; and (3) by increasing the discard. The second is lowering the finishing temperature, possibly by some modification of the procedure in rolling, but more probably by a considerable change in the section of the rail. I finally consider the use of dry blast, but see little reason to expect benefit from it.

Though material benefit is to be expected from free dosing with aluminum and slow pouring, both relatively cheap steps, yet it is unlikely that they alone will suffice, and some one or more of the other and far more costly means probably should be used.

The Basic Open-hearth Process

With the old relatively light wheel loads and the old conditions of manufacture so favorable to good quality, a 70-lb. rail with 0.10 per cent. of phosphorus and 0.35 per cent. of carbon did well enough. But two important changes in conditions, acting cumulatively, have made that composition unsafe. Either of these changes alone might have sufficed to do this; together their effect is extremely grave. The first of these is the great increase in wheel loads, to resist the abrasion from which a harder rail, and therefore one richer in carbon, is needed. But this higher carbon content, in and by itself, increases greatly the harm which phosphorus, the great embrittling enemy of the steel maker, causes, as has long been known and abundantly proved. The second of these changes is the higher temperature at which the present operation of rolling rails ends, or the "finishing temperature;" and it has long been known that the higher the finishing temperature, within certain limits, the more brittle the steel is.

To make a rail which shall be safe under the traffic of today, we must lessen this brittleness, either by lessening the phosphorus content greatly, or by lessening the embrittling effect of that phosphorus, or by both means jointly.

If the embrittling conditions of manufacture remain as serious as they now are, it seems to me extremely improbable that the phosphorus content can be so far reduced by the use of low-phosphorus ores as to yield a safe rail, because there is no sufficient supply of ore free enough from phosphorus to yield the enormous quantity of rail steel needed. But it would be possible to effect this reduction by the use of a dephosphorizing process. The bessemer process leaves in the steel practically the whole of the phosphorus which the ore contains, and it cannot be so altered, under American conditions, as to remove phosphorus. But the basic open-hearth process can readily remove the phosphorus so fully that its embrittling effect would no longer be important.

It would be years before the open-hearth furnaces needed to replace the present bessemer work could be built and put into commission; what are we to do meanwhile? We must reduce to a minimum the bad effects of phosphorus. Indeed, this reducing the harm done by phosphorus is one of the chief merits of the steps which I now go on to consider, the steps of restraining segregation and of lowering the finishing temperature. Let us hope that by such means as these we may improve the quality of bessemer rail steel so greatly that for a long time to come it may do what is demanded of it, even though we must expect that the inevitable continuous increase in wheel loads and in speed will eventually call for a still higher quality than can be given by the bessemer process, even as thus bettered. Progress should not and will not stop. Wheel loads will ever be heavier and trains will ever be swifter.

Lessening Segregation

Segregation, like the poor, will always be with us, and we must fight it as we do poverty. Steel which contains as a whole 0.07 per cent. of phosphorus may contain in its segregate 0.30 phosphorus; and, though this segregate lies near the neutral axis of the rail, yet even there it is a source of danger.

In order to lessen the degree of what we may call residual segregation, the segregation which remains in the finished rail, I advise three steps; first, free use of aluminum; second, extremely slow pouring, and third, greater discard from the top of the ingot.

The use of aluminum will lessen segregation materially, but it will lengthen the pipe; or, where no pipe exists it will increase the tendency to piping. This tendency in turn will have to be met by cropping off and discarding a larger part of the top of the ingot.

Extremely slow pouring should both shorten the pipe and raise the segregate toward the top of the ingot, in both respects lessening the proportion of discard needed in order to get trustworthy steel. In that it thus shortens the pipe it counteracts the pipe-lengthening effect of aluminum, which accompanies the beneficial effect of that metal in lessening the degree of segregation. That slow pouring should have this effect of shortening the pipe and raising the segregate, ought to be evident on reflection; and Professor Stoughton and I have proved that it does

*Professor of Metallurgy, Columbia University, New York.

have this effect by our experiments with wax ingots.[1]

The pouring should be as slow as is compatible with having the last of the ladleful of steel still remain hot enough to flow freely out of the ladle into the molds, so that no serious skull of frozen steel shall remain in the bottom of the ladle. In order to increase the practicable slowness of pouring, or in other words, in order to prolong the time occupied by the filling of each individual ingot taken by itself, without prolonging the pouring of the whole heat so greatly as to cause a large ladle skull, our proper course is to cast two or more ingots simultaneously, either through two or more nozzles from a single ladle, or by means of a distributing funnel, or by artificially keeping the steel hot in the ladle by burning gas or oil on top of it. Any one of these things will cost care and money; but the result should justify the expense.

Increasing the Discard

The richest of the segregate lies near the top of the ingot, usually in the upper 20 per cent., often in the upper 10 per cent. of its length. There is good reason to hope that, by means of slow pouring, it can always be kept in the upper 10 per cent., even if aluminum is used freely. To increase the discard of course is to increase the cost of a ton of finished rails, and to lessen the output of finished rails. However much this may be regretted, it may prove to be a necessity. It is idle to crop off only the mechanically unsound top part of the ingot, and leave just below the most dangerous, because the most segregated part, the part in which the phosphorus from the whole ingot is concentrated. Here we have to face the music.

The degree to which the cost would be increased and the output would be lessened by increasing the discard, has been overestimated by many hasty writers. They have assumed that a discard of say 20 per cent. would decrease the output by 20 per cent., forgetting that there is already a very considerable discard, and that it would be only the excess of the proposed discard over the present that would decrease the output. For instance, if the initial discard at a given mill were 10 per cent., and this should be raised to 20 per cent., this step would decrease the output not by 20 per cent., but by less than 9 per cent.

Lowering the Finishing Temperature

It is well known that within certain limits the higher the temperature at which the rolling of the rail ends, the more brittle will the rail be; and that the power of the rail to endure shock is increased by continuing the rolling process until the temperature has sunk to a point at which the metal itself has become so hard that further reduction by rolling becomes extremely difficult. The trouble in applying this principle has been that, while it is easy enough to arrange matters so that the rolling of the thin web and flange of the rail shall continue till these parts are properly cool, yet, because the head of the rail is so much thicker than the web and the flange, and because it therefore cools so much more slowly than they, it still remains very hot at a time when they have already grown so cool and hard that it is not practicable to reduce them farther by rolling. On this account the rolling ceases while the head is still far too hot, and through this the metal in the head is seriously injured.

But this condition of things, though convenient enough as far as the mere administrative work of rail making is concerned, is not necessary, if indeed it is intelligent. Today we may question whether it is tolerable. If, as I understand, it is to the interest of the railroads that their rails shall have the greatest attainable power of resisting shock, some method of lowering the finishing temperature of the rail head should be sought. What that method shall be it is for rail-making experts to decide. That some practicable method can be found we can hardly doubt.

To bring this about by some change in the procedure in rolling may be possible, but the difficulties are certainly very great. The usefulness of the Kennedy-Morrison process of setting the rail aside to cool for a short time just before the last pass, has been challenged on the ground that the reduction which the final pass gives is too slight to improve the condition of the rail-head materially. This in turn probably rests on the further fact that, when the rail has grown as cool and rigid as it is at this last pass, it is not practicable to reduce one part, say the head, materially more than any other part, say the flange; because if we did, the greater reduction of the cross-section of the head would elongate the head in the direction of rolling, or parallel with the length of the rail, so much more than the flange, as to camber the rail very seriously. Such unequal reduction by means of what is called an "unbalanced pass" can be resorted to earlier in the rolling operation, when the metal is so soft that the camber thus caused is immediately effaced by the collars of the rolls, or by suitable pieces attached for that purpose; but at the end of the rolling, when the metal has grown rigid, this effacing of a serious camber is impracticable. Hence, after the rail has been set aside for cooling in the Kennedy-Morrison process, all the reduction that can then be given to the head is the slight one which can simultaneously be put upon the rigid web and flange, a reduction so slight that it does not remove the injury caused to the head by its exposure to the high temperature.

Like considerations stand in the way of another plan which naturally suggests itself. That plan is to adjust the passes in such a way that the flange and web shall reach their final size, or come very near to it, at a time when the head is still much larger than its final size; and then in the subsequent passes give only very slight reduction to the relatively rigid web and flange, but heavy reduction to the head, which would thus meanwhile be cooling continuously.

But here, as before, the difficulty arises, that reducing the head materially more than the flange in these proposed last passes, would cause a camber so strong that to remove it would be difficult if not impossible.

Changing the Rail Section

Another and an expensive way would be to change the section of the rail in the direction of making the web and flange much more nearly of the same thickness as the head. The present design is based on civil engineering rather than on metallurgical considerations. The web, because it is so near the neutral axis, does not, from a purely civil-engineering standpoint, need to be very thick. The flange, made very broad so as to prevent the rail from being overturned by side pressure, and also so as to prevent its cutting into the tie, does not need great thickness from a purely civil-engineering standpoint. But the head has to be made thick, in order to endure the concentrated wheel load applied to its upper surface. Manifestly, the head cannot be wide and thin like the flange; it must be thick and relatively narrow.

Let us look back at these conditions. The thinness of the flange and web compel us to stop the rolling at a time when the thickness of the head keeps it still too hot for its rolling to end. Well, now, this thinness of the web and flange are only permissive; they are not obligatory. There is no reason beyond that of expense why the web and flange should not be heavier; indeed why they should not be approximately as thick as the head. If they were, then the cooling of the web and flange would not thus outrun that of the head, and the rolling of the whole could continue until not only the web and flange, but also the head, had cooled off to a proper finishing temperature.

As men of sense we would not of course carry this idea to its logical conclusions by really making the thickness of web and flange fully equal to that of the head; but we may consider carefully whether it would not be wise to go a considerable distance in this direction, by lessening the difference in thickness between the different parts of the rail: or in other words by making the web and flange

[1] "The Influence of the Conditions of Casting on Piping and Segregation, as Shown by Means of Wax Ingots." *Transactions* American Institute of Mining Engineers, April, 1907.

materially thicker than they now are. The additional metal thus placed there would be useful in permitting the rolling of the head to be prolonged till this part had cooled to a safer temperature; and even from a purely civil-engineering standpoint it would not be wholly wasted, because it would certainly add materially to the strength and stiffness of the rail.

Dry Blast.

It is possible that drying the blast may improve the product of the bessemer process materially. Variations in the atmospheric moisture lead to corresponding variations in the temperature of the operation or "blow" itself, and an excessive temperature is distinctly injurious to the steel. Thus it may happen that the operator or "blower," having his conditions adjusted to give the right temperature when the weather is moist, should fail to take note of a sudden change to fair dry weather, and that he should thereby let his temperature rise too high, and thus harm his steel.

But little weight should be attached to this consideration, in my opinion. Variation in the moisture of the atmosphere is only one source of variation in the temperature of the blast, and by no means the most serious. Variations in the proportion of silicon in the pig iron treated, in the sensible heat of that iron, in the initial temperature of the converter, and in the rapidity with which the blast is blown through, all affect the temperature of the operation, and they may act cumulatively. The rapidity of blowing varies, not so much with variations in the apparent pressure of blast in the blast main, as with variations in the length of the tuyeres, and often in the number of tuyeres, through the blanking or intentional stopping up of some short tuyere. Moreover, these latter sources of variation in the blast temperature come upon the blower suddenly and without warning, much more suddenly than any variation in the moisture of the atmosphere possibly can; and coming suddenly and unforeseen are the harder to combat.

Finally, so long as these other causes of variation in the temperature of the operation continue, it seems idle to remove any one single cause like that of variation in atmospheric moisture, as is seen on reflection. A given balance will detect underweight coins just as accurately when there are two or more sources of underweight, as when there is only a single source; just as accurately if, for instance, the coins are liable to be underweight both because of clipping and because of false compositon and low density, as when they are all of true density and fall short in weight only, because of clipping. In the same way the eye of the blower can hit the desired temperature just as accurately when there are three or more causes tending to disturb the temperature, as when there is only one cause, of the same degree of power as each of the others; so that the removal of one cause of irregularity does not increase the accuracy of the blower's control as long as other causes of like power remain.

It is indeed asserted that more second-quality rails are made in summer, when the air is moist, than in winter when it is dry; which means that there is less defective or bad steel in summer than in winter. This may indeed mean that the moisture in the blast injures the steel directly in some obscure way, as for instance by impregnating it with hydrogen, besides its indirect effect of injuring it by leading to occasional excessive temperature when the weather changes from wet to dry. This, indeed, is possible, and it would be interesting to watch the results of direct experiments with dry blast to test this point.

Personally I am not inclined to give much weight to this fact. If the atmospheric moisture had a direct harmful effect, then taking the summer months by themselves, there should be fewer second-quality rails in dry cool days than on warm moist days; so, too, in winter; and it is notorious that the warm winter days are the moist days, and the cold ones the dry days. But no such relation has been established, so far as I know, even by the most careful tests.

It seems, therefore, more probable that the better quality in winter than in summer is due to some other cause, such as the fact that the men, and especially the blower, are physically in better condition in the bracing weather of winter than when they are beset with the heat of summer in the superheated converting mill; or the fact that the light is better in winter, when the paler sun does not light the converting mill so brilliantly, and leaves the blower's eyes more fully under the influence of the bessemer flame, by the color and brilliancy of which he chiefly judges how to conduct the process.

Electric Processes

There remain the electric purifying processes, by which the phosphorus may be removed. But, according to the data available, these would be so expensive in the present stage of their development as hardly to be worth considering.

The sectional area of the main return airways should always be larger than the main intake. As the return air during the greater portion of the year has a higher temperature than the intake air, the rise in temperature of the air increases the volume of the return current. This increased volume is also augmented by gas generated in the mine, which is considerable in some of the gassy mines. On account of the mine resistance the intake air is under a greater pressure than the return air, and for this reason the volume of the return air is still further increased.

A Memorial at the Sault Ste. Marie

The *Marine Review*, of Cleveland, says that the semi-centennial commission appointed two years ago to celebrate the opening of the first canal at Sault Ste. Marie to commerce will, some time during the present summer, erect at the Sault an obelisk in commemoration of the event. The obelisk has been completed at one of the quarries at Branford, Conn. The shaft is of hammered Stony Creek red granite, is 45 ft. long, 5 ft. 5 in. square at the foot, tapering to a dimension of 1 ft. square and then finished to a point. It weighs about 60 tons. Its shipment has brought about a transportation problem that several railroad traffic men are figuring out. The only solution seems to be the use of a Pennsylvania Railroad car which is used to transport heavy ordnance. The monument is boxed and ready for shipment, and the foundations are now being prepared at the Sault. The obelisk was designed by Charles I. McKim, of the architectural firm of McKim, Mead & White. The contractors are Norcross Brothers, of Worcester, Mass., and Cleveland, O. The cost of the monument is $19,000, which sum was contributed by the general government, the State of Michigan, and the transportation and mining interests of the lakes. It will be erected at Locks Park, close to the great locks of the Sault canal.

Mining in Formosa

An article in *Zeit. f. angew. Chem.* (May 17, 1907) gives some information as to the condition of the mining industry in Formosa. In 1905 the output from the island amounted to 47,341 oz. of gold from quartz mines in addition to 3050 oz. obtained from placer workings; 94,216 metric tons of coal, and 1121 metric tons of sulphur. These minerals are obtained from the mountainous regions of the north and northeastern parts of the island. The sulphur district lies north of Taihoku and the gold region is southeast from Kilong, the coal region being between these two.

The gold production from quartz has doubled since 1902, and placer workings are increasing rapidly. The gold-mining concessions are owned by three Japanese companies and the usual mode of recovery is to cyanide and amalgamate after crushing in Blake breakers and Huntington mills. The ore is silicious and carries small amounts of antimony. The Formosan coal is better in quality than that of Japan but the seams are thin and much contorted. Operations on a large scale have scarcely been made to pay and the tendency now is to revert to a smaller scale and more primitive methods.

Working Flat and Pitching Anthracite Seams

Methods Employed When One Seam Overlies Another; and the Use of Manways and Chutes in Pitching Seams

BY M. S. HACHITA*

Methods of opening and developing anthracite coal measures depend on the geological structure of the underlying rocks. If the coal crops out within the limits of the property and if the measure is flat, the method usually employed is a water-level drift, but if the measure is inclined, a slope is sunk directly in the vein or a tunnel driven across the intervening rocks; or a shaft sunk in the basin.

Developing a Flat Seam

In the anthracite coalfield where the vein lies comparatively flat, shafts and water level drifts are both commonly used. Those veins found below water level are usually opened up by shafts, while those above water level by drifts. The latter method is almost extinct, as the surface measures are nearly worked out, and there is no other way to reach the deep veins except through the shafts.

When a vein is to be opened by a shaft, the prevailing practice in the anthracite field is to locate the main opening directly over the basin found on the tract. In order to get this result, it is absolutely necessary to have all the geological information obtainable represented on an accurate map with sections to show the character of the geological formations, so that the depth and the location of the basin may be readily determined. The proper location of a shaft has been recognized as a problem of vital importance for the most economical extraction of the coal.

Shafts

Shafts in the anthracite field are always rectangular or square, and the second opening is generally used as an upcast. Before reaching the bed rock, earth, clay, sand, gravel, and hard pan are usually met; the thickness of the wash depending on local conditions. In the Wyoming valley of Pennsylvania, it varies from a few feet to 150 ft. When the wash is not more than 50 ft. an ordinary cribbing of heavy timber (usually 12x12 in.) or masonry cribbing is used, and for much deeper wash, the use of a double cribbing has met with success. The main shaft is at once divided into the required compartments with heavy buntons, alternating or "skin to skin," so as to brace the cribbing against the lateral pressure exerted by the wash.

*District engineer, Lehigh Valley Coal Company, Wilkes-Barre, Pennsylvania

The width of a shaft depends on the length of the mine cars, which varies from 8 to 11 ft. so that the width adopted for a shaft is usually from 9 to 12 ft., while the required length is determined by the area of the air-way needed, and the number of compartments for hoisting. The compartments are made from 6 to 8 ft. wide, or on an average about 6½ ft. between the guides. For a shaft with two compartments the length varies from 16 to 20 ft.; 22 to 26 ft. for three compartments; 30 to 38 ft. for four compartments and 44 to 52 ft. for six compartments. When six compartments are provided, two are usually used as up-cast, two are used for hoisting, while the remaining two are held in reserve for future requirements. Such is the case at the Exeter Colliery of the Lehigh Valley Coal Company.

Size and Cost of Anthracite Shafts

Some of the shafts in the anthracite coalfield are of extraordinary sizes; the Woodward shaft of the Delaware, Lackawanna & Western Company is 10x53 ft. This shaft was originally started 12x60 ft., but trouble from decomposed rock made it necessary to decrease its size. The shaft at the Dorrance Colliery of the Lehigh Valley Coal Company is 13x52 ft. The average progress made in sinking shafts, including the time required for timbering and all stoppages, is from 250 to 400 ft. per year. In comparatively hard rock, the average cost of sinking shafts for an average sectional area is from $5.50 to $9 per cu.yd., solid, for shafts from 400 to 800 ft. deep. In general the cost per cubic yard increases with the depth.

At the foot of a shaft in the coal measures the usual practice is to leave a substantial pillar to protect the shaft, known as a "shaft pillar," the size of which depends on the character and the depth of the overlying strata and the thickness of the vein. Fig. 2 shows the size of such pillar for a shaft 300 to 400 ft. deep, together with the general track arrangements, necessary grades for loaded and empty cars, dump and pump room at the foot of the shaft.

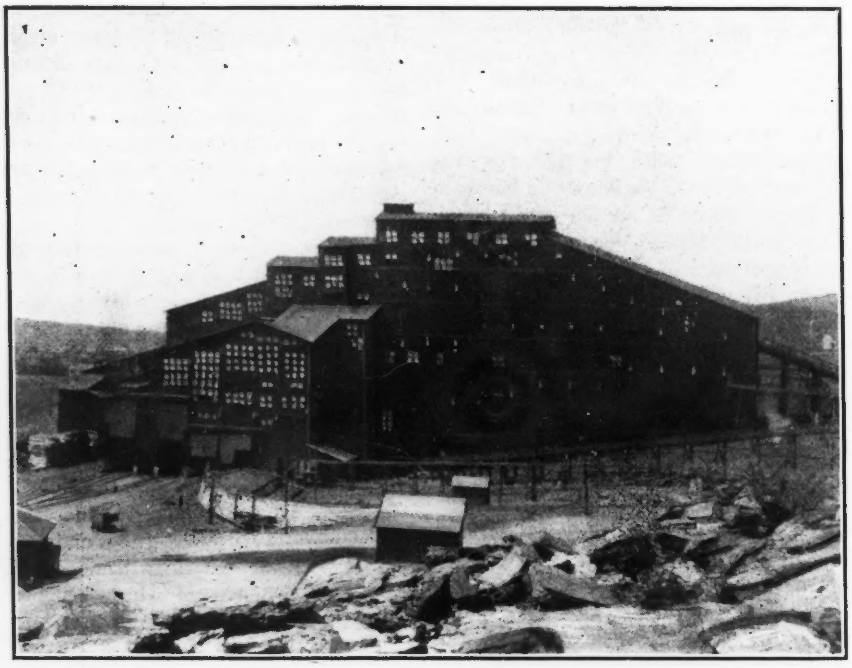


FIG. 1. TYPICAL ANTHRACITE BREAKER

The method used in the anthracite mines is almost universally the pillar-and-breast system; although the details of the system under peculiar local conditions vary so widely that a comparison of mine maps from different districts gives the idea that the coal is mined by entirely different methods, showing nothing in common, but there are identical features in all anthracite mining methods. The chambers or breasts are long and comparatively narrow; they are driven parallel to each other wherever possible, and are separated by rectangular pillars and connected by crosscuts for ventilation.

The System now in Use

The thickness of the veins now being worked varies from 2½ ft. up to 70 ft., and the dip varies from nothing to 90 deg. The plans in general may be divided into two classes: First, workings in seams pitching from horizontal to 25 deg. are considered as flat workings and the workings in seams pitching from 25 to 90 deg., "pitch-workings."

In the flat seams, gangways are usually driven from the foot of the shaft, and when the roads are sufficiently advanced breasts are turned off from the upper side of the gangway. An airway is driven parallel to the gangway for ventilation, and it is separated by from 15 to 50 ft. of solid coal, and crosscuts are driven through every 40 to 80 ft. in gangway, then turn it off to the usual course; see Fig. 4.

The width of the breasts and pillars between them, vary according to the nature of the roof, the thickness of the seam and overlying strata. The prevailing practice in the anthracite mines is for a seam 200 to 300 ft. deep, to have 24-ft. chambers, and 26-ft. pillars, or 50 ft. from center to center, when the seam varies in thickness from 4 to 8 ft. For a thickness of 8 to 15 ft., the breasts are from 18 to 24 ft. wide and 32 to 36 ft. pillars, so that the distance from center to center varies from 50 to 60 ft. Crosscuts are driven through pillars every 70 to 80 ft. in such a vein. In case of the workings being gassy a brattice is built either from the gangway, which is the case if the breast is just started, or from the inside crosscut; see Fig. 4.

Working Flat Thin Seams

In working flat thin seams, 2½ to 3½ ft. thick, the breasts are usually wider than in thicker veins, so as to accommodate the gob and the roof or the bottom rock lifted for hight. The average hight required for a mule is 5½ ft. clear above the rail. All the refuse thus obtained is carefully piled up on one side of the chamber, while the track is laid on the other side, and the center line of the track is from 4 to 6 ft. from the rib, so that when the pillars are to be removed, there will be less dead work in getting at the pillars. In lifting the bottom rock or taking the roof down, the miners are usually paid 5½c. per in. per linear yard, or $1.32 per yd. for lifting the bottom 2 ft. thick. In working such a seam, the width of the breast should be maximum, so as to make it pay. The prevailing practice, however, is from 28 to 34 ft. wide with from 22- to 16-ft. pillars between the two breasts, and having crosscuts driven every 60 to 75 ft. The width of the crosscuts is from 8 to 10 ft. so that there is an ample sectional area for the ventilation. If the seam has a side pitch the crosscuts are usually driven from the lower breast, so that the practice of shoveling the loose coal is assisted by the grade. This plan also prevents water from accumulating in the face while driving. Every ninth or tenth breast is left as a reserve pillar to protect the workings from a general squeeze; but this block is mined out when the remaining pillars are robbed.

If the seam is thick, it is often mined in benches; the breasts are first driven in the lower bench and driven to the limit of

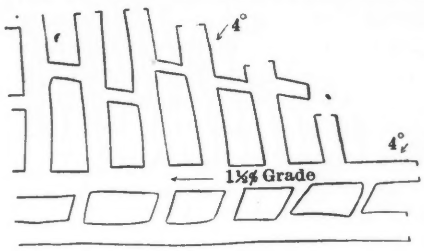


FIG. 3. WORKINGS IN FLAT SEAM

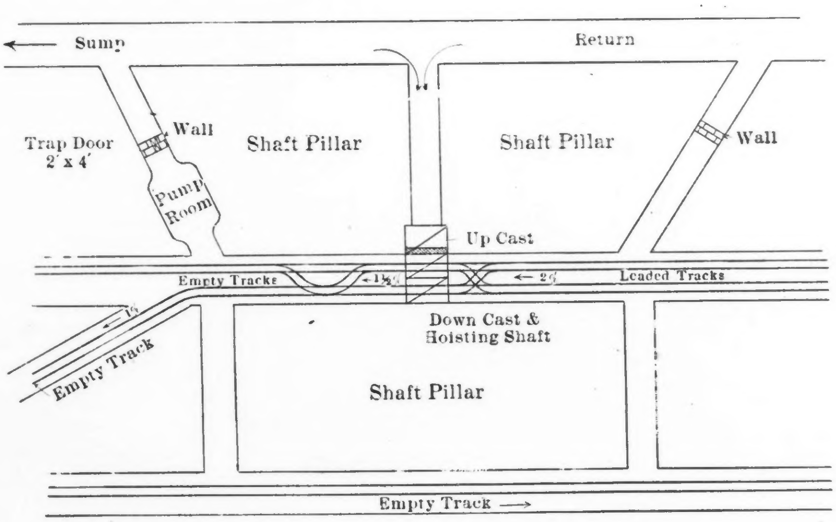


FIG. 2. GENERAL ARRANGEMENTS AT FOOT OF SHAFT AND SHAFT PILLAR

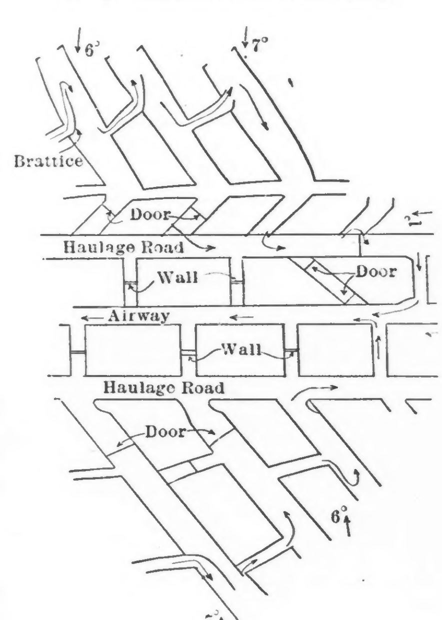


FIG. 4. METHOD OF WORKING AND VENTILATING A FLAT GASEOUS SEAM BY THREE GANGWAY HEADINGS

this pillar for air connections. The average grade of gangways is about 1½ per cent. with the load so that all the coal mined will practically flow out to the foot of the shaft by gravity, while empty cars are hauled either by mules or motors. The course of breasts with respect to the gangway depends on the inclination of the seam. If the vein pitches from 2 to 4 deg., the chambers are driven at right angles to the gangway, see Fig. 3. When the seam pitches 4 to 10 deg., all the breasts are turned off slant head or slant back, see Figs. 4 and 5. From the figures it is readily seen that the switch arrangements at the foot of the breast in the former differ from the latter. In the slant-head system an easy curve may be laid at the foot while the slant back chamber must be provided with a back switch; however, in recent practice, this back switching in the gangway is overcome by driving the breast slant head for 40 to 50 ft. from the

the breasts, and then come back on the top coal. The advantages in bench mining are the props used are shorter, consequently they are easily put up; the workings are more easily ventilated; the coal makes a better roof than fireclay or soft slate. Experience has shown that when such rocks (fireclay and soft slate) are exposed to the mine air for any length of time, they disintegrate very easily, consequently the timbering of such a roof becomes an expensive item.

Developing a Basin

In developing a syncline or basin where extensive mining is to be done, the method commonly used is to drive two gangways and an airway between the gangways. Breasts are turned off from both gangways up the pitch; see Fig. 5. If the mine is gassy, the gangways are made the intake so that men and mules working in the haulage roads breathe, pure air and there is less danger of a fire-damp explosion; also the two splits of air for this district of the workings gives better protection to the miners and laborers as there is less smoke and sulphurous fumes from shot firing.

When One Seam Overlies Another

When two seams are separated by a few feet of slate or rock, taking down such parting rock is expensive. The methods used in mining under such conditions are numerous; among the most noticeable ones, are: first, if the thickness of the parting rock is from 3 to 7 ft. and the upper seam is comparatively too thin to be mined separately (see Fig. 6), the breasts are driven in the lower vein first, and as the workings in the lower vein progress, holes 3 to 5 ft. in diameter are driven up from the lower workings every 25 to 40 ft.; thus the top coal is mined with the lower measure. When the parting rock is too thick, and the upper vein can be mined by itself, then the system used is to drive all chambers and gangways over the corresponding workings in the lower seam, or *vice versa*. The reason for this method is self-evident; the strain of the pillars in the upper seam is resisted by the pillars directly below in the lower vein. Otherwise the pressure of the upper pillar will shear the intervening rock and results in a cave or a general squeeze. This method is commonly used for seams separated by a stratum less than 50 ft. in thickness.

Working Pitching Seams

In working pitching seams, a series of lifts are turned off the slope; the distance between any two lifts depends on the local conditions, but when the inclination is comparatively uniform, the lifts are from 250 to 350 ft. apart. The width of gangways varies according to the character of the roof, the thickness of the seam and amount of refuse in the coal. If the vein is more or less clean with a good roof the width is 12 ft. An airway is driven parallel to the gangway as in the flat-seam workings. The airway width is from 6 to 10 ft., and a 25- to 35-ft. pillar is left between the airway and the gangway. The chutes are from 6 to 8 ft. wide, and are driven from the gangway every 40 to 60 ft., while the manway headings are from 4 to 8 ft. wide and are opened in the middle of every other pillar. The face of the gangway is always 50 to 70 ft. ahead of the airway, so that when the chute and heading men have driven up the heading to the airway, they can start a new chute without interfering with the men driving the gangway. All the coal mined in the airway is run down the chute and the manway heading. A wheel-barrow is sometimes used to haul the coal to the chute or heading. In order to avoid using wheel-barrows the airway is started from every other chute, and is driven in both directions so that the airway men may shovel the coal a maximum distance of 20 to 25 ft. This method is not generally used if the mine is gassy. In case the gangway gives off gas, a brattice is sometimes built from the last heading to a point sufficiently close to the face or a fan boy may be employed to fan the air from the foot of the last heading or chute to the working face of the gangway. All the headings are boarded up air-tight, with man-holes 2x3 ft. in the middle.

When the pitch of the seam is from 14 to 30 deg., sheet iron is used on the bottom of the breasts so as to aid the movement of the loose coal, although coal on a pitch less than 20 deg. will not slide freely on sheet iron, consequently the miners have to push the coal down. The breasts are usually provided with one chute, the end of which is projected into the gangway at an elevation sufficiently high to allow the mine cars to be placed under it. A door is built at the end of the chute, so as to keep the surplus coal in the chute when the car is loaded. The gob is sometimes piled on one side of the breasts for skipping or robbing the pillars in the future; in some cases the gob is loaded out with the coal. The width of the breasts for fairly good roof is from 24 to 34 ft. When the pitch is over 30 deg. the coal will slide without sheet iron, but the refuse will come down with the coal, on this account a different method is sometimes used on such inclined seams.

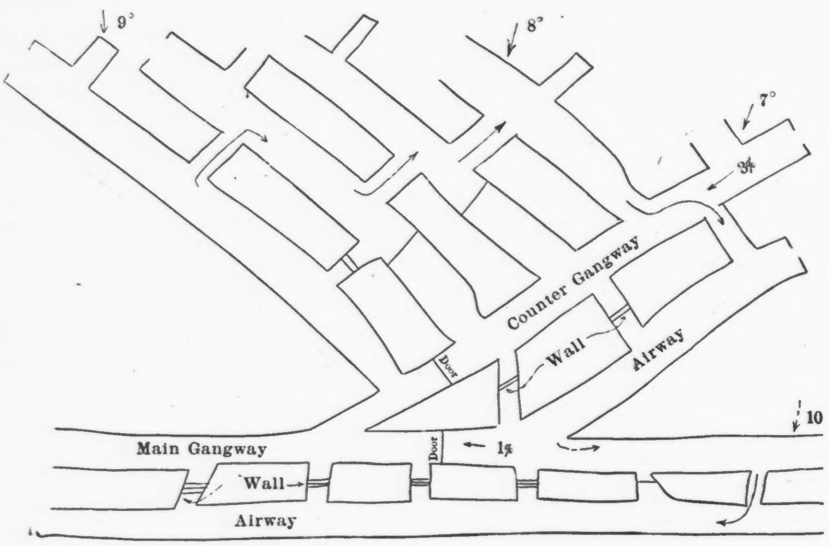


FIG 5

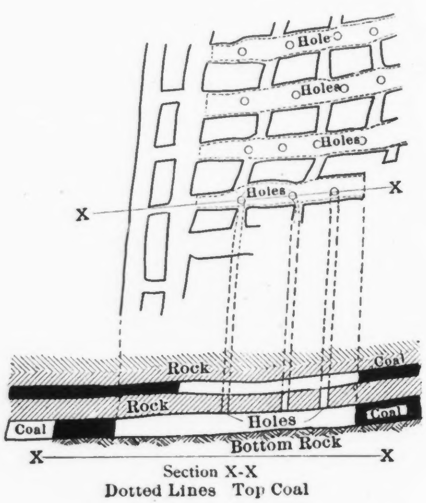


FIG. 6

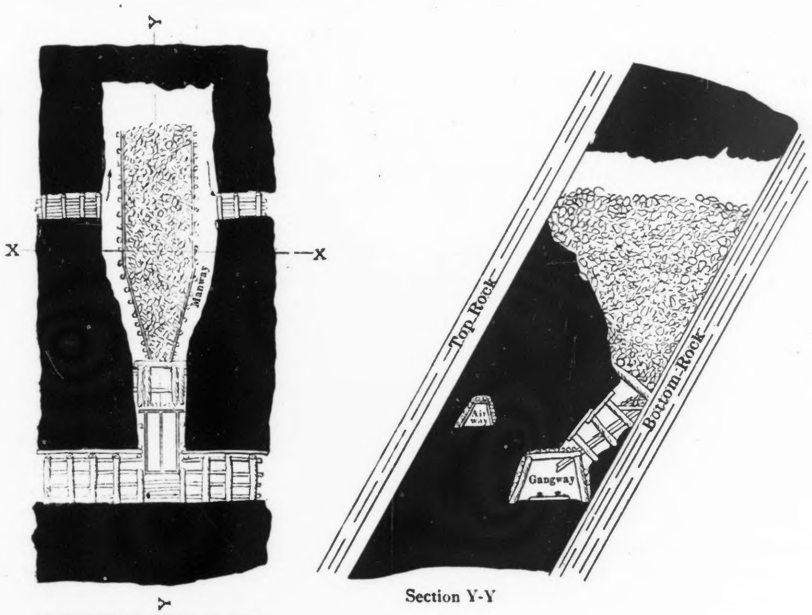
Manways and Chutes

When the seam is comparatively free from impurities, the breast is driven up with one chute from 30 to 35 ft., then it is gradually widened out to its full width. The chute is walled with planks a few feet above the gangway, with an opening in the middle 3x4 ft., through which the supply of the coal is drawn. This wall is locally known as a "battery." The chute may be extended as the working face advances, and be kept up to within a few yards of the face. The manway is built along the rib and is bratticed air-tight, so as to send the current of air to the face. The manner of building a chute and manway depends on the thickness of the seam, degree of purity of the seam, character of the roof and pitch of the vein.

If the seam contains a great deal of refuse, the manway is generally used as a chute, while the gob is piled up in the center of the breast. The width of such a manway varies from 5 to 8 ft., for a vein 8 ft. thick. For a thin seam with poor roof and pitching less than 40 deg. the breast is opened up by a single chute, about 30 ft. long, and then the chamber gradually widened out to the usual width.

The coal-way is made in the center of the breast and is opened by two rows of props, being 4 to 8 ft. apart, and the rows 3 to 5 ft. apart. On one of these rows a brattice is built to send the air up to the working face and this airway is used as a manway.

In thick seams on steep pitches, it has been found impossible for the miners to keep up to the working face as they have nothing to stand on; hence it is necessary either to build a platform in the face or to leave the loose coal in the breast. If the latter method is used then it is necessary to provide an arrangement to tap the surplus coal from the breast. The loose coal occupies about 70 per cent. more space than the coal in solid, and the airway and manway occupy about 20 per cent. of the breast space, so that there is 80 per cent. of breast for a coalway. The timbering used in the breast depends on the character of the roof. The manways are usually built of "Jugglers" or inclined props, faced by 2- or 3-in. planks, and are made nearly air-tight so as to deflect the air to the face of working. Fig. 7 shows the general arrangement of props, chute, and manway of such workings. In working a thick, steep pitching seam, as in the Lehigh region of Pennsylvania, the chute is driven up in the middle about 7 to 9 ft. wide and 6 ft. high; for a distance of about 30 ft., and after connection with the airway above, the breast is gradually widened to its full width. As the face of the working place advances, the weight of the stock coal becomes very great; on this account the battery must be built strong enough to bear this pressure.



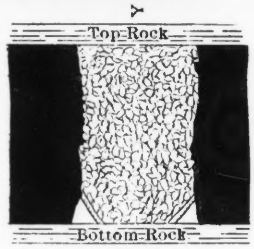


FIG. 7

Haulage

The system of transportation used in flat seam workings is similar to that used in the pitch-workings. Planes and slopes are generally used both in pitch and flat workings. Such haulage roads are usually driven in the seam normal to the strike.

There are two kinds of planes in use, namely gravity and engine planes. The former is more extensively used as its manipulation is very simple, furthermore, its initial cost of installation and maintenance is much smaller compared with the latter. The necessary materials for a gravity plane are few; they are, wire rope twice the length of the plane plus about 150 ft., drum and rollers. The average rope used for such service is plow-steel rope, which has a very high tensile strength. The diameter of the rope depends on the weight of a trip which is usually from two to five cars; assuming a trip made up of five cars with 2½ tons burden per car, and weight of each empty car ¾ ton that the total weight of the trip is 16¼ tons, and if the plane has 17 deg. pitch, the strain on the rope is 0.313 times the weight of the trip or 5.09 tons. For this purpose 1- to 1⅛-in. rope is used. The ropes generally in use have six strands, a hemp center, and 19 wires to the strand. The diameter of the drum at the head is usually from 5 to 7 ft. The track arrangements at the head and foot of the plane are very important as the economy of the operation depends on the convenience and the ease with which the cars are handled. The width of the head and foot of a plane is on an average about 18 ft. for two tracks, the center to center of the two tracks is 7 ft., and the rails weigh 40 lb. per yd. The grade at the head for the loaded cars is from 1 to 2 per cent. in favor of the load to the knuckle, which is provided with a sufficiently large vertical curve, the radius of which varies from a few feet up to about 20 ft.; much depending on the wheel base of the cars. The grade for the empty track at the head is usually the reverse of the loaded track so that the empty cars will run in by gravity.

The track arrangements at the foot are very much similar to those at the head, but the higher side of the road is used for the loaded cars and the lower side for empty cars.

Rock Planes

Rock planes are usually driven to connect upper seams. The pitch of such haulage roads varies from 10 to 18 deg., much depending upon the inclination and the thickness of the intervening strata. The dimensions of such rock work are usually 12 ft. wide and 7 ft. above the rail for hight measured at right angles to the line of the plane. A ditch 2 ft. at the top, 1½ ft. at the bottom and 1½ ft. deep is provided on one side of the plane so as to protect the track in case the upper vein makes water, see Fig. 8. Driving such rock work is usually done by contract, and the cost per cubic yard depends on local conditions; however, a fair average cost in the anthracite coalfield is about $3.50 per cu.yd. solid.

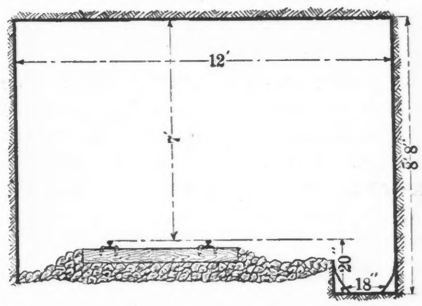


FIG. 8. STANDARD SECTION OF TUNNEL AND ROCK PLANE

The Temperature of Coke Ovens

Experiments have been conducted at the Semet-Solvay coke ovens, belonging to the Bridgewater collieries, Lancashire, England, with a view of ascertaining the temperatures of the charge. A Roberts-Austen electrical pyrometer was used and readings were taken of the temperature in the exact center of the charge. From the time the retort was charged, at 1 p.m. until 10 p.m., the temperature did not rise over 100 deg. C. The temperature then rose by midnight to 200 deg. C. At 1 a.m. it had risen to 350 deg. C., at 2 a.m., to 530 deg. C., at 3 a.m., to 600 deg. C., at 4 a.m. to 700 deg. C., at 5 a.m. to 820 deg. C., at 6 a.m. to 900 deg. C., and at 7 a.m. to 920 deg. C. The increase during the next four hours showed a slow rise to 1000 deg. C., at which time, 11 a.m., the coke was discharged.

Colliery Notes, Observations and Comments

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

DEVELOPMENT AND MANAGEMENT

Hungarians and Italians cause 85 per cent. of the accidents in American coal mines. The Welsh miners are charged with only 5 per cent. of the mishaps.

For a gravity plane having a heavy pitch, it is often best to use a pair of drums and a pair of ropes so that each trip can be kept under perfect control with the brake. For a plane with a light pitch a single rope can be used; it should be given one turn upon the bull wheel.

The best grade for mule haulage varies from 1 to 2 per cent. in favor of the load. If the haulway has less than a 1 per cent. grade, which is not sufficient for drainage, the road becomes sluggish, and consequently the frictional resistance is increased; also the wear and tear of the rails and wheels, and as a consequence the cost of maintenance are greater.

The chances of explosions in a gassy mine are greatly reduced by dividing the air current into two or more splits. The return air from each split should be directly discharged into the main return airway. By this system of ventilation the gases generated in one portion of the mine do not pass into another portion, but are carried out at once to the main return.

In operating compressed-air engines the air should be brought in from some place cool and free from dust, preferably outside of the engine room. The engineer should be cautious in running the compressor not to feed an unnecessary amount of oil into the air cylinders, as it is wasted and tends to clog up the air-intake valves and interfere with the proper operation of the compressor.

The deepest diamond bore hole in the world was put down near Leipzig, Germany. The object of the hole was to prospect for coal. The hole attained the great depth of 5790 ft. At the surface the diameter of the hole was 6 in. and at the bottom it decreased to less than 1 in. The total length of rods weighed 20 tons. It took 10 hours to take the rods apart and put them together again.

Experience has shown that the wires carrying a current of electricity from the power house to the shaft should be insulated with weather proof material, and for underground work where a better quality of insulation is required, rubber-covered wire should be used. For high-tension lines, the usual practice is to use bare wires and insulate them with porcelain insulators. Ordinary weather-proof insulators give no protection for inside work where high pressures are used.

The cost of installing a compressed-air plant is about the same as that of an electric plant of the same rated capacity, but the advocates of compressed air claim that the operating cost is lower than electricity. It is also stated that renewals and repairs with compressed air are less and that the plant lasts longer than any other system. It saves the cost of insurance charges. Also air leakage is less dangerous than electric leakage; compressed air helps mine ventilation, and so materially increases the safety of mines.

In using small sizes of anthracite coal for generating steam, the economy, and consequently the efficiency of the plant, depends largely upon the kind of grate used in the boiler. Pin-hole grates, having round holes about 3/8 in. diameter, which have 10 per cent. air space, have been successfully used with forced draft. A grate bar of the herring-bone type, having an air space 1/4 in. in width, is well adapted for burning buckwheat coal, and is usually used both with forced blast and natural draft. The bar usually gives over 30 per cent. of air space, which is adequate.

Almost all anthracite collieries are provided with fire protection by having water pipe lines laid underground in the yard. The size of pipes varies from 2 to 4 in., sometimes being even larger. Fire hydrants are connected to the lines at convenient places. They are easily closed as the cut-off valve gradually reduces the flow of water. The valve should close against the pressure so as to avoid the hammer of the water and prevent leakage. Valve rubbers of the best quality should be used. The drip rod should be at the side of the hydrant stand-pipe and independent of the stem. The hydrants are usually bronze mounted at all bearing parts.

The Karharbari colliery of India has adopted the following method of mining coal: A modification of the pillar system is used, as the roof is of hard sandstone, and the workings are divided into districts. The gangways and the main levels are driven first to the extremity of each district, then the coal is mined back toward the shaft in sections. When the pillars are robbed, the strong sandstone roof gives way in very heavy falls; at times an acre in area and 30 to 40 ft. in thickness. Such falls create tremendous blasts of wind, which blow out doors and stoppings. When there is an indication of such a fall, all operations are suspended until all is quiet again.

The point of the pick used in soft coal mining is a very important factor in the production of coal. A sharp-pointed pick should never be used in mining soft, foliated coal, as it will sink deep and become firmly wedged in the vein and require great exertion to loosen it after each blow. A pick with a blunt point should be used for such coal. For hard and brittle coal containing many sulphur balls, a sharp pick gives the best results. In mining coal with a pick, the stroke of the pick should be in the plane of the stratification, and the work should be started from the bottom.

The use of coal cutters in Great Britain does not progress very fast, and only a small proportion of the coal is won by this means. In the Staffordshire coalfield, usually known as the "Black Country," there were 30 machines in work during 1906 as compared with 26 in the prevous year. These were distributed among 10 collieries. The other collieries in this district, amounting to 428, were entirely without machine cutters. In the north of England, which includes the coalfields of Cumberland, Newcastle and Durham, there were altogether 210 coal cutters at work at the end of 1906, an increase of 59 during the year. In these districts the proportion of coal won by cutters to that won by hand labor is only about 3 per cent. The variety of cutters in use is considerable, about 20 different types being in vogue. The motive power is divided about equally between compressed air and electricity.

Experience has shown that buckwheat coal contains twice as much ash as egg. The average ash content is from 7½ to 15 per cent. It has been found that in a boiler of good design 3.6 lb. of egg or 4 lb. of buckwheat coal will develop one boiler horse-power; about 11 per cent. more buckwheat is needed to make the same amount of steam. In burning buckwheat a denser and more compact bed of fuel is formed than when the larger sizes of coal are used, and in order to force the air for combustion through this bed a greater suction or pressure is required. If natural draft is used the hight of the chimney becomes an important factor. Draft depends upon the size of the fuel used, the manner of firing and the quantity of ash produced. In general the following figures indicate draft in inches of water at the damper: 0.3 in. draft per 10 lb. of fuel per square foot of grate per hour; 0.45 in. for 15 lb.; 0.73 in. for 20 lb.; 1.00 in. draft for 25 lb. of fuel.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

505 Pearl Street, New York.

London Office: 6 Bouverie Street. London E. C., Eng.

CABLE ADDRESS "ENGMINJOUR, N. Y."

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

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

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

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

For sale by all newsdealers generally.

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

During 1906 THE ENGINEERING AND MINING JOURNAL printed and circulated 462,500 copies, an average of 8896 per issue. Of this issue, 16,000 copies are printed. None sent regularly free. No back numbers beyond current year.

Contents

*Illustrated.

"The Mineral Industry"

THE MINERAL INDUSTRY, Vol. XV, covering the calendar year 1906, is now on the press, and barring unforeseen accidents in the press-room and bindery, the book will be issued about July 31. This will be earlier than for many years. Indeed, in respect to promptness the forthcoming volume is expected to beat the best on record in the history of the publication. Certain of the early volumes appeared a little earlier in the year, but in their cases the editorial work was begun much earlier and was completed much earlier than in the case of Vol. XV. This necessitated going to press before the statistics of many important metals and mineral substances in foreign countries were available. In order to give "The Mineral Industry" the maximum of completeness in those particulars, it was considered best this year to defer the end of the editorial work until May 31. The editorial work was completed on that date, as planned, and the reading of the final proofs was sufficiently advanced to enable printing to be begun June 20. The book will have about 950 pages and in the comprehensiveness of its scope is as elaborate as any of its predecessors. As in the case of Vol. XIV, the forthcoming volume is being printed directly from the type, wherefore there will be no reprinting after the first edition has been exhausted.

Copper at the Mid-year

At the end of the first six months of 1907 the situation in the copper market may be summed up as follows:

(1). The consumers who ceased buying three or four months ago are still out of the market. Whereas, at the beginning of last March they still considered it necessary to contract for their requirements three or four months ahead, since that time they have not considered it necessary to pursue the same policy. Obviously this manifests a great change in sentiment. In the meanwhile the producers have been filling their contracts for delivery, and with the beginning of July in general all contracts have been completed. Of course, there are some running into July, but on the other hand there is still unsold some June production, and even some May production. At the beginning of the year there was about 8,000,000 lb. of refined copper in the hands of the principal refiners. Their stock is now surely larger, and will increase so long as the consumers remain out of the market. It is evident now, as was surmised a month ago, that last spring many important consumers overbought. This is manifested by the resales that have been made by them, by their requests to delay delivery, and by their ability to remain out of the market after July has begun.

(2). At the beginning of the year, the statistical position was extraordinarily strong. At the mid-year it is uncertain what the statistical position really is. It is claimed that the American production has decreased, but the statistics upon which such claims are made are pure guesswork. Anyway, the domestic production is only one factor (true it is the largest factor) in determining market conditions, inasmuch as American refiners produce a large amount of copper from imported material. In 1906 the production of domestic mines was 917,620,000 lb., while the production of the principal refiners was about 1,165,000,000 lb. By the "principal refiners" we mean those whose business is chiefly the treatment of the crude product of the mines. However, they produce also a considerable quantity of copper by the retreatment of old material. There are also many small refiners, whose business is confined to the retreatment of old material, which in the aggregate produce a large amount of marketable copper, that never figures in statistics. In the absence of complete statistics as to the refined product, estimates of consumption and the general statistical position are at the best only rough approximations.

(3). Complete statistics of the imports and exports of copper are as yet available only for the first five months of the year. These show an increase in the imports of 27,883,500 lb., which is greater than any claim as to the diminution in the rate of domestic production. On the other hand, exports have decreased 43,572,500 lb., as compared with the corresponding period of 1906. This falling off is exaggerated because of the strike of longshoremen at New York in May, wherefore the exports in that month were unusually small, while the exports in June have been rather large because of the shipment of copper that was delayed in May. However, even after making this allowance, the exports of copper show a decided falling off in 1907 as compared with 1906. It is highly unlikely that consumption in the United States has expanded this year, as compared with last, to an extent that would take care of the increased supply.

(4). It is evident, therefore, that at the mid-year the statistical position of copper is not so strong as it was at the beginning of the year, nor is it so strong in Europe, where recent market conditions have been somewhat similar to those in the United States. James Lewis & Son, in their last statistical circular report the consumption in Great Britain during the first five months of 1907 as 18,030 long tons against 28,919 in the corresponding period of 1906; in France, 22,168 against 24,728; in Germany (consumption of foreign copper only) 36,225 against 38,804.

(5). As to the market price developments are still uncertain. The whole world is awaiting the breaking of the deadlock which has existed in America. The selling of the production in America and the buying of the major portion of the consumption are both very much concentrated. The question is upon what basis the big producers and big consumers will agree for the business that must inevitably be done in the near future. There has been recently a concerted effort to hold up the price, to which the big consumers (who are really the big manufacturers, not the consumers) are apparently not loathe, providing they can see that the ultimate consumers will take their goods at the high prices which must be asked. So it is really upon the ultimate consumers, and the general condition of trade and finance, that the future of the market depends. Concerted action on the part of the large producers may artificially sustain prices for a while, but they cannot do so in the long run if the ultimate consumers will not pay. Accumulation of stocks means interest charges which sooner or later force disposal of the stocks for what they will bring. At present the general feeling in trade is more optimistic than it was a little while ago, and we may possibly see an upward turn in copper, but the general trend of price for all the metals is likely to be downward. Settlement to a more conservative basis will not be regretted, because the financial troubles that have lately disturbed the markets both here and abroad, are due in no small degree to the largely increased capital that is required to carry on business at the greatly enhanced prices for commodities.

The Steel-rail Problem

The agitation for the improvement in the quality of steel rails has come quickly to a head. A meeting of railway officials and steel manufacturers was held last week at which the matter was discussed. No decision was reached, but it is evident that both parties are in earnest about correcting the defect which is conceded to exist. The chief question seems to be how much more should the railways be called upon to pay for improved rails, conforming to the Pennsylvania specifications. It is argued that such rails will be 10 to 20 per cent. more costly than the present ones, but should that advance be made upon the present price for rails, bringing the price for the new rails up to $32 or $33 per ton, or should the steel manufacturers recognize that they are already realizing an enormous advance upon the actual manufacturing cost and agree to furnish something better for the same money, or only a small advance?

It is very opportune that Prof. Henry M. Howe is able to present his views upon the steel-rail problem, which is by all means the leading metallurgical question of the day, in the present issue of the Journal. Professor Howe is strongly of the opinion that the quality of the steel rails can be greatly improved by cutting off a larger end of the ingot and altering the design of the rail section. It is important to observe that the ideas of the engineers who have prepared the Pennsylvania specifications are essentially in line with Professor Howe's recommendations. Professor Howe presents the various phases of the problem in an extremely lucid manner, and his article will be sure to attract wide attention.

"High-grading" at Cobalt

Cobalt has heretofore had the commendable reputation of being a moral mining camp. There have been no saloons or gambling rooms, and the evil of "high grading," which has troubled Cripple Creek, Goldfield, and other places where the ore is exceptionally rich, has been remarkably absent, although considerable of the ore of Cobalt is semi-bullion. Now, however, Cobalt is having its high-grading troubles, five miners charged with theft of ore having recently been convicted. Like the sons of highly esteemed parents who go wrong, the "high graders" of Cobalt have gone very wrong. It has not been sufficient to steal the ore for the bullion which it will yield, but it has been found more profitable to sell it to "promoters" for salting worthless claims, upon which companies can be incorporated and paper certificates sold to unsuspecting "investors." In this way the proceeds of stolen ore are immensely multiplied. Truly, it has remained for Cobalt to develop the art of "high grading" to the maximum of its possibilities. In compariso with the Cobalt experts in this art the high-graders of Cripple Creek, Goldfield and Kalgoorlie look like children.

An Unusual Hoisting Accident

The precautions to be taken in connection with the hoisting engines in mines cannot be too great. At the Beldon Colliery, near Newcastle-on-Tyne, England, a serious accident happened owing to the engineman following the mechanical instincts of long habit. The shafts at the colliery were being altered, and a temporary arrangement was made whereby another shaft was used for bringing the men up and down. It happened that at the engine, temporarily in use for this purpose, steam was shut off by pushing the lever away from the operator, whereas in the engine which had been formerly in use for 20 years, the cut-off was effected by pulling it forward. After 20 years of one practice, it is not to be wondered that the operator one day in a fit of absent mindedness pulled the lever, and brought steam to full-on, so causing a serious case of overwinding.

Apropos of the project to effect a combination of the iron and steel manufacturers of Great Britain, similar to those existing in the United States and Germany, the London correspondent of the *Evening Post* makes a remark which speaks volumes. He says, concluding his report: "It is pointed out that it is most difficult to complete such a combination in England, as it is necessary to make public all deals in referring them to the shareholders of the various companies." If that had been required by American corporation laws, we wonder how many of our present trusts would have been born?

Views, Suggestions and Experiences of Readers

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

CORRESPONDENCE AND DISCUSSION

Preservation of Mine Timber

I have read with interest the article in your issue of May 4 on the preservation of mine timber from decay, taken from a lecture delivered by John M. Nelson, of Pottsville.

It seems almost a pity that when experiments are being made to determine the effect of certain preservatives on the life of timber, in most instances only two or three of the accepted methods of treatment are tested. Hardly a month passes without some new method being patented or introduced to public notice. The majority of these are adaptations of earlier inventions, though many present features which it would be well worth the while of large timber users to investigate.

One of the most important discoveries in regard to timber preservation has been a treatment with the by-products of sugar refineries; sugar, being a simple, stable carbohydrate, is incapable, in the absence of soluble nitrogenous of nourishing septic organisms. In solution it has a somewhat higher boiling point than water, and it has been demonstrated in this country that it possesses greater power of diffusion through wood than water only, much of the sugar absorbed cannot be parted from the tissues of the wood although it is not visible under a microscope either as crystals or as drops of syrup; chemical analysis, however, proves its presence. Its high boiling point gives it a penetrating power which enables the pressure necessary for so many other processes to be dispensed with, and owing to the fact that sugar possesses a distinct affinity for wood, substances of an antiseptic and insect-destroying character can be carried into the wood by being dissolved in the saccharine solution in which the wood is treated.

Impregnation

The illustrations and figures you give, of the different degrees of impregnation obtained by treating wood with creosote under pressure and in open tanks, is most instructive. The fact, however, remains that if wood is to be efficiently preserved against decay and insects it must be permeated with the preservative employed. No mineral oil has a sufficient affinity for wood, nor have the ordinary timbers, in use for mining purposes, sufficiently absorbative powers to secure complete impregnation without the application of vacuum or pressure. In the case of the Powell process, the name given to the saccharine treatment of wood, no pressure or vacuum is necessary. Experiments to date show that Powellized wood is absolutely proof against any form of fungoid growths and by a slight addition to the solution can also be rendered immune from insect attack.

Another point worth considering is that any timber can be Powellized immediately it is felled, and the plant being of a simple inexpensive character can be erected where cutting operations are in progress, and from time to time shifted further into the forest. The boiling drives out the air from the wood, as well as the moisture which is in the sap, while the saccharine matter in the solution coagulates the albumen of the sap, thereby retaining all its most valuable qualities. For mine work little or no artificial drying is subsequently necessary. E. H. Scammell.

London, May 31, 1907.

The Vanning Assay for Tin Ores

In dealing with Cornish methods generally, a recent contribution to your correspondence columns specially singled the above out for criticism, alleging that only some 75 per cent. of the tin actually present could be obtained by this method. As this opinion is not uncommonly held in some circles it may be of interest if I furnish some extracts from a paper recently contributed to the *Camborne School of Mines Magazine* by Ernest Terrell, then assayer at Clitters United, and now manager of the Stormsdown and Owlacombe tin and arsenic mines.

Made up samples were used, the matrix materials having been previously analyzed for tin and found pure in that respect.

Sample No. 1, all through 30, none through 120 mesh: Silica, 40 per cent.; iron oxides, 25 per cent.; mispickel, 15 per cent.; iron pyrites, 10 per cent.; copper pyrites, 8 per cent.; tin oxide, 2 per cent. Tin oxide recovered by vanning, 1.92 per cent., equivalent to 96 per cent. recovery

Sample No. 2, all through 150 mesh: Silica, 50 per cent.; mispickel, 10 per cent.; iron oxides, 35 per cent.; copper pyrites, 3 per cent.; tin oxide, 2 per cent. Tin oxide recovered by vanning, 1.887 per cent., equivalent to 94.35 per cent. recovery.

Sample No. 3, all sulphides roasted before vanning: Iron pyrites, 60 per cent.; copper pyrites, 15 per cent.; mispickel, 23 per cent.; tin oxide, 2 per cent. Tin oxide recovered by vanning, 1.90 per cent., equivalent to 95 per cent. recovery.

Tests on natural samples were also made with the following results, the chemical assay employed as a check being the hydrogen reduction method:

Tin Oxide.

	By Chemical Analysis.	By Vanning.	Recovery.
No. 1.....	4.26%	4.01%	94.1%
No. 2.....	0.64%	0.60%	93.7%
No. 3.....	0.22%	0.20%	90.9%

While the above figures, and others with which I will not trouble you, as they are readily accessible to anyone interested in the question, speak highly for the assay by vanning, there is no doubt that a really rapid, accurate, and easy chemical method is greatly needed. It is not generally known that native tin oxide can be reduced by acting upon it with hydrochloric acid in the presence of zinc (or of magnesium, aluminum, or other high potential metals); but unfortunately the reduction is never complete, some oxide always obstinately resisting attack. I have found that reduction is assisted by allowing the hydrogen evolved to accumulate under pressure, and would suggest further experiment along this line by anyone setting out to solve the problem.

R. T. Hancock.

School of Mines,
Camborne, Cornwall, Eng.,
May 22, 1907.

Fluorspar

Attached we send you a cutting from the Journal with regard to production of fluorspar. We are sorry that you have overlooked the fact that we are the largest producers of fluorspar, even above that of the United States, as you state it.

With regard to the use of fluorspar in the melting furnace, we may say that the merits of this are quite understood; and, as you say, the joint use of fluorspar and limestone in the foundry is superior to limestone alone. As to the cost being high, we cannot quite agree with you, inasmuch as it takes a small quantity only, and does a large amount of work for the money. There is no saving, but an absolute loss in comparison, when using limestone alone.

George G. Blackwell, Sons & Co.

Liverpool, England, June 7, 1907.

Personal

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

G. E. Alexander has left Denver, Colo., to take charge of a copper property at Sparta, Oregon.

John Fritz was given the honorary degree of doctor of science by Stevens Institute of Technology on June 13.

W. J. Parker, of New York, has gone to Cobalt, Ont., to take charge of a property owned by New York capitalists.

W. R. Todd, president of the Quincy Mining Company, has been in the Lake district inspecting the property of the company.

J. R. Finlay, mining engineer, of New York, is at Joplin, Mo., where he will be engaged on professional business for about a month.

F. X. Gosselin, of Dawson, has been appointed gold commissioner for Yukon territory, Canada, in place of E. C. Senkler, appointed legal adviser for the Yukon.

B. B. Thayer, assistant to President H. H. Rogers, of the Amalgamated Copper Company, has gone to Butte to inspect the mines and smelters and property in general belonging to that company.

E. Dwight Kendall, of New York, has been in the zinc district of north Arkansas, on professional business, and is now at Bartlesville, in the oil district of the Indian Territory.

E. Lindeman, under instructions from the Dominion department of mines, Ottawa, has begun an investigation of the iron-ore resources of Vancouver island and neighboring islands, British Columbia.

John E. Rothwell, metallurgical engineer for the Colorado Iron Works Company, of Denver, Colo., is at Indé, Durango, Mexico, where he is erecting a concentration and cyanide plant for the Indé Gold Mining Company.

Herbert Carmichael, provincial assayer and assistant to the provincial mineralogist of British Columbia, has been deputed to make a reconnaissance of the country tributary to Alberni, west coast of Vancouver island. His party includes three assistants for survey and topographical work.

Andrew N. Fairlie, chemist with the Tennessee Copper Company, Copper Hill, Tenn., has been elected secretary of the American Brass Founders' Association, a recently organized association which will have a co-operative relation to the American Foundrymen's Association and will hold its annual convention at the same time and place.

E. J. McCaustland, for the past five years assistant professor of mining and surveying in Cornell University, has been appointed Professor of Mining Engineering in the University of Alabama at Tuscaloosa. Mr. McCaustland has had many years experience in the practice of his profession as a civil and mining engineer and his work as a teacher has been very successful.

W. R. Ingalls, editor of the JOURNAL, intends to leave New York, July 3, for a Western trip, in the course of which he will visit Denver, Salt Lake City and adjacent mining and smelting districts, several of the mining districts of Nevada, San Francisco, the Cœur d'Alene, and Butte, Mont. He will return to New York about the end of August.

Obituary

Orange J. Salisbury, of Salt Lake City, mine owner and director of various corporations, died in New York, June 18. He was born in Buffalo in 1844 and was one of the pioneers of the Rocky Mountain region. With his brother Monroe and J. T. Gilmer he operated lines of stage coaches in the West before the days of the railroads. Mr. Salisbury held large interests in the Homestake mine and in other properties in Idaho, Utah and Nevada.

Societies and Technical Schools

Engineering School of Colorado College—Gen. W. J. Palmer has presented this institution with the sum of $12,000 to be expended upon additional equipment for the engineering laboratories for senior work.

University of West Virginia—At the annual commencement on June 20 it was announced that the board of regents had decided to establish a chair of mining engineering. Work in the new department will begin next fall.

American Society of Civil Engineers—The annual convention of the American Society of Civil Engineers will be held in Mexico City from July 8 to 20. It is expected that about 140 members will leave St. Louis on a special train July 4 for Mexico City. Many interesting side trips have been planned.

American Mining Congress—This organization has issued the call for its tenth annual session, which will be held at Joplin, Mo., November 11-16, 1907. James F. Callbreath, Jr., Denver, Colorado, is the secretary of the Congress, and Clay Gregory, of Joplin, Mo., is the secretary of the local executive committee.

Society for the Promotion of Engineering Education—The fifteenth annual meeting will be held in the Rockefeller Physical Laboratory, Case School of Applied Sciences, Cleveland, Ohio, July 1 to 3. Headquarters will be at Hotel Euclid, and in addition to a program containing more than 20 technical papers and entertainment features there will be visits to laboratories and an excursion to Put-in-Bay Island by boat.

Mining Association for Mexico—According to reports from Torreon a constitution is being drawn up for the formation of an association of mining men in Mexico, the matter to be acted upon at the meeting of geologists in Mexico City within a few weeks. The association will follow the lines of the American Institute of Mining Engineers. Among those active in the movement are: José Maria Garza Adalpe, Torreon; Juan D. Vallerello, and José J. Reynoso, Mexico City; J. Navarro, Guadalajara; and F. Puente, Sinaloa.

Industrial

The Bucyrus Company, Milwaukee, Wis., with its Philadelphia agent has established an office in New York in the Singer Building, Broadway and Liberty street, under the management of James M. Reed.

Crocker-Wheeler Company, Ampere, N. J., has opened a sub-office in the Columbus Savings and Trust Company building in Columbus, O. The office will be in charge of C. W. Cross, formerly of the Cleveland office.

The Walter A. Zelnicker Supply Company, St. Louis, Mo., issues weekly a list of new and used rails and track supplies of light and heavy section and of the tee and girder type, as well as a list of narrow- and standard-gage and geared locomotives.

Cephas Whitney, of Demarara, British Guiana, is fitting up six launches equipped with 10-h.p. double-cylinder Mietz & Weiss marine oil engines of the tunnel propeller type, especially designed for the shallow rivers of the interior. He recently covered 285 miles on the Massaruni river to the gold and diamond fields in a motor boat equipped with an engine of the same type.

Trade Catologs

Receipt is acknowledged of the following trade catalogs and circulars:

B. F. Sturtevant Company, Hyde Park, Mass. Folder, illustrated, paper, 3½x6 inches.

American Locomotive Company, New York City. Eight Wheel Type Passenger Locomotives. Pp. 60, illustrated, paper, 6x9 inches.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1513. Christensen Portable Air Compressor. Pp. 4, illustrated, paper, 8x10½ in.; April, 1907.

Westinghouse Electric and Manufacturing Company, Pittsburg, Penn. Industrial Series No. 13,101. Electrical Equipment at the Hornell Shops of the Erie Railroad. Pp. 24, illustrated, paper, 6x9 inches.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 26—The saloon keeper of Hayden Hill, Lassen county, who sued the Lassen Mining Company of that place for $5000 damages because the company refused to employ men who visited the saloon, failed in his suit before the Superior Court. Meantime the company closed down its mine and 75 or 80 men lost their jobs. As it is the main support of the little camp of Hayden Hill, the matter was of some local importance. The mining company protested against a license being issued to the saloon, and offered to reimburse the county for all losses sustained. It became a question between a small saloon which produced nothing and built up nothing, and a mining company employing 80 men and which has paid $500,000 in the past five years for wages. The supervisors decided in favor of the saloon, and the mining company closed down its plant and mine. Then the saloon-keeper sued the company, alleging personal animosity, but he has lost his suit. In the meantime the company is opening a new mine in Nevada county, having become disgusted with its treatment in Lassen county.

At a meeting last week of the Executive Committee of the Anti-Debris Association, the committee on dredge mining reported that the dredge miners' association of Oroville had agreed to landlock their dredges as required by the association. At the present time no damage is being done, but the committee decided that if the land-locking was not completed, in compliance with the understanding, before next winter, legal proceedings would be commenced to enjoin the further operation of the dredges.

The Marysville Dredging Company has incorporated, with Robt. E. Cranston as manager, and the following directors: T. L. Livermore, president; Bulkeley Wells, vice-president; S. L. Ames, F. H. Hamilton, L. A. Shaw and J. P. Snook. The stock to be issued represents shares paid for in property owned by those now members of the corporation. The company owns 1200 acres of dredge mining land six miles east of Marysville on the Yuba river, a machine shop, two dredges, etc. The company has heretofore been known as the Marysville Gold Dredging Company, but it was not then incorporated. A. B. Strock is the superintendent in charge of operations.

The Folsom Development Company, R. G. Hanford, manager, has succeeded notwithstanding opposition from "the outside" in getting numerous signers to the petition for dredging out the unused and ungraded streets on the edge of the town of Folsom. The fact is that the operations of this company are so important to the town that there would be little to do there were it to suspend operations. A graded street will be given to the town in return for those dug up.

The Trinity County Development Association is actively engaged in promoting the mining interests of that section, and in advertising them. This is one of the great gravel mining counties of California and has large quartz interests also. The largest hydraulic mine in the world is operated within its borders. Not one-tenth of the gravel deposits have as yet been exploited and there is no law against hydraulic mining as there is in most other parts of the State.

Thompson Brothers, who have been working under lease the old Walker mine in Old Diggings, Shasta county, are removing the pumps, hoist, etc., to the Idlewild mine at Georgetown, El Dorado county, which they have also leased. The Idlewild was a famous producer in its day, but work has been stopped on it for a long time. Thompson Brothers worked in the mine years ago and are well posted as to the conditions.

At Grass Valley, the leading gold-producing camp of California, miners, carmen and machine-men are in demand and are being advertised for. This shortage of miners in the district has not happened for years. The present condition of affairs may be largely traced to the exodus which took place to Goldfield and other camps some time ago. There are more than a hundred houses vacant in the town.

Siskiyou county surveyors are "viewing out" the line for a new wagon road connecting the present county road on Horse Creek with the Blue Ledge copper camp, on the summit of the Siskiyou mountains. Several hundred men are working in the Joe Creek country, and several large mines are being developed. All this trade has gone into Oregon, while the mining camp is in California. A good road, with an easy grade, is to be built, and an effort made to divert this trade, or a part of it, into Siskiyou county.

At Grass Valley, sufficient ore has been promised the promotion committee to construct the advertising monument on the line of the railroad at Colfax. In the center of the monument a tablet will be placed to contain the names of the mines from which the ore was contributed. It is proposed also to ask the supervisors for permission to remove the county ore cabinet to the State Mining Bureau in the Ferry Building at San Francisco for advertising purposes.

Salt Lake City

June 23—The ore and bullion settlements reported last week amounted to $470,800. This, however, does not represent the value of all the ore handled by the Salt Lake valley smelters during the period stated.

The articles of incorporation of the Silver King Coalition Mines Company have been filed. The organization is the culmination of the transaction in which the consolidation of the Silver King, and a number of other Park City mines are involved. F. Augustus Heinze is supposed to be a leading spirit in this enterprise. Former United States Senator Thomas Kearns is mentioned as manager.

The ore shippers of the Tintic mining district have been granted lower freight rates on ore shipped to Salt Lake valley smelters. Heretofore, freight charges have been gaged by the "gross" valuation of the ore. Beginning July 1, the railroads will charge $1.10 on ores netting $5 and under $10 a ton; $1.25, $10 to $15 a ton; $2.25, $15 to $20 a ton; $2.50, $20 to $50 a ton, and $3 a ton on ore netting over $50 a ton.

The State board of equalization has made a ruling requiring leasers of mines to pay a bullion tax in accordance with the provisions of a law passed at the last session of the legislature.

Denver

June 28—The Tomboy mines at Telluride are making a fine record and when for the fiscal year ending June 30, the sum of $562,500 will have been paid in dividends, the total paid out for that purpose since 1896 being nearly $2,200,000. The percentage of extraction is expected to be raised still more and $100,000 has been set apart by the directors for further experiments in that direction.

The Northern Colorado Power Company has commenced supplying electric current to Boulder and vicinity and will shortly also supply the districts in the entire northern portion of Colorado.

The Copper Price Mining and Smelting Company, operating in the Red Gulch district, west of Cañon City, has made a shipment to the United States Smelting Company, the result being over 30 per cent. copper, besides some silver.

For the second time the Union Pacific

and holding companies are in difficulties with the United States authorities with regard to titles to coal lands. The Government has begun suit for the recovery of a large area in Horsethief cañon, Wyoming, alleging that the agents of the company have secured title by fraud. William D. Cornish, of New Jersey, vice-president of the Union Pacific, and Dyer O. Clark, general manager of the Union Pacific Coal Company, are among the defendants. This suit will be tried before Judge Riner at Cheyenne.

Superintendent Frank M. Downer and Harry Tarbell, coiner of the Denver mint, have been summoned to Washington.

Nearly 300 men are at present employed on the great reservoir project of the Central Colorado Power Company in Boulder cañon. The reservoir will contain 520,000,000 cu.ft. of water. A pipe line will be constructed to a second reservoir near Magnolia, whence two miles of steel pipe, able to stand a pressure of 800 lb. to the square inch, will carry the water to the power plant, nearly 2000 ft. below in the cañon.

The spelter output of the Colorado mines during 1906 was over 44,000 tons, valued at $5,495,900, of which the Leadville district alone produced about four-fifths.

Duluth

June 29—Discoveries of iron ore on the Mesabi range have been considerably larger this year than was to have been expected, considering how thoroughly the range has been prospected and how scarce expert drill runners now are. It is possible that the finds of the year may equal the year's shipments; if they do not, it will be the first season since the Mesabi became a factor in the market that they have not done so. If work now under way west of the Mississippi river is successful finds of the year may considerably exceed shipments. Much of the work of this season is west of the river, and explorers are getting to the borders of Cass county, where there are absolutely no surface indications of the strike of the range. Indeed, there are none worth mentioning at any point west of the Mississippi. The fact that the Mesabi formation does so disappear below a level surface of drifts extending many miles north and south, has made explorers very chary of expending much time and money in that district. And not only is the work there quite in the dark, but it is generally conceded that ores to be found will not be of the highly concentrated character of the central and eastern Mesabi, but will partake more of the character of those near the river on the east, where development on a large scale has been carried on for the past year or so, and the Oliver Iron Mining Company is spending many millions of dollars in the development of the mines of Canisteo and Trout lake.

Toronto, Ont.

June 28—The latest of the series of bulletins issued by the Canadian Census Bureau showing the growth of manufacturing industries gives the amounts of capital invested in 1900 and 1905. The capital employed in smelting has increased from $10,483,112 in 1900 to $87,482,829 in 1905. Other noteworthy increases are electrical apparatus and supplies, from $5,267,397 to $14,393,666; Portland cement, from $891,950 to $8,625,240; cars and car-works from $2,475,602 to $14,248,654; and iron and steel bridges from $1,755,379 to $3,341,754.

Several members of the Provincial Government, including Hon. Frank Cochrane, Minister of Mines, Hon. Dr. Reaume, Minister of Public Works, and Hon. Nelson Monteith, Minister of Agriculture, who are on a tour of investigation through Northern Ontario, visited Cobalt on June 24. The party are making special inquiries as to the needs of that section with a view of allaying the discontent with existing conditions, which has lately taken the form of threats of secession. While in Cobalt the need of establishing smelters, or at least taking steps to ascertain the values of the ores before they left the country, to be treated abroad, was strongly urged.

E. P. Earle, W. B. Thompson and J. E. Thompson, of New York, accompanied by W. B. Russell, Arthur Ferland and W. H. Linney were in Cobalt recently, inspecting the Violet mine, and the Chambers Ferland holdings, which are to be exploited by a new company they are organizing, known as the "Chambers-Ferland Cobalt," with $1,500,000 capital. Development will be started immediately with W. H. Linney, as engineer in charge.

At a meeting of the Trethewey directors on June 1, it was decided to pass the quarterly dividend payable this month in accordance with the report of Consulting Engineer Frank C. Loring to the effect that money was urgently needed for development purposes. The report stated that in addition to ore marketed there were 6000 tons on the dump, Cobalt, having value sufficient to yield by concentration $10 profit per ton, and an estimated additional 14,000 tons of this grade not extracted, above level No. 1.

The wagon-road which the Provincial Government has undertaken to build from Boston station, on the Timiskaming & Northern Ontario Railway to Larder City, 20 miles long, has been laid out by W. A. Campbell, Deputy Commissioner of Public Works, and construction will be pushed as rapidly as possible in order to finish it this summer. At present it costs $100 per ton to pack freight into camp through the bush.

London

June 22—In an article which appeared in the JOURNAL, June 8, some information is given with regard to the Falmouth Consolidated Mines, Ltd., a company which was recently formed to acquire the Wheal Jane and adjoining tin mines in Cornwall. The prospectus of this company has been published this week. The capital is £150,000, of which £80,000 (£5000 in cash and £75,000 in shares) goes as purchase price. An issue is being made of 55,000 shares, which will provide £5000 for purchase price and £50,000 as working capital. The remaining 2000 shares are kept in reserve.

The bulk of the issue has already been guaranteed, so the company should have no trouble in going ahead. The plant to be installed will be capable of treating 150 tons a day. The record of results obtained by treating the ore is of interest. During the last nine months or so about 1350 tons of ore have been treated by an old custom mill in the neighborhood, and the average extraction has been 24 lb. of concentrate per ton. When the new plant is erected its performance will be looked forward to with great interest.

The promoters of coalite have issued a prospectus, asking for capital. The company is called "British Coalite Company, Limited." The capital is £2,000,000, divided into 500,000 deferred shares of £1 each and 1,500,000 ordinary shars of £1 each. The venders take the whole of the deferred shares and £55,000 in cash as their purchase price, in exchange for which they give the patent rights and the land and works belonging to them. The board of directors is a thoroughly practical one, the directors being business men of high repute. The British patent is numbered 14,365 of 1906, but it is not yet published.

Briefly, the patent consists of making a soft coke that will burn easily in an open fire grate, and the process is conducted at only half the temperature of ordinary coke-making. Coke at present is made for two purposes: Coke for metallurgical purposes has to be hard, and the temperature for the production of a hard coke is a high one. Coke produced in gas-making is also hard, because the high temperature is used in order to obtain the greatest amount of illuminating gas. Mr. Parker's coke is made at a lower temperature because his chief object is to obtain an easily combustible fuel.

There is considerable discussion going on in commercial and scientific circles as to the validity of Mr. Parker's patent. The allegation of the opponents of Mr. Parker and coalite is that the process of making soft coke has been known longer than hard coke. Until the patent specification has been published it is impossible to argue on this point. It is obvious, however, that it is only some special plant or process that can in this case be patented, and not the product itself. Already the Scottish Smokeless Coal Syndicate and the Gas Light and Coke Company, of London, are putting a similar product on the market, undeterred by Mr. Parker's patent.

Mining News from All Parts of the World

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

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Acton Coal Field—The railroad spur has reached the field and shipping of coal has begum.

Alaska

KETCHIKAN DISTRICT

Brown-Alaska Company—B. D. Brown, of New York, president of this company, and of the Alaska Smelting and Refining Company, has sold his interest in these companies to G. D. Mumford, who represents other stockholders. The company owns and operates the Mamie mine, near Hadley, Prince of Wales island, southeast Alaska, and the Outsiders' group, near Maple bay, Portland canal, British Columbia. N .O. Lawton is mine manager. The Alaska Smelting and Refining company smelting works at Hadley smelt the ores of the Brown-Alaska mines and such custom ores as are obtainable. Mr. Mumford is now president of both companies.

Arizona

COCHISE COUNTY

Shattuck—The drift on the 900-ft. level is in 60 ft. and has shown up a quantity of sulphide ore. Bids for the building and equipment of a new smelting plant have been received.

YAVAPAI COUNTY

De Kalb Mining Company—This company has been organized for the purpose of taking over some claims in the Peck mining district.

Logos Mines Company—This company, operating in the Big Bug district, near Mayer, has ordered a 40-h.p. gasolene hoist and a five-drill air compressor. The workings have reached a depth of 60 ft. The ore carries gold and copper.

Octave Mining Company—This company now has its 40 stamps dropping. About 100 men are employed in the mines.

California

BUTTE COUNTY

Butte Mining and Development Company—The Westcott property, on the Magalia Ridge, near Skyhigh, is to be exploited by the new company, the officers of which are G. W. Braden, president; G. W. Walley, secretary, and F. W. Eilersman, treasurer. Over $15,000 worth of development work has already been done. The mine as now developed is evidently a feeder of the Mammoth Channel.

GLENN COUNTY

Manganese—A wide deposit of manganese ore has been found near Stony Ford, and will be developed.

INYO COUNTY

Climax Gold Mining Company—A property in Bishop Creek district, four miles from Chalfant, is being worked by this new company. The mine is the north extension of the old Sacramento claim.

Inyo Mines Syndicate—This company has started work on the Badger claim, in Gunter's cañon. The mine is on the west slope of the White mountains north and east of Laws.

NEVADA COUNTY

Antimony—A deposit of antimony ore has been found on the ranch of Robert Johnson, and will be developed by L'C. Heler, of Grass Valley.

Banner—This mine on Banner hill will shortly resume pumping operations. The operations were closed down last winter on account of the lack of fuel.

PLUMAS COUNTY

Newton Mining and Development Company—S. J. Newton, manager, is about to commence operations on properties about seven miles from Merrimac.

SAN BERNARDINO COUNTY

Manvel Mining Company—New parties have control of the properties of this company at Manvel and a pumping plant is to be put in.

Colorado

LAKE COUNTY—LEADVILLE

Chatauqua Claim—At this claim on Little Ellen Hill, next to the Cleveland claim of the New Monarch, machinery is being installed.

Hibschle Shaft—About 40 tons of lead-silver ore is being shipped daily from this shaft. With rail transportation 100 tons of iron ore could be handled.

Iowa Gulch—Several shipments of gold ore have been made from veins encountered in development work in the Chicago tunnel, operated by the Aurora Mining Company.

Reindeer Shaft—Shipments of silver ore are being made from the upper levels of the Reindeer on Rock Hill. The shaft has been sunk to a depth of 800 ft.

South Seneca Shaft—During the month of May 300 tons of iron ore were shipped from this shaft.

Zinc—Local zinc buyers are putting forth efforts to secure all the available zinc in the market. Immense bodies of zinc ore were recently opened up in the Colorado No. 2 shaft of the Louisville, while the Moyer has also increased its zinc production. An unusual combination of lead and zinc from the Tucson is being shipped to Kansas for treatment.

Idaho

SHOSHONE COUNTY

Snow Storm—The output for June exceeded that of any previous month in the history of the mine. New bunk-houses are being built and new machinery equipment includes a 20-drill compressor driven by a 300-h.p. motor and five induction motors for the mill.

Michigan

IRON—MENOMINEE RANGE

Crystal Falls—A shortage of men is reported at nearly all the mines at Iron River, Stambaugh and Crystal Falls. It is stated that at least 500 men could be employed on underground and surface work at the mines. The companies have been drawing steadily on their stock-piles, which are becoming depleted.

Minnesota

IRON—MESABI RANGE

Oliver Iron Mining Company—This company is pushing the stripping on its Ohio group of four claims at Virginia, and these will hereafter be operated as one. About 40 ft. of overburden, which includes considerable taconite, must be removed. The mines were formerly operated underground in a desultory way. In the Hibbing district the company has pushed the stripping on the Sellers and Pittsburg properties, but these will not be producing for some time to come.

Hull-Rust—These mines, adjoining the big Mahoning pit, are being enlarged, and will soon be among the largest shippers on the range.

St. James—Corrigan, McKinney & Co. will begin shipments from this mine, near Aurora. The ore is of bessemer grade, and is mined underground; the shaft is down 225 ft.

Montana

BUTTE DISTRICT

Boston & Montana—A 10-inch vein of commercial copper ore has been struck at 840 ft. in the Greenleaf. The company is sinking a shaft 1500 or 1800 ft. on this property, and this is the first ore in place it has cut. Daily shipments of ore to the smelter aggregate 3400 tons a day. During the year ended June 1 the company shipped 1,156,785 tons, an average daily production of 3213 tons, the gross yield of which was $14.376 per ton. The gross proceeds for the year were $16,629,643.50, and the net proceeds, $7,049,988.28.

Parrot—At a depth of 1000 ft. sinking has been suspended in the Little Mina, and a station is being cut. Production averages about 250 tons of ore a day.

MISSOULA COUNTY

Cape Nome Copper Mining Company—The annual report of this company operating mines at Clinton recommended the sale of 25,000 shares of treasury stock at 25c. a share to provide funds for continuing development work. Since the organization of the company 520 ft. of drifts have been driven, the 300-ft. shaft has been unwatered and partially timbered, a station cut at the 105-ft. level and machinery, has been installed.

Nevada

LYON COUNTY

Ludwig Copper Company—A. J. Orem & Company, representing the Nevada-Douglas Copper Mining Company, Yerington, has purchased the mines of this company. The properties are almost entirely surrounded by those of the Nevada-Douglas company and the purchase increases the holdings of the latter company to approximately 700 acres and 34 claims and a fraction.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments over the Tonopah Railroad for the week ending June 20 were: Tonopah Company, 1490 tons; Belmont, 225; Tonopah Extension, 200; Montana-Tonopah, 99; Jim Butler, 63; Midway, 41; West End, 40; total, 2158 tons. There were 880 tons shipped from Goldfield, making a total of 3038 tons. In addition the Tonopah Company sent 2540 and the Belmont 1160 tons to the mills.

North Carolina

ASHE COUNTY

Ballou—The Virginia Iron, Coal and Coke Company has purchased these iron mines. The ore is magnetite and was extensively used in early days.

Pennsylvania

ANTHRACITE COAL

Harleigh—This colliery, owned and operated by Madeira, Hill & Company, Philadelphia, will resume work July 1, after an idleness of six months. About 100 men and boys will be employed.

Old Harleigh—G. B. Markle & Company, operators of the Jeddo and Highland collieries, have let a contract to Fred Cuyle, of Philadelphia, for stripping an extensive tract at Harleigh, covering the old Harleigh mines which were drowned out and abandoned 20 years ago.

Warrior Run Coal Company—This company has been granted permission by the courts to dissolve. The stockholders of the company were Fred A. Chase, S. D. Warriner, William H. Sayre, H. Drinker and J. W. Platten.

BITUMINOUS COAL

Connellsville Southern Coke Company—This company has been organized at Connellsville with a capital stock of $200,000, to develop 283 acres of coal and surface land opposite the town of Cheat Haven; 300 ovens will be built. The officers are: S. J. Harry, president; Frank E. Markell, vice-president; J. R. Davidson, secretary; and W. H. Brown, treasurer.

Pittsburg & Westmoreland—This coal company, which recently acquired 5000 acres of coal territory in Washington and Greene counties, has begun sinking two large shafts near Amity.

Utah

JUAB COUNTY

Tintic Ore Shipments—Shipments for the week ending June 22 were 151 carloads, the contributing mines and respective amounts being: Yankee Con., 5; Victoria, 1; Uncle Sam Con., 4; Ajax, 4; Beck Tunnel, 9; Bullion Beck, 3; Carisa. 7; Colorado, 6; Centennial Eureka, 44; De Pue, 4; Eureka Hill, 9; Grand Central, 3; Gemini, 5; Lower Mammoth, 9; La Clede, 2; May Day, 5; Mammoth, 20; Scranton, 6; Tintic Iron, 5.

Eureka Hill—This mine has been closed down for repairs to the shaft.

SUMMIT COUNTY

Park City Ore Shipments—Shipments for the week ending June 23, were 2,313,500 lb., the contributing mines and amounts being: Daly, 99,000; Silver King, 1,475,140; Daly West, 982,000; Ontario, 69,000; Daly Judge, 960,000; Little Bell, 145,000; other mines, 145,000.

Wabash—Development work has been resumed after a shut-down caused by surface water.

TOOELE COUNTY

Hidden Treasure—This property in Dry Cañon has been acquired by E. W. Clark for the Ophir Hill Mining Company. The ore will probably be trammed to Ophir for treatment in the Ophir Hill mill.

Washington

Money prizes totalling $1250 will be offered for two rock-drilling contests to be held at the Spokane Interstate Fair, September 23 to October 5. Several trophy cups, cash prizes and diplomas will be awarded for camp and district mineral exhibits.

West Virginia

GREENBRIER COUNTY

Peoples' Coal and Land Company—This company has been organized at Charleston with a capital stock of $1,000,000 to develop 20,000 acres of coal land along Gauley river, near Elk, in Nicholas and Greenbrier counties.

TAYLOR COUNTY

Harrison Coal Company—This company, organized by Pennsylvania capitalists to develop coal lands, near Grafton, will construct a power-house, tipple and other necessary buildings. The company will work the Pittsburg seam, and expects to ship from 20 to 30 cars daily.

Wyoming

FREMONT COUNTY

Copper Mountain District—Holders of claims west of this district recently organized at a meeting on Tough creek, and decided to petition that the district be enlarged to include all of that part of the mountain east of the east line of the Willow Creek district.

Canada

ONTARIO—COBALT DISTRICT

Cobalt Ore Shipments—Shipments of ore for the week ended June 22 were as follows: Buffalo, 221,130 lb.; Coniagas, 435,860; La Rose, 316,215; Nipissing, 160,000; Trethewey, 61,200. Total, 1,194,406 pounds.

Big Pete—Judgment was given on June 26 in an action against the Cobalt Central Mines Company, confirming its title to the Big Pete and holding the patent, given by the government to Farah, the former owner, to be unassailable.

Nova Scotia—A 6-in. vein has been cut 80 ft. south of the shaft. Assays show 200 oz. of silver per ton.

Silver Leaf—A rich vein, found June 19 on the surface, on being stripped 50 ft. was found to run 4 in. in width, carrying much silver.

Japan

According to a cable dispatch received at Victoria, B. C., serious labor disturbances are reported at the Besshi copper mines, near Miyanoshita, Japan. Ten thousand strikers have burned mine buildings, destroyed property, killed the chief of police at Suimoto, and attacked a regiment of soldiers sent to stop the rioting. Damage done to the mines is estimated at more than $1,000,000.

Metal, Mineral, Coal and Stock Markets

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

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 3—Lake coal shipments are holding fairly strong, but prices have receded; most of the big consumers are well supplied. The Northwest has big stocks of coal and no shortage is feared.

In the East the situation is divided in the bituminous market between a dull, listless condition in New York harbor and strong demand in the far East. The vessel shortage has not been relieved to any extent and freight rates are still being kept at the former high level. Considerable activity still obtains in the Alabama field, but the market is dull in the middle West.

The usual monthly advance of 10c. per ton on broken, egg, stove and chestnut coal took place July 1. There has been no change in the anthracite market.

Some difficulties have arisen over the proposed transfer of the New York, Ontario & Western to the New York Central, and the New Haven company will probably retain control of that road and its anthracite properties for the present.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to June 22 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	1,985 702	2,698,724	I. 713,022
Bituminous	14 940 729	17.955,624	I. 3,014,895
Coke	6 063,741	6,690,937	I. 627,196
Total	22,990,172	27,345,285	I. 4,355,113

The total increase this year, as compared with 1906, was 18.9 per cent.

New York

Anthracite

July 3—The demand for hard coal continues light, but fairly regular. The small sizes are in good demand, and are in fair supply, except for pea and barley. We quote prices as follows: Broken, $4.55; egg, stove and chestnut, $4.80; pea, $3; buckwheat, $2.50; rice and buckwheat No. 2, $1.90@2; barley, $1.50@1.60; all f.o.b., New York harbor.

Bituminous

The Atlantic seaboard soft-coal trade is extremely variable. The market in New York harbor is weak, and there is a good supply of coal on hand at tidewater. Lower-grade coal has sold as low as $2.25 and good Clearfield grades bring about $2.40.

In the far East, however, there is a heavy demand and lack of water transportation is still affecting the market. Along the Sound trade is quiet and coal is in fair demand. There is little doing in all-rail trade, transportation being good and cars in fair supply. In the coastwise market vessels are scarce although it is believed that better conditions will prevail in the market before long, and indications are that freight rates will fall. Current rates of freight are quoted as follows: From Philadelphia to Boston, Salem and Portland, $1.10; to Lynn, Newburyport, Bath, Gardiner and Bangor, $1.25; to Portsmouth, $1.15; to the Sound, 90c.; with towages where usual.

Birmingham

July 1—There will not be much suspension of work at commercial coal mines in this district. Several of the operators recognizing the union miners have signed the wage contract which has been in vogue for the past three years, among them being the Alabama Consolidated, the Southern Steel, the Palos and one or two others.

The old Connellsville mines, in the corner of Jefferson and Tuscaloosa counties, which have not been in operation for several years, recently purchased by Dr. G. B. Crowe and associates, are again at work. Coke is being produced on a large scale, with the demand picking up. There is not too much coke being produced under natural conditions.

Cleveland

July 2—Shipments of coal up the lakes have been heavy during the week, but prices have fallen off under heavy local receipts and a falling off in demand uplake, where dealers seem well supplied. Local interests do not expect an improvement until August. Sales of No. 8 slack are quoted at $1.40@1.45 on track, Pittsburg grade 5c. higher, No. 8 run-of-mine $1.85; ¾ lump $1.95. Discount rates dropped 10c. on anthracite on July 1.

Pittsburg

July 2—The coal market is a trifle stronger this week and prices are well maintained at $1.15@1.20 for mine-run coal at mine. Slack is firmer, the lowest quotation for spot being 60c. a ton, and for future delivery 80c. is asked. Nearly all the mines are in full operation and there is no complaint as to railroad cars. Most of the product of the Pittsburg Coal Company is going to the lake ports for the Northwestern markets. Work on the railroad extensions into the Greene county field is progressing favorably and new coal territory will be opened in a short time. The Pittsburg-Buffalo Company expects to have its new shafts completed within the next two months, when it will begin work on a number of coke ovens. The bulk of the coal from these shafts is to go into the production of coke. All the mines along the Monongahela river continue in operation and a large tonnage is being loaded for shipment to Southern ports when the rivers are again navigable.

Connellsville Coke—All spot coke at low prices has disappeared and prices are stronger, due to active buying for second-half delivery. Strictly Connellsville furnace coke commands $2.40@2.65 and the product of the lower field is quoted at $2@2.25. Foundry coke is firm at $3@3.25 for any delivery. A contract for 35 cars for deliveries over a period of nine months, dating from July 1, was closed this week at $3.15. The Pickands-Magee Coal and Coke Company closed a contract this week and began shipments on 5000 tons of smelter coke for a Mexican interest. The shipments are being made to Baltimore and from that point to Tampico, Mexico, by vessel. The Connellsville *Courier* in its summary for the week gives the production in both regions at 419,574 tons. The shipments amounted to 14,625 cars, distributed as follows: To Pittsburg, 5167 cars; to points west of Connellsville, 8577 cars; to points east of Connellsville, 881 cars.

Foreign Coal Trade

Imports of coal and coke into the United States for the five months ending May 31, were as follows:

	1906.	1907.	Changes.
Great Britain	66,461	20,277	D. 46,187
Canada	695,920	566,448	D. 129,474
Japan	11,496	61,220	I. 49,724
Australia	80,108	150,661	I. 70,553
Other countries	4,101	1,159	D. 2,942
Total coal	858,086	799,765	D. 58,321
Coke	50,053	62,352	I. 12,299
Total	908,139	862,117	D. 46,022

Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal is on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Exports of coal and coke from the United States for the five months ending May 31, are reported as below by the

Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
Anthracite	644,888	966,877	I. 321,989
Bituminous	2,709,699	3,463,013	I. 753,314
Total coal	3,354,587	4,429,890	I. 1,075,303
Coke	306,490	348,680	I. 42,190
Total	3,661,077	4,778,570	I. 1,117,493

These figures do not include coal bunkered, or sold to steamships engaged in foreign trade. The coke exported went chiefly to Mexico and eastern Canada; the distribution of the coal was as follows:

	1906.	1907.	Changes.
Canada	2,314,882	3,114.123	I. 799 241
Mexico	446,231	494,158	I. 47,927
Cuba	327,204	350,268	I. 23,064
Other W. Indies	140,654	213,991	I. 73,337
Europe	34,687	39,150	I. 4,463
Other countries	90,929	218,200	I. 127,271
Total	3,354,587	4,429,890	I. 1,075,303

The exports to Europe were chiefly to Italy; those to other countries, to South America. The exports to Canada—70.3 per cent. of the total in 1907—were, in detail, as follows:

	1906.	1907.	Changes.
Anthracite	626,583	948,560	I. 321,977
Bituminous	1,688,299	2,165,563	I. 477,264
Total	2,314,882	3,114,123	I. 799,241

There was a large increase this year, in both anthracite and bituminous coals.

Iron Trade Review

New York, July 3—The markets for pig iron and for structural steel, plates, pipe and billets continue strong, although pig-iron makers are beginning to feel a slowing down of new business. Their product is sold well into the first quarter of 1908. The general pig-iron market is decidedly easy at present. The threatened strike among blast-furnace workers in the Pittsburg district did not materialize and furnace-owners do not anticipate further trouble. Many rolling mills throughout the country have shut down for the annual repairs and this work will be rushed.

Our Pittsburg correspondent reports that the rail-makers who figured on the Cassatt specifications demand an advance of $5 a ton for rolling the rails. The report that there is friction between the railroad company and the steel corporation regarding the new specifications for rails is denied. There is a difference, however, but it is of a commercial and not a metallurgical nature. It was learned that the Pennsylvania Railroad specifications for the 142,000 tons of rails it will require next year call for a discard of 25 per cent. from the top of the ingot and an increase in the severity of the drop test. There are some other features, but they are not of special importance. Rail mills can make any kind of a rail desired and the only trouble that may be encountered will be on the price.

Reports come from England of a plan for organizing a trust, or combination, which will include a number of firms and companies, and will control between 50 and 60 per cent. of the British output of finished iron and steel. The arrangements are said to be well advanced, and details will soon be made public.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for May, and the five months ended May 31, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
May	$15,685.722	$14.593,643	D. $1 092 079
Five months	70,638,763	76,965,100	I. 6,326,337

The total increase for the five months was 8.9 per cent. The leading items of export for the five months were, in long tons:

	1906.	1907.	Changes.
Pig iron	28,209	35 688	I. 7,479
Billets, ingots & blooms	112.152	46,898	D. 65,254
Bars	36 437	39 451	I. 3,014
Rails	153,730	124,450	D. 29 280
Sheets and plates	42,132	57 157	I. 15,025
Structural steel	40,691	53,828	I. 13 137
Wire	73,162	63,729	D. 9,433
Nails and spikes	30,033	23,398	D. 6.635

The notable decreases were in rails, billets and nails. The chief increases were in bars and structural steel.

Iron and Steel Imports—Imports of iron and steel, including machinery, in the United States for May and the five months ending May 31, are valued by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
May	$2,859.492	$4,520,103	I. $1,660.611
Five months	12.735,473	18,262,387	I. 5,526,914

The increase for the five months was 43.4 per cent. The chief items of the iron and steel imports for the five months were, in long tons:

	1906.	1907.	Changes.
Pig iron	124,644	286,259	I. 161,615
Scrap	9 358	8,531	D. 827
Ingots, blooms, etc	8,424	6,988	D. 1,436
Bars	11,930	12,635	I. 1,705
Wire-rods	6,892	7.440	I. 548
Tin-plates	19.767	26.991	I. 7,224

The larger increases were in pig iron and tin-plates. The only decreases were in scrap, ingots and blooms.

Iron Ore Movement—Exports and imports of iron ore in the United States for the five months ended May 31 are reported as follows, in long tons:

	1906.	1907.	Changes.
Exports	43.246	14,040	D. 29,206
Imports	475,654	538,767	I. 63.123

Most of the exports were to Canada. Imports were from Cuba, Spain and Algeria.

Imports of manganese ore for the five months ended May 31 were 68,449 tons in 1906, and 74,628 tons in 1907; an increase of 6179 tons. Most of the ore received this year was from India and Brazil.

Baltimore

July 2—There were no imports of spiegeleisen and ferromanganese for the week. The receipts of iron ore were 5500 tons from Cartagena, Spain. One cargo of manganese ore, 6400 tons, was received from Vizigapatam, India.

Birmingham

July 1—Some small sales of pig iron are still being made. Very little effort is being made to push the trade. The production in the Southern territory shows a little improvement. The furnace of the Southern Steel Company, at Gadsden, lost another week's time on account of some necessary repairing.

The attention given to the raw material supplies is at last showing results, especially in the output at the ore mines. A large influx of foreign labor is noted. A number of German laborers are getting out ore in Jefferson county.

Pig-iron quotations remain the same. No. 2 foundry, delivery during the fourth quarter of the year, is $21.50 per ton. Iron selling for delivery during the first half of 1908 is still quoted at $18.50 per ton, No. 2 foundry.

Cleveland

July 2—Ore shipments from Lake Superior ports last month promise to figure approximately 6,400,000 tons. The Corrigan-McKinney and Pickands-Mather mines are shipping the heaviest quantities in their history and the movement to lower lake ports is extremely large.

The pig-iron market carries an easier tone, due to a light demand. Indications are that foundries are well supplied to carry over until furnaces are in blast again. Spot prices are quoted at $24 for No. 2 foundry Northern, a few sales being made during the week at that price. Last half delivery prices are quoted unchanged at $23.90 for bessemer; No. 1 foundry 24.50; No. 2, 24; No. 3, $23.50; No. 2 Southern, $24.35; 8 per cent. silvery, $22.50.

The coke market is not as active as during the last three weeks, but prices are firm. Foundries are about all contracted up for the balance of the year. Spot prices on furnace grade are quoted at $2.15@2.45. Last half unchanged at $2.25@2.50; foundry grade $3.15@3 35 per ton.

Philadelphia

July 3—Dull pig-iron markets prevail throughout this territory. The business amounts only to small lots, mostly irons for special purposes. The shading of prices has retarded rather than stimulated business. This condition will continue. Makers are indifferent and even interest in basic iron has subsided. Foundries are well supplied to the end of the third quarter and mills are not buying at present. It is thought here that foreign iron will weaken and if it does, there is a chance of doing some business. No. 2 for fourth quarter has been quoted at $23 and forge at $22.25. Basic iron for the same delivery, $23. Low phosphorus $27@27.50.

Steel Billets—Rolling billets are active at $32@34 for early delivery. A good business is expected but buyers do not need to act in a hurry as most of them have placed contracts.

Bar Iron—Steel bars continue to sell at a premium and present prices will hold because of reflected conditions in western mills. The repairing season is on. Refined commands 1.85c. in a large way. The stores are doing a good business.

Sheets, Pipes and Tubes—Sheets are unchanged. Pipes are high and hard to get. Big tube renewal-contracts are due and a few have been already placed.

Plates—The rush of big orders in outside territory will help to maintain premium quotations on the business done here. Boiler plates continue very active and the mill people expect a large summer business. Tank, in small lots brings 1.90@2c.; flange 2.10; marine plate 2.25@2.50 and locomitive steel, 2.50.

Structural Material—Reflected western conditions are keeping prices at the top notch. Considerable small business is coming along for local requirements. Premium prices on this business is the rule.

Steel Rails—Much uncertainty surrounds the rail situation. Light rails continue in good demand.

Scrap—No. 1 steel is held at $18.50; railroad at $20.50; No. 1 yard scrap, $18.50; machinery scrap, $20.50.

Pittsburg

July 2—Outside of the large plants of the Carnegie Steel Company, most of the iron and steel mills in the Pittsburg and Valley districts, were entirely or partially closed yesterday for the usual annual repairs. The McKeesport works of the National Tube Company and about half of the mills of the American Sheet and Tin Plate Company will be down for about two weeks. All the plants of the Republic Iron and Steel Company are idle, but the repairs will be rushed as the company is crowded with orders, the number of specifications and orders on the books July 1 being four times greater than last year. All the large companies report an excess of business compared with previous years, but there has been a decline in new business lately. The Carnegie Steel Company has received contracts for plates for seven lake vessels which will amount to about 22,000 tons. An order for 8000 tons of steel for bridge work for the Great Northern Railroad was booked by the American Bridge Company and the McClintic-Marshall Construction Company received an order for 1000 tons for a viaduct. The sheet market continues strong, and it is probable that an advance of $2 a ton will be ordered in galvanized sheets, due to the high price of spelter. No change in black sheets will be made this year, as sales have been made for large tonnages for deliveries extending into the fourth quarter. Rail orders are extremely light both for this year and next year delivery. Railroads are evidently awaiting the result of the controversy between the Pennsylvania Railroad and the United States Steel Corporation.

The Pittsburg Steel Company, the large independent wire interest, yesterday gave the Carnegie Steel Company notice of cancellation of the five-year contract for billets made about two years ago. This contract was entered into for the purpose of inducing the Pittsburg Steel Company to abandon its plans for the erection of a steel plant. It had the privilege of terminating the contract in three years, and has taken advantage of this feature of the agreement by giving one year's notice. As has already been mentioned the Pittsburg Steel Company has arranged to issue $4,000,000 in bonds for the purpose of providing funds for extensions to its plant at Monessen, Penn. It proposes to build eight 60-ton open-hearth furnaces, a blooming mill and three billet mills. Work will be rushed, and it is likely the new steel plant will be in operation early next year.

The pipe mills are still congested with orders and new business is being offered every week. Spang, Chalfant & Co. have taken an order for 10 miles of 16-in. line pipe, and La Belle Iron Works received two large contracts, one for 20 miles of 12-in. and the other for 10 miles of 10- and 12-in. line pipe. The National Tube Company has enough orders on the books to keep all of its plants running steadily through the year.

Pig Iron—The pig-iron market remains quiet. It is reported that the United States Steel Corporation has taken the 15,000 tons of basic iron thrown on the market through the failure of Milliken Brothers. The iron was bought for delivery in the third quarter. The report that the corporation took the iron has not been confirmed, but it is known that it got 510 tons that was loaded on cars at the time shipments were stopped. The only sale of bessemer iron was one lot of 1500 tons for fourth quarter at $23, Valley furnaces. The price for prompt and third-quarter ranges from $23 to $23.50. Basic iron is about 50c. under bessemer, and No. 2 foundry rules at about the same price as bessemer. Gray forge is quoted at $23.90, Pittsburg. The strike of blast-furnace workers, scheduled for July 1, did not materialize, and there is not likely to be any trouble. A meeting of furnace-owners was held here yesterday, and it was decided to ignore the workers' organization, but furnaces may adjust wages and conditions with their employees if they desire.

Steel—The Carnegie Steel Company is reported to have bought fully 40,000 tons of bessemer steel billets from the Cambria Steel Company within the past few weeks to take care of its outside contracts, including the one with the Pittsburg Steel Company. Bessemer billets are quoted at $29.50@30, and open-hearth at $31@32. Plates remain at 1.70c., and merchant steel bars at 1.60c.

Sheets—The sheet market is decidedly strong, although there is not much new business in black sheets. Demand for galvanized sheets is heavy, and an advance of $2 a ton may be ordered. Black sheets are quoted at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—For spot shipment $64@65 is quoted, and for future delivery the price is from 50c. to $1 less.

Metal Market

NEW YORK, July 3.

Gold and Silver Exports and Imports

At all United States Ports in May and year.

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

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending June 29 and years from Jan 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 5,123,750	$ 65,848	$ 2,794,393	$ 35,782
1907......	24,600,089	5,742,368	22,669.026	854,202
1906.....	5,738,021	44,766 034	31,003,965	1,062,114
1905.......	36,878,999	6,490,636	15,994,270	1,856,697

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

The joint statement of all the banks in the New York Clearing House for the week ending June 29, shows loans $1,126,539,100, a decrease of $7,813,700; deposits, $1,092,031,700, a decrease of $14,950,300, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie......................	$187,184,500	$200,792,500
Legal tenders.	87,275,500	74,724,700
Total cash	$274,460,000	$275,517,200
Surplus....................	$12,055,750	$ 2,509,275

The surplus over legal requirements this year shows a decrease of $3,117,325, as compared with the previous week.

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

	Gold.	Silver.	Total.
Ass'd New York	....	....	$200,792,500
England........	$177,721,105	....	177,721,105
France.........	562,464,335	$198,479,105	760,943,440
Germany.......	181,450,000	60,485,000	241,935,000
Spain..	77,700,000	129,125,000	206,825,000
Netherlands....	26,788,500	28,735,500	55,524,000
Belgium........	16,120,000	8,060,000	24,180,000
Italy...........	161,915,000	24,558,500	186,473,500
Russia..........	582,185,000	32,910,000	615,095,000
Aust.-Hungary.	228,500,000	63,140,000	291,640,000
Sweden.........	20,705,000	....	20,705,000

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

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to June 20:

	1906.	1907.	Changes.
India.........	£ 9,063,613	£5,867,244	D. £ 3,196,369
China.......	....	....	....
Straits......	1,750	505,362	I. 503,612
Total.......	£ 9,065,363	£6 372,606	D. £ 2,692,757

Receipts for the week were £5000 from Australia, £210,000 in bars and £31,000 in Mexican dollars from New York; £246,000 in all. Exports were £131,100 in bars and £79,600 in Mexican dollars; £210,700, all to India.

Indian exchange has been steady, all the Council bills offered in London being taken to 16.09d. per rupee.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars......	$0.52	$0 54
Peruvian soles and Chilean...... ...	0.47¼	0.50¼
Victoria sovereigns............	4.85	4.87
Twenty francs.	3.85	3.89
Spanish 25 pesetas...	4.78½	4.80

SILVER AND STERLING EXCHANGE.

June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
27	4.8690	67⅛	30⅞	1	4.8660	67⅜	31 1/16
28	4.8640	67⅛	30 15/16	2	4.8690	67⅜	31 1/16
29	4.8660	67¼	31	3	4.8700	67⅜	31

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

Other Metals

June.-July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
27	23½ @24	22 @22¼	96⅛	43	5.75	6.35 @6.40	6.20 @6.25
28	23½ @24	22 @22¼	97¾	42¾	5.75	6.35 @6.40	6.20 @6.25
29	23½ @24	22 @22¼	.....	42¾	5.75	6.35 @6.40	6.20 @6.25
1	23 @23½	22 @22¼	98⅞	42½	5.75	6.30 @6.35	6.15 @6.20
2	23 @23½	22 @22¼	98½	42¾	5.75	6.27½ @6.32½	6.12½ @6.17½
3	23 @23½	22 @22¼	99¾	42½	5.25	6.27½ @6.32½	6.12½ @6.17½

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

Copper—The business of the past week has again been almost entirely with foreign consumers, who have placed orders for some good-size lots of electrolytic during the last day or two. Consumers on this side have continued to remain out of the market. However, it is anticipated that the deadlock will soon be broken. It is rumored that certain of the sellers who have been holding aloof for a long time back have this week offered copper at the prevailing price. The close is 23@23½c. for Lake and 22@22¼c. for electrolytic. The business in casting during the week has been done at 21@21¼c.

It is reported from London that a great many short commitments will have to be covered during the early part of this month, and the effect of this has been felt in both spot and three months' options, the close of which is cabled at £99 17s. 3d. and £94 2s. 6d., respectively.

Statistics for the second half of June show an increase in the visible supplies of 1100 tons.

Refined and manufactured sorts we quote: English tough, £102; best selected, £106; strong sheets, £113.

Exports of copper from New York for the week were 2721 long tons. Our special correspondent reports exports for the week from Baltimore at 1355 long tons copper.

The movement of foreign copper in Germany for the four months ended April 30 was: Imports, 39,059 metric tons; exports, 2834; balance, imports, 36,225 tons, a decrease of 2579 tons from last year. Of the imports this year the United States furnished 31,103 tons.

The Consolidated Copper Company, recently organized with $50,000,000 capital stock, will, it is reported and generally believed, take over a number of copper properties in Nevada, which are now being developed.

Tin—The decrease in the statistics for the month of June of 1400 tons started the ball rolling, and under aggressive bidding by the bull operators, the market advanced from day to day, closing very firm at £199 for spot, £184 for three months'. The unreasonable backwardation makes legitimate buyers very cautious, and their purchases are restricted to immediate needs. Liberal arrivals have helped to reduce the premium for spot, but it has not altogether disappeared. Business is being done in New York at 42½@42¾c.

Lead—The American Smelting and Refining Company reduced its price $10 per ton, July 3, thus making the quotation for desilverized lead at New York 5.25c.

After the reaction reported last week, the market in London has recovered and closes steady at £20 15s. for Spanish lead, £20 17s. 6d. for English lead.

St. Louis Metal Market—The John Wahl Commission Company reports (July 2): Lead appears to be on the down grade and the metal has few friends at the present time. Latest sales here are on basis of 5.57½c., East St. Louis, for Missouri brands, and even at these prices there are more sellers than there are buyers.

Spelter—A number of sellers have been trying to force the market and, not finding a ready outlet, they have lowered their prices from day to day. The market closes weak at 6.27½@6.32½ New York, 6.12½@6.17½ St. Louis.

Weakness also prevails in the London market, which closes lower at £24 for good ordinaries, £24 5s. for specials.

No decision has yet been rendered in the appeal of the Government in the zinc-ore case. The delay is causing considerable annoyance among importers and others who are interested in the decision.

The American Zinc, Lead and Smelting Company will double the capacity of its plant at Caney, Kan., and will add two blocks of furnaces to its plant at Deering, Kan. These additions will be made as quickly as possible. When completed the company will have a total of 18 blocks.

The new smelter of the Bartlesville Zinc Company, at Bartlesville, Kan., is expected to be ready for operation by Oct. 1 next.

Antimony—The market is quite dead. It is hoped that the bottom has been reached, but this is uncertain. The only thing that is certain is that no business to speak of is being done at present. Quotations are 13½@14c. for Cookson's; 12@13c. for Hallett's; and 10@11c. for ordinary brands.

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

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

Minor Metals — For minor metals and their alloys, wholesale prices are, f.o.b. works:

	Per Lb.
Cadmium, 99.5% f. o. b. Hamburg....	1.40@1.46
Chromium, pure (N. Y.)...............	80c.
Copper, red oxide....................	50c.
Ferro-Chrome (70)....................	11½c.
Ferro-Chrome (7-9% carbon, per lb. Cr.)	10½c.
Ferro-Chrome (66–71% Cr., 6% C.).....	12c.
Ferro-Chrome (66-71% Cr., 6.5% C.)...	11½c.
Ferro Chrome (60-70% Cr., 1% C. or less)	38c.
Ferro-Molybdenum (50%).............	$1.00
Ferro-Titanium (20%)...	90c.
Ferro-Tungsten (37%)......	60c.
Ferro-Vanadium (25-50%, per lb. vanadium contents)........	$6.00
Magnesium, pure (N. Y.)..............	1.50
Manganese, pure 98@99% N. Y.......	75c.
Manganese—Copper (30@70%) N. Y..	45c.
Molybdenum (98@99%, N. Y.).......	$1.65
Phosphorus, foreign red (f. o. b. N. Y.)	90c.
Phosphorus, American yellow (f. o. b. Niagara Falls)....	42c.
Tungsten (best) pound lots...........	1.35
Ferro-Silicon (50%) spot. Ex. ship Atlantic ports......................	$110 ton.

Variations in price depend chiefly on size and condition of orders.

Platinum—No change occurred during the past week, and refiners do not expect any material change in price of the metal; it is believed that if any change occurs it will consist in a slight shading off from present quotations. Prices remain as follows: Ordinary metal, $26 per oz.; hard metal, $28.50. Scrap is quoted at $20@21 per ounce.

Imports and Exports of Metals

Copper — Exports of copper from the United States for the five months ended May 31 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each:

	1906.	1907.	Changes
Great Britain	8,913	7,170	D. 1,743
Belgium	908	484	D. 424
France	15,389	11,433	D. 3,956
Italy	2,872	3,409	I. 537
Germany and Holland	45,686	34,846	D. 10,840
Russia	799	1,160	I. 361
Other Europe	5,206	3,764	D. 1,442
Canada	532	536	I. 4
China	1,200	. ..	D. 1,200
Other countries	55	74	I. 19
Total metal	81,560	62,876	D. 18,684
In ores and matte	2,893	2,125	D. 768
Total	84,453	65,001	D. 19,452

The total decrease was 23 per cent. The actual quantity of ore and matte exported this year was 34,821 tons, of which 29,151 tons went to Canada, 5490 tons to Mexico, the balance to Great Britain and Germany.

Imports into the United States of copper and copper material for the five months ended May 31, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico	16,746	7,303	24,049
Canada	5,383	2,449	7,832
Great Britain	8,514	......	8,514
Japan	1,346	......	1,346
South America	......	1,683	1,683
Other countries	9,635	734	10,369
Total imports	41,624	12,169	53,793
Re-exports	178	....	178
Net imports	41,446	12,169	53 615
Net imports, 1906	31,517	9,650	41,167

The total increase in the net imports was 12,448 tons, or 30.2 per cent. The actual tonnage of ores and matte imported from Mexico this year was 41,385 tons; from Canada and Newfoundland, 46,273 tons; from South America, 12,251 tons.

The exports and net imports compare as follows for the five months:

	1906.	1907.	Changes.
Exports	84,453	65,001	D. 19,452
Net imports	41,167	53,615	I. 12,448
Excess, exports	43,286	11,386	D. 31,900

This shows a decrease this year of 73.7 per cent. in the excess of exports.

Tin—Imports of tin into the United States for the five months ending May 31 were as follows, in long tons:

	1906.	1907.	Changes.
Straits	6,564	6,515	D. 49
Australia	443	363	D. 80
Great Britain	11,510	9,787	D. 1,723
Holland	203	553	I. 350
Other Europe	776	483	D. 293
Other countries	30	24	D. 6
Total	19,526	17,725	D. 1,801

There was a decrease of 9.2 per cent. in the imports this year.

Lead—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the five months ended May 31, in short tons of 2000 lb. each:

	1906.	1907.	Changes.
Lead, metallic	4,180	7,033	I. 2,853
Lead in ores and base bullion	32,833	25,215	D. 7,618
Total imports	37,013	32,248	D. 4,765
Re-exports	19,973	10,142	D. 9,831
Net imports	17,040	22 106	I. 5,066

Of the imports this year 21,341 tons were from Mexico and 3726 tons from Canada. Exports of domestic lead were 97 tons in 1906 and 203 tons in 1907, an increase of 106 tons.

Spelter—Exports of spelter, zinc dross and zinc ores from the United States for the five months ending May 31 are reported as below, zinc ore being in long tons, the others in short tons:

	1906.	1907.	Changes.
Spelter	1,847	304	D. 1,543
Zinc dross	4,775	5,379	I. 604
Zinc ores	10,275	8,070	D. 2,205

Imports of spelter for the five months were 2023 short tons in 1906, and 479 tons in 1907; a decrease of 1544 tons.

Antimony — Imports of antimony into the United States for the five months ended May 31 were as follows, in pounds:

	1906.	1907.	Changes.
Metal and regulus	3,234,590	4,361,187	I. 1,126,597
Antimony ore	616,336	1,466,043	I. 849,707

There was a large increase this year, both in metal and ore.

Nickel—Imports of nickel ore and matte into the United States for the five months ended May 31 were 5703 tons in 1906, and 6713 tons, containing 8,265,284 lb. metal, in 1907. The metal contents were not reported last year.

Exports of nickel, nickel oxide and nickel matte for the five months were 4,717,181 lb. in 1906, and 4,784,163 lb. in 1907; an increase of 66,982 lb. this year.

Platinum—Imports of platinum into the United States for the five months ended May 31 were 5310 lb. in 1906, and 3436 lb. in 1907; a decrease of 1874 lb. this year.

Quicksilver—Exports of quicksilver from the United States for the five months ended May 31 were 252,842 lb. in 1906, and 223,338 lb. in 1907; a decrease of 29,504 lb. this year.

Aluminum—Exports of aluminum from the United States for the five months ended May 31 were valued at $68,129 in 1906, and $131,247 in 1907; an increase of $69,118 this year.

Missouri Ore Market

Joplin, Mo., June 29—The highest price of zinc was $51 per ton on an assay base of $46@48 per ton of 60 per cent. zinc. The average price was $45.82. The highest price for lead was $76 for one lot, closing the week lower at $68. The average price was $71 per ton.

The half-year now ended marks the most remarkable increase ever recorded in the district, with an increase of 22,491 tons of zinc and 6006 tons of lead, the value being $2,073,733 greater than the first half of 1906. It is possible that the increase of the year will exceed 50,000 tons of zinc ore, and the value be three to four million dollars greater.

Following are the shipments of zinc and lead from the various camps of the district for the week ending June 29:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,111,560	1,124,350	$112,473
Joplin	2,464,640	415,430	74,791
Galena-Empire	1,402,860	263,300	42,182
Duenweg	1,137,370	322,970	38,031
Alba-Neck City	1,284,110	......	31,460
Aurora	614,930	36,740	13,193
Badger	513,390	....	12,578
Granby	640,000	66,000	10,900
Prosperity	253,030	92,800	9,194
Baxter Springs	185,490	118,240	8,582
Oronogo	252,270	53,330	7,634
Spurgeon	301,360	44,130	7,151
Sarcoxie	184,000	... ...	4,232
Zincite	123,190	22,660	3,688
Cave Springs	140,840	....	3,310
Springfield	....	63,880	2,235
Carthage	83,160	....	2,037
Sherwood	29,480	23,760	1,863
Carl Junction	54,530	4,050	1,395
Totals	12,776,210	1,315,560	$386,929
Six month	316,004,490	49,554,240	$9,373,815

Zinc value, the week, $292,792; 6 mos., $7,377,374
Lead value, the week, 94,137; 6 mos., 1,996,441

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

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51	45.98	May	78.40	79.56
June	43.83	44.82	June	80.96	73.66
July	43.25	.....	July	74.31	.....
August	43.56	.....	August	75.36	.....
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.13	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

Platteville, Wis., June 29—The price for 60 per cent. ore climbed up to an average of $47@48, while the lower grades sold at their usual prices. The weather was quite favorable for the entire week, the roads being fair, but the usual shortage of cars prevailing. The majority of the ore produced was sold and most of the ore for the coming week has also been sold, leaving no surplus in the bins.

The price of 84 per cent. lead was $78 while 75 per cent. sold at $68. It will be noticed that lead is still off and the producers all persist that they will not sell on the lower market. Sulphur and dry bone suffered no material change.

Following is the shipment of the district, by camps, for week ending June 29, 1907.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	729,990	.....	.....
Benton	644,300	.....	.....
Highland	407,600	.....	.....
Mineral Point	349,980	.....	.....
Linden	235,040	.....	40,000
Cuba City	211,120	82,670	.....
Harker	194,680	.....	.....
Livingston	180,000	.....	.....
Galena	79,100	.....	.....
Rewey	......	.....	.....
Buncombe-Hazel Green	......	.....	.....
Total for week	3,031,810	82,670	40,000
Year to June 29	49,908,815	1,959,110	229,160

The tonnage for the Shullsburg camp has not been reported so far this year, owing to the fact they do not ship ore each week. The shipping figures, March 21 to June 25, were 877,300 lb., while the net output for the same period was 980,700 lb. No report was received for the week from Buncombe-Hazel Green camp.

Chemicals

New York, July 3—Imports of heavy chemicals into the United States for the five months ended May 31 are reported as follows, in pounds:

	1906.	1907.	Changes.
Bleaching powder	47 555,091	50,320,661	I. 2,765,570
Potash salts	77,470.264	92.707,964	I. 15,237.700
Soda salts	9,247,008	9,985,338	I. 738,330

Exports of acetate of lime for the five months were 27,279,428 lb. in 1906, and 38,477,032 lb. in 1907; an increase of 11,197,604 lb. this year.

Phosphates—Exports of phosphates from the United States for the five months ended May 31 were, in long tons:

	1906.	1907.	Changes.
Crude	431,404	395,203	D. 36,201
All other	9,200	12,544	I. 3,344
Total	440,604	407,747	D. 32 857

The chief exports this year were 123,665 tons to Germany; 64,204 to Great Britain; 63,819 to France; 34,596 to Italy.

Sulphur—Imports of sulphur and pyrites into the United States for the five months ending May 31 were, in long tons:

	1906.	1907.	Changes.
Sulphur	37,644	13,361	D. 24,283
Pyrites	225,572	244,388	I. 18,816

The decrease in sulphur imports is due to the utilization of Louisiana sulphur in place of the Sicilian product. Estimating sulphur contents of pyrites, the total imports of sulphur were 127,893 tons in 1906, and 103,116 tons in 1907, a decrease of 24,777 tons.

Copper Sulphate—During the past week prices have receded, owing to the depreciation in the cost of copper metal. Quotations are off ¼c. to $7.25 per 100 lb. for carload lots, and some independent producers are offering the salt at $7.12½ per 100 lb. Smaller lots bring ¼c. more, depending on seller and terms of sale.

Exports of copper sulphate from the United States for the five months ended May 31 were 16,539,408 lb. in 1906 and 5,646,745 lb. in 1907; a decrease of 10,892,663. The exports this year contained the equivalent of about 706 short tons of fine copper.

Nitrate of Soda—The market is quiet but firm, with demand continuing good and supplies about the same as usual. Prices are unchanged. We quote 96 per cent. for 1907 at 2.55c., with 95 per cent. at 2.47c. For next year's delivery these grades are quoted at 2.55½c. and 2.50c., respectively.

Mining Stocks

New York, July 2—Early in the week the tone of the market was somewhat depressed and showed considerable weakness, partly owing to the failure on the part of New York City to float a bond issue; this, together with exports of gold to France, kept prices down at first. This condition, however, soon improved and the general market gained in strength, while mining stocks showed a decided improvement. Amalgamated and American Smelting common had the best movements, the former closing at $86⅛, an increase of nearly $1.50; the latter, after going up and down during the week, closed at about the same figure as a week ago. United States Steel closed up $2⅝, at $37. The curb market was inclined to dullness and comparatively few sales were made, at only fractional advances. More strength was shown in industrial than in mining stocks.

The Consolidated Copper Company has been incorporated under the laws of Delaware with $50,000,000 of stock, divided into shares of $5 each. It is expected that the company will take over certain properties in the Ely, Nevada and Utah fields. It is believed that James Phillips, Jr., W. Hinkle Smith and Wm. B. Thompson will be largely interested in the new company. Guggenheimer, Untermyer & Marshall are the attorneys. In making the par value of the shares $5 the fact was taken into consideration that this is the par value of nearly all the mining stocks listed upon the London and Paris stock exchanges.

Boston

July 2—The market shows a decided improvement and the best copper shares are materially higher, while there is a better disposition toward the others. The hand of T. W. Lawson is also apparent in the sharp advance in Trinity and Balaklala shares. The increase in the Osceola and Tamarack dividends and an initial dividend by the Old Dominion Company of New Jersey also gave inspiration to the trading. Amalgamated is up $2.25 to $86.75 for the week, and Copper Range over $3 to $81.62½. North Butte has been well bought, advancing $4.25 to $83.50. Trinity had the most conspicuous advance, going up over $6 today to above $29. Balaklala is up $1.62½ for the week to $10.62½, and Butte Coalition $1.75 to $26.75. Boston Consolidated scored a $2.37½ rise to $28.12½ and Isle Royale $1.75 to $21.75. Mohawk is up $5 to $83, Old Dominion $3.25 to $48.50, and Utah Consolidated $1.62½ to $53.50.

Osceola and Tamarack both broke on the dividend announcement on June 27, but subsequently recovered. The former fell $5 to $130 and the latter, after falling to $110, has recovered to $118. Osceola directors declared a semi-annual dividend of $7 and Tamarack $4. Both companies earned a great deal more than these amounts represent, but conservative action prevailed. Calumet & Hecla benefits to the amount of $158,697 by its ownership of Osceola stock. Osceola's annual meeting has been further adjourned to Jan. 2, 1908, by agreement of counsel. Calumet & Hecla is up $15 to $815. Vice-president Thomas L. Livermore, of Calumet & Hecla, has had direction of Calumet copper sales for 17 years and in an affidavit he says that more than 1,000,000,000 lb. of copper have been sold under his direction, at a total price of more than $128,000,000, and an average price of between 12 and 13c.

Bingham stock has recovered $1.50 during the week, touching $16, and Calumet & Arizona is up $13 to $160 on normal trading. Michigan is up $1.50 to $14.25, Parrot $1.50 to $20.50, Quincy $4 to $119, and Wolverine $5 to $160. The new $50,000,000 copper combination by the Guggenheims to take over Nevada properties has not caused a ripple here.

Nevada-Utah has been the curb feature, advancing to $6.25 here on heavy trading. This company has an option on the Consolidated Arizona Smelting Company. Shares of the latter sold on the curb today for the first time at $5. Boston & Corbin rose almost $2 on the curb to $12.62½ per share.

Colorado Springs

The local stock market seems to have gone on a summer vacation. Prices are slowly but surely dropping every day; the entire list shows signs of a decided slump. The El Paso Consolidated recently paid a dividend. but a well authenticated report has it that the lower workings of this mine are being flooded and in all probability will not be accessible until the new drainage tunnel penetrates for enough to relieve the situation.

San Francisco

June 28—The San Francisco stock and exchange board has raised the rates of commission of brokers dealing in mining stocks from 0½ per cent. to 1 per cent. flat. The commission is still lower than that charged in any other exchange in the United States for the handling of mining stocks. At Goldfield the rate is 1½ per cent. flat. On the New York curb the commissioners on a sliding scale that runs from 1 per cent. a share for stocks sold from 20c. to $1, to 12½c. a share for stocks that bring $5 or more a share. The minimum commission on the New York curb is $1. At Butte the commissions range from 1½c. a share on stocks bringing from 25 to 50c. a share to 12½c. a share for stocks sold at $10 and upward. The minimum Butte charge is $12. The old rate in San Francisco of 0½ per cent. was based on dealings in stocks that sold for hundreds of dollars a share. There are few stocks on the present list that sell for more than $1 a share now. There are risks and delays in payments, and there are telegraphic charges and other expenses and the time taken up to be considered. San Francisco is still the cheapest place for payment of mining commissions, even under the new rate, in this country.

STOCK QUOTATIONS

NEW YORK July 2

Name of Comp.	Clg.
Alaska Mine	15/16
Am.Nev.M.&P.Co.	....
Amalgamated	86 1/8
Anaconda*	58 1/4
Balaklala	10 1/2
British Col. Cop.	9
Buffalo Cobalt	2 1/4
Butte & London	....
Butte Coalition*	26 3/4
Butte Cop. & Zinc.	....
Cobalt Contact	....
Colonial Silver	2
Cum. Ely Mining.	8
Davis Daly	13
Dominion Cop	5 3/4
El Rayo	5
Foster Cobalt	65
Furnace Creek	9/16
Giroux Mine	8 1/4
Gold Hill	2
Granby, New	....
Greene Gold	1 5/8
Greene G. & S	1 3/8
Greenw'r & D.Val.	75
Guanajuato	3 1/4
Guggen. Exp.	212 1/2
Hanapah	50
McKinley Dar	1 1/8
Micmac	5 1/4
Mines Co. of Am.	1 3/8
Mitchell Mining	2 7/8
Mont.Sho. C.(New)	7 1/4
Nev. Utah M. & S.	6 1/8
Newhouse M. & S.	17
Nipissing Mines	11 1/4
Old Hundred	2 5/8
Silver Queen	1 1/8
Stewart	2 1/8
Tennessee Copper	38 1/2
Union Copper	3/4
Utah Apex	6 3/8
West Columbus	11

N. Y. INDUSTRIAL

Am. Agri. Chem.	....
Am. Smelt. & Ref.	118 1/4
Am. Sm. & Ref., pf.	107 1/8
Bethlehem Steel	11
Colo. Fuel & Iron.	32 3/4
Federal M. & S., pf.	85
Inter. Salt	16
National Lead	62
National Lead, pf.	98 1/2
Pittsburg Coal	11
Republic I. & S.	29 3/8
Republic I. & S., pf.	83
Sloss-Sheffield	57 1/2
Standard Oil	504
Tenn. C. & I.	....
U. S. Red. & Ref.	16 3/4
U. S. Steel	37
U. S. Steel, pf.	100
Va. Car. Chem.	26 1/2
Va. I. Coal & Coke	....

ST. LOUIS June 29

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettle	.05	.03
Center Cr'k	2.50	2.30
Cent. C. & C.	67.50	65.00
C.C. & C. pd.	78.50	77.50
Cent. Oil	120.00	110.00
Columbia	7.00	4.50
Con. Coal	26.00	24.00
Doe Run	150.00	140.00
Gra. Bimet.	.27	.20
St. Joe	18.00	16.00

BOSTON July 2

Name of Comp.	Clg.
Adventure	3
Allouez	47
Am. Zinc	36 1/4
Arcadian	6 3/4
Atlantic	13
Bingham	16 1/4
Boston Con.	28
Calumet & Ariz.	169
Calumet & Hecla*	....
Centennial	29
Con. Mercur	....
Copper Range	81 1/4
Daly-West	16
Franklin	14 7/8
Greene-Can	16 7/8
Isle Royal	21 1/2
La Salle	14 3/4
Mass	5 7/8
Michigan	14 1/2
Mohawk*	83 1/2
Mont. C. & C.(new)	....
Nevada	13 7/8
North Butte	82 3/4
Old Colony	....
Old Dominion	47 1/2
Osceola	134
Parrot	20 1/2
Phoenix	....
Quincy	119
Rhode Island	5 1/4
Santa Fe	3 1/4
Shannon	18
Tamarack	116
Trinity	29
United Cop., com.	64
U. S. Oil	10 1/4
U. S. Smg. & Ref.	48 7/8
U.S.Sm.& Re.,pd.	43
Utah Copper	52 1/2
Victoria	....
Washington	1 1/16
Winona	8 1/4
Wolverine	160
Wyandotte	1 1/8

*Ex. Div. †Ex. Rights.

BOSTON CURB

Ahmeek	....
Ariz. Com	....
Black Mt	....
East Butte	10 1/2
Hancock Con	8 1/2
Keweenaw	....
Majestic	2 3/4
Raven	1 7/16
Shawmut	.50
Superior	....
Superior & Pitts	16 1/2
Troy Man	1 1/2

LONDON July 3

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	0
Camp Bird	1	1	3
Esperanza	2	1	3
Tomboy	1	11	3
El Oro	1	8	9
Oroville	0	16	0
Somera	1	0	6
Utah Apex	1	6	10
Ariz.Cop.,pfd.	3	3	3
Ariz.Cop.,def.	3	2	1

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

S. FRANCISCO June 26

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.24
Best & Belcher	.70
Caledonia	.15
Chollar	.08
Con. Cal. & Va.	.61
Crown Point	.17
Exchequer	.39
Gould & Curry	.16
Hale & Norcross	.50
Mexican	.42
Ophir	1.80
Overman	.12
Potosi	.09
Savage	.66
Sierra Nevada	.35
Union	.26
Utah	.05
Yellow Jacket	.88
TONOPAH STOCKS	
Golden Anchor	.21
McNamara	.28
Montana-Pitts.ex	.09
North Star	.30
Rescue	.17
GOLDFI'D STOCKS	
Black Ants	.05
Blue Bull	.28
Columbia Mt	.48
Comb. Frac	3.45
Conquerer	.12
Daisy	1.75
Florence	4.10
Frances-Mohawk	1.15
Goldfield Con	6.90
Grandma	.11
Great Bend	.67
Red Hills	.47
St. Ives	.99
BULLFROG STOCKS	
Amethyst	.27
Bonnie Claire	.54
Mayflower Con	.35
Montgomery Mt.	.14
Original	.09
MANHAT'N STOCKS	
Gold Wedge	.05
Manhattan Mg.	.06
Pine Nut	.08
Ruby Wonder	.20
Stray Dog	.16
Yellow Horse	.04

NEVADA July 3
(Weir Bros. & Co., New York)

TONOPAH STOCKS	Clg.
Tono'h Mine of N.	13.00
Tonopah Exten	1.75
Montana Tonop'h	3.15
Belmont	3.50
Tonopah Midway	1.20
West End Con	.85
Jim Butler	1.00
GOLDFI'D STOCKS	
Sandstorm	.40
Kendall	.30
Red Top	3.00
Jumbo	3.00
Goldfield Mining	1.20
Dia'dfield B. B. C.	.22
Atlanta	.50
Mohawk	13.50
Silver Pick	.57
Laguna	1.20
BULLFROG STOCKS	
Mont. Shoshone C.	6 75
Tramps Con	.56
Gold Bar	.64
Bullfrog Mining	.16
Bullfrog Nat. B.	.21
Homestake Con	...
MANHAT'N STOCKS	
Manhattan Con	.46
Manhat'n Dexter	.13
Jumping Jack	.08
Stray Dog	.16
Indian Camp	.05

COLO. SPRINGS June 29

Name of Comp.	Clg.
Acacia	9 1/2
Black Bell	....
C. C. Con	4 5/8
Dante	....
Doctor Jack Pot	....
Elkton	54 7/8
El Paso	40 1/2
Findlay	58
Gold Dollar	6 5/8
Gold Sovereign	4
Isabella	22
Index	....
Jennie Sample	....
Jerry Johnson	5
Mary McKinney	....
Pharmacist	....
Portland	....
Un. Gold Mines	7 1/2
Vindicator	80
Work	16

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Smelting & Ref., com	July 15	$2.00	$1,000,000
Am. Smelting & Ref., pfd.	July 1	1.75	875,000
Anaconda	July 17	1.75	2,100,000
Buffalo Mines, Ltd.	July 10	0.03	27,000
Central C. & C., com	July 15	1.50	76,875
Central C. & C., pfd	July 15	1.25	23,438
El Oro	July 12	0.36	388,800
Esperanza, Ltd	July 18	1.32	600,600
Inter. Nickel, pfd	Aug. 1	1.50	131,123
Kerr Lake (Cobalt)	July 1	0.15	90,000
Mines Co. of Am	June 26	0.02	40,000
New Idria	July 1	0.20	20,000
Nipissing	July 20	0.15	180,000
North Star	June 27	0.20	50,000
N. S. St. & Coal, com	July 15	1.50	74,814
N. S. St. & Coal, pfd	July 15	2.00	20,600
Osceola	July 29	7.00	673,050
Philadelphia Gas	Aug. 1	0.75	434,296
Silver Hill	June 24	0.05	5,400
St. Mary's Mineral Land	July 1	1.00	150,000
Tamarack	July 23	4.00	240,000
Tenn. C. I. & R. R., com	Aug. 1	1.00	225,536
Tenn. C. I. & R. R., pfd	Aug. 1	2.00	4,960
Tezuitlan	July 1	2.00	....
Tonopah of Nev	July 22	0.25	250,000
U. S. Smelting & Ref	July 15	1.75	656,250
Vulcan Detinning, pfd	July 20	1.25	18,750

Assessments

Company.	Delinq.	Sale.	Amt.
Bullion, Nev	June 10	July 2	$0.05
Challenge Con., Nev.	June 19	July 10	0.10
Etna King, Cal	June 8	July 1	0.03
Exchequer, Nev	July 8	July 30	0.05
Forty-nine G. Pl., U.	June 26	July 15	0.01
Honerine, Utah	June 25	July 20	0.20
Julia Con., Nev	June 24	July 16	0.03
Mexican, Nev	July 15	Aug. 5	0.10
Nev. Superior, Utah	June 17	July 5	0.10
Savage, Nev	June 12	July 1	0.10
St. Joe, Utah	June 13	July 3	0.02
Wasatch, Utah	June 17	July 2	1.25
Yellow Jacket, Nev.	July 3	Aug. 10	0.15

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.765	65.462	29.984	30.253
May	66.976	65.98	30.968	30.471
June	65.394	67.090	30.185	30.893
July	65.105	......	30.113	......
August	65.949	......	30.529	......
September	67.927	......	31.483	......
October	69.523	......	32.148	......
November	70.813	......	32.671	......
December	69.050	......	32.003	......
Year	66.791	......	30.868	......

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

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	24.224	18.688	25.260	84.793	98.625
May	18.475	24.048	18.724	25.072	84.867	102.375
June	18.442	22.665	18.719	24.140	83.994	97.272
July	18.190	......	18.585	......	81.167	......
August	18.380	......	18.706	......	83.864	......
September	19.033	......	19.328	..	87.831	......
October	21.203	......	21.722	......	97.269	......
November	21.833	......	22.398	......	100.270	......
December	22.885	......	23.350	......	105.226	......
Year	19.278	......	19.616	......	87.282	......

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

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	......
February	36.403	42.102	August	40.606	......
March	36.662	41.313	September	40.516	......
April	38.900	40.938	October	42.852	......
May	43.313	43.149	November	42.906	......
June	39.260	42.120	December	42.750	......
			Av. year	39.819	......

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350	6.000	15.922	19.703
April	5.404	6.000	15.959	19.975
May	5.685	6.000	16.725	19.688
June	5.750	5.760	16.813	20.188
July	5.750	......	16.525	......
August	5.750	......	17.109	......
September	5.750	......	18.266	......
October	5.750	......	19.350	......
November	5.750	......	19.281	......
December	5.900	......	19.609	......
Year	5.657	......	17.370	......

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

AVERAGE PRICE OF SPELTER

MONTH.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.078	6.685	5.931	6.535	25.781	25.900
May	5.997	6.441	5.846	6.291	27.000	25.563
June	6.096	6.419	5.948	6.269	27.728	24.469
July	6.006	......	5.856	......	26.800	......
August	6.027	......	5.878	......	26.938	......
September	6.216	......	6.056	......	27.563	......
October	6.222	......	6.070	......	28.075	......
November	6.375	......	6.225	......	27.781	......
December	6.593	......	6.443	......	27.938	......
Year	6.198	......	6.048	......	27.020	......

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Bort, good drill quality, carat		$85.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05½@.06
Emery, in kegs: Turkish flour	"	.01¾@.02½
Grains	"	.03½@.04½
Naxos flour	"	.01¾@.02½
Grains	"	.03½@.04½
Chester flour	"	.01¾
Grains	"	.03½@.04½
Peekskill, f.o.b. Easton, Pa., flour	"	.01¼@.01½
Grains, in kegs	"	.02¼@.02¾
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone, Am. Powd.	100 lb.	1.60@2.00
Italian, powdered	"	.01¼@.01½
Lump, per quality	"	.03@.20
Rottenstone, ground	"	.02½@.04½
Lump, per quality	"	.05@.25
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.02¼@.02½
Boric	"	.09¾@.10
Hydrofluoric, 30%	"	.02¾@.03
" 48%	"	.06
" 60%	"	.10
Hydrochloric acid, 20°, per lb.		1.25@1.50
Nitric acid, 38°	per lb.	4.25@4.62½c.
Sulphuric acid, 50°, bulk, per ton		$12 up.
60°, 100 lb. in carboys		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys		1.00@1.25
66°, bulk, ton		18.00
Oxalic	"	.08½@.09
ALCOHOL—Grain	gal.	2.46½
Refined wood, 95@97%	"	.70@.75
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	lb.	.04½
ALUMINUM—Sulphate, com'l.	"	1.25@1.60
AMMONIA—24 deg.	lb.	.04½@.05½
" 26 "	"	.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.23
Carbonate	"	.07⅝@.08
Muriate grain	"	.06⅛@.06½
Lump	"	.09¼@.09¾
Sulphate, 100 lb		3.10@3.12½
Sulphocyanide com.	"	.30
" " chem. pure	"	.40
ANTIMONY—needle, lump	lb.	.10@.11
ARSENIC—White (nominal)	"	.07¼@.07½
Red	"	.07½@.07⅝
ASPHALTUM—		
Barbadoes	per ton.	40.00@80.00
West Indies	"	20.00@60.00
Egyptian	lb.	.14@.18
Gilsonite, Utah ordinary	per ton.	35.00
Trinidad	"	30.00@32.50
California	"	22.50@30.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton.	30.00@35.00
Powdered, 80@90%	lb.	.02@.02½
Chloride com'l	ton.	40.00 up
Nitrate, powdered, in casks	lb.	.05½@.06
Sulphate (Blanc Fixe)	"	.02¾
BARYTES—		
Am. Ground	sh. ton.	16.00@21.00
Floated	"	22.00
Foreign floated	"	19.50@22.50
BISMUTH—Sub-nitrate	lb.	1.50
BLEACHING POWDER—35%	100 lb.	1.25@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		7.25
BONE ASH	lb.	.02½@.04
BORAX		.07½@.08
CALCIUM—Acetate, gray	"	2.35@2.40
Acetate, brown	"	1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. N. Y.	"	14.75@19.75
CEMENT—		
Portland, Am. 500 lb.	bbl.	1.55@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)		.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton	17.50@20.00
Bricks, f.o.b. Pittsburg	M.	175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	"	8.50@9.00
Foreign	"	11.50@17.50
COBALT—Oxide	lb.	2.50

COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.75
In bags	"	.60@.70
CRYOLITE	lb.	.06½@.06¾
FELDSPAR—Ground best	sh. ton.	14.00
FIRE BRICK.		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis No. 1	"	16.00
" No. 2	"	14.00
Extra	"	20.00@23.00
FIRE CLAY.		
St. Louis mill, dom.	per ton	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	lg. ton.	8.00@10.00
Ground	"	11.50@13.50
Gravel	"	4.25@4.50
Foreign crude ex. dock		8.00@10.00
FULLER'S EARTH—Lump	100 lb.	.80@.85
Powdered	"	.85@.90
GRAPHITE—		
American, ore, common	lb.	.01@.10
Artificial	"	.06
Ceylon, common pulv	"	.02¾@.03½
Best, pulverized	"	.04@.08
German, com. pulv	"	.01¼@.01½
Best, pulverized	"	.01½@.02
Italian, pulverized	"	.01@.02
GYPSUM—		
Fertilizer	sh. ton.	7.00
Powdered	sh. ton.	10.00
INFUSORIAL EARTH—		
Ground Am. best	lb.	.01¾
French	lg. ton.	56.00
German	lb.	.02½@.02⅝
LEAD—Acetate (sugar of) brown	lb.	.07¾
Nitrate, com'l	"	.09½@.09¾
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	7.00@8.00
Calcined, powdered	sh. ton.	35.00@40.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.80@1.15
Sulphate (Epsom salt)	100 lb.	.90@1.00
MANGANESE—		
Crude powdered:		
70@75% binoxide	lb.	.01¼@.01½
75@85% binoxide	"	.01½@.02
85@90% binoxide	"	.01¾@.05
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	35.00@60.00
MARBLE—Flour	sh. ton.	9.50@10.00
MINERAL WOOL—		
Slag, ordinary	"	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb.	.08 and up.
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb.	.13@.18
" double	"	.09@.11
NITRATE OF SODA—100 lb. 96% for 1907		2.55
95% for 1908		2.47
95% for 1909		2.50
96% is 5½c higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	"	.07½@.07¾
English glassmakers'	"	.08½@.08¾
Lithopone	"	.03¾@.07
Metallic, brown	sh. ton.	16.50@22.00
Red	"	16.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½@.03
French, washed	"	.01½@.02½
Paris green, pure, bulk	"	.26
Red lead, American	"	.07½@.07¾
Foreign	"	.08½@.08¾
Turpentine, spirits bbl., per gal.		.60½
White lead, Am., dry	lb.	.06¾@.07
American, in oil	"	.07½@.07¾
Foreign, in oil	"	.10½@.10¾
Zinc white, Am. extra dry	"	.05½@.05¾
Foreign, red seal, dry	"	.07½@.07¾
Green seal, dry	"	.08½@.08¾
PHOSPHATES—Acid		.65@67½c per unit
*Fla., hard rock		10.25@10.50
land pebble 68%		5.75@6.00
†Tenn., 78@80%		6.50@7.00
75%		6.00@6.25
68@72%		4.00@4.25
‡So. Car. land rock		5.75@7.25
" " river rock		....

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

POTASSIUM—		
Bicarbonate crystal	lb.	$.08½@.09
Powdered or granulated	"	.09@.09½
Bichromate, Am	"	.08⅜@.09
Scotch		.11
Bromide	"	.16
Carbonate (80@85%)		.03¾@.04
Caustic, ordinary	"	.04¼@.05¼
Elect. (90%)	"	.05½@.06
Chloride (muriate), 100 lb.		1.90
Chlorate, powdered	"	.09¼@.09½
Crystals	"	.09@.09¼
Cyanide (98@99%)	"	.18@.19
Kainite, long ton, bulk, 8.50; bags, 9.50.		
Permanganate	lb.	10@10½
Prussiate, yellow	"	.16@.16¼
Red	"	.33@.35
Sulphate	100 lb.	2.18½@2.21½
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit	11@11½c
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c
Imported non-arsenical, furnace size, per unit		.13½@.14
Imported, arsenical, furnace size, per unit		.12½@.13
Imported fines, arsenical, per unit.		.08½@.09
" " non-arsenical, per unit		10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.18
N. Y. agricultural	sh. ton.	3@4.40
SALTPETER—Crude	100 lb.	4.25@4.50
Refined, crystals	"	4.75@5.75
SILICA—		
Ground quartz, ord'ry	lg. ton	13.00@15.00
Silex	"	13.00@30.00
Lump Quartz	"	2.50@4.00
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.43½@.45½
SODIUM—		
Acetate	lb.	.04¼@.04½
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb		1.20@1.50c.
Soda, caustic, per 100 lb., 76/60		1.75@1.85
" " powdered		.02¾@.03¼
Salt cake, per 100 lb		.65@.85
Soda, monohydrate, per lb		1½c.
Bichromate	lb.	.07⅛@.07½
Bromide	"	.16
Chlorate, com'l	"	.08¾@.09
Cyanide, ("100% KCN")	"	.18@.19
Hyposulphite, Am	"	1.35 up
German	"	1.60@1.70
Phosphate	100 lb.	1.80@1.90
Prussiate	"	.09⅞@.10¼
Sal soda, f.o.b. N. Y.	100 lb.	.70@.85
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	100 lb.	.75@1.15
Sulphate, com'l, (Glauber's salt)	100 lb.	.50@.60
" " calcined		.65@.85
STRONTIUM—Nitrate	lb.	.08¼@.08½
SULPHUR—		
Louisiana (prime) to New York, Boston or Portland	lg. ton	22.12½
To Philadelphia or Baltimore	"	22.50
Roll	100 lb.	1.85@2.15
Flour	" "	2.00@2.40
Flowers, sublimed	" "	2.20@2.60
TERRA ALBA—French & Eng.	100 lb.	.85@1.00
TALC—Domestic	sh. ton.	15.00@25.00
French	"	20.00@25.00
Italian, best	"	35.00@40.00
TIN—Bi-chloride, 50%	lb.	.12½
Crystals	"	.25¾ up
Oxide, lb		.47@.49
URANIUM—Oxide	"	3.50
ZINC—Metallic ch. pure	"	.15
Chloride solution, com'l 20°	"	.02½
Chloride, granular	"	.04½@.05
Dust	"	.05½@.06½
Sulphate	"	.02¼@.02½

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

Metal and Mining Companies—U. S.

Name of Company and Location.		Authorized Capital	Shares.		Dividends.		
			Issued.	Par Val.	Total to Date.	Latest. Date.	Latest. Amt.
Alaska Mexican, g.	Al'ka	$1,000,000	180,000	$ 5	$1,572,381	Jan. 1907	$ .50
Alaska Treadwell,g	Al'ka	5,000,000	200,000	25	9,235,000	Jan. 1907	1.00
Alaska United, g...	Al'ka	1,000,000	180,200	5	306,340	Jan. 1907	0.30
Amalgamated, c,.	Mont	155,000,000	1,530,879	100	50,584,788	May 1907	2.00
Am.Sm.&Ref.,com.	U. S	50,000,000	500,000	100	10,625,000	July 1907	2.00
Am. Sm. & Ref. pf.	U. S	50,000,000	500,000	100	24,463,053	July 1907	1.75
Am. Smelters, pf. A	U. S	17,000,000	170,000	100	1,430,000	Mar. 1907	1 50
Am. Smelters. pf. B	U. S	30,000,000	300,000	100	3,000,000	June 1907	1.25
Anaconda,c	Mont	30,000,000	1,200,000	25	36,950,000	July 1907	1.75
Annie Laurie, g	Utah	5,000,000	25,000	100	465,061	July 1905	.50
Arizona, c	Ariz	3,775,000	3,682,520	.....	6,182,361	Apr. 1906	.05
Atlantic, c	Mich	2,500,000	100,000	25	990,000	Feb. 1905	.02
B. & H., l. z.	Mo	400,000	400,000	1	40,000	Dec. 1905	.01
Beck Tunnel, g.s.l.	Utah	100,000	1,000,000	0.10	555,000	May 1907	.04
Bingham & N.H.,c.g	Utah	2,000,000	226,000	5	22,600	Sept. 1906	.10
Boston & Montana.	Mont	3,750,000	150,000	25	47,875,000	Nov. 1906	12.00
Bull.Beck.&Cham.g	Utah	1,000,000	100,000	10	2,688,400	Apr. 1907	.10
Bunker Hill & Sull.	Ida	3,000,000	300 000	10	8,946,000	June 1907	.60
Butte Coalition,c.s.	Mont	15,000,000	1,000,000	15	1,800,000	June 1907	.50
Calumet & Arizona c	Ariz	2,500,000	200,000	10	8,000,000	June 1907	5.00
Calumet & Hecla,c.	Mich	2,500,000	100,000	25	103,400,000	June 1907	20.00
Camp Bird, g., s	Colo	5,500,000	820,000	5	3,882,700	June 1907	.12
Carisa, c.g	Utah	500,000	500,000	1	55,000	Nov. 1906	.01
Central Eureka, g	Cal	400,000	398,425	1	778,921	Mar. 1906	.07
Columbus Con. c	Utah	1,500,000	300,000	5	105,000	Apr. 1907	.20
Combi'tion Co.G'f'd	Nevada	400,000	320,000	1	688,000	Sept. 1906	.15
Con. Mercur, g	Utah	1,000,000	1,000,000	1	1,205,000	Dec. 1906	.02½
Continental, z. l	Mo	550,000	22,000	25	209,000	July 1907	.50
Copper Range Con.	Mich	38,500,000	383,781	100	5,326,458	July 1907	2.00
Creede United, g	Colo	2,000,000	1,625,000	1	214 053	July 1906	.00½
Cripple Creek Con.g	Colo	2,000,000	2,000,000	1	180,000	Mar. 1905	.00½
Daly Judge, g. s. l.	Utah	300,000	300,000	1	225,000	Apr. 1907	.37½
Daly West, g. s. l	Utah	3,600,000	180,000	20	5,607,000	Mar. 1907	.60
De Lamar, g. s	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
Doctor Jack Pot	Colo	3,000,000	3,000,000	1	268,000	July 1906	.00½
Doe Run, l	Mo	10,000,000	59,062	100	1,316,913	June 1907	.50
Elkton Con., g	Colo	3,000,000	2,500,000	1	1,841,960	Feb. 1907	.01½
El Paso, g	Colo	2,500,000	2,450,000	1	1,022,750	June 1906	.01
Fed. Sm., com	Idaho	10,000,000	60,000	100	2 348,750	June 1907	5.00
Federal Sm., pf	Idaho	20,000,000	120,000	100	2,861,250	June 1907	1.75
Findley, g	Colo	1,250,000	1,250,000	1	325,000	Aug. 1906	.01
Frances-Mohawk,g	Nevada	1,000,000	1,000,000	1	141,000	Dec. 1906	1.10
Gemini-Keystone	Utah	500,000	5,000	100	1,850,000	July 1906	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	.00½
Grand Central, g	Utah	250,000	250,000	1	1 278,000	May 1907	.04
Gwin Mine, Dev., g.	Cal	1,000,000	100,000	10	35,000	Mar. 1906	.25
Hecla, s. l	Idaho	250 000	1,000,000	0.25	1,280,000	June 1907	.10
Homestake, g	S. D	21,840,000	218,400	100	22,244,040	Apr. 1907	.50
HornSilver,g.s.c.z.l	Utah	10,000,000	400,000	25	5,622,000	June 1907	.05
Inter'l Nickel, pf.	N. Y	12,000,000	87,415	100	786,736	Aug. 1907	1.50
Iron Silver	Colo	10,000,000	500,000	20	4,050,000	July 1907	.10
Jamison, g	Cal	3 900 000	390,000	10	270,670	Apr. 1907	.03
Jerry Johnson	Cal	2,500,000	2,500,000	1	61,700	Apr. 1906	.03
Kendall, g	Mont	2,500,000	500,000	5	1,110,000	June 1907	.03
Liberty Bell,g. s	Colo	700,000	130,551	5	110,857	Jan. 1906	.15
Lightner, g	Cal	125,000	102,255	1	295,694	Aug. 1905	.05
Lower Mammoth, g	Utah	190,000	190,000	1	9,500	May 1907	.05
Mammoth, g. s.l	Utah	10,000 000	400,000	25	2,120,000	Oct. 1906	.05
Mary McKinney, g.	Colo	1,500,000	1,304,252	1	801,765	Apr. 1907	.03
Mohawk, c	Mich	2,500,000	100,000	25	1,400,000	July 1907	5.00
Mont. Ore Purch	Mont	2,500,000	80,833	25	9 437,274	Jan. 1907	15.00
Monument, g	Colo	300,000	300,000	1	27,124	Apr. 1905	.01
Nevada Hills, s.g	Nevada	1,000,000	200,000	5	20,000	Mar. 1907	.10
New Century, z., l.	Mo	300,000	300,000	1	211,500	Nov. 1906	.01
New Idria, q	Cal	500 000	100,000	5	920,000	July 1907	.20
New Jersey Zinc	U. S	10,000,000	100,000	100	8,400,000	Feb. 1906	3.00
North Butte	Mont	6,000,000	400,000	15	5,000,000	June 1907	2.00
North Star, g	Cal	2,500,000	250,000	10	1,386,989	June 1907	.20
Northern Light,g.s	Utah	2,000,000	400,000	5	20,000	Feb. 1904	.05
Old Dominion Cop.	Ariz	7,500,000	281,589	25	280,843	May 1906	.50
Old Gold	Colo	2,101,150	2,101,150	1	10,506	Mar. 1906	.05
Ophir, g. s	Nevada	302,400	100,800	3	1,797,400	July 1904	.25
Osceola, c	Mich	2,500,000	96,150	25	7,035,650	July 1907	7.00
Parrot, c,s	Mont	2,300,000	229,850	10	6,692,724	Mar. 1907	.25
Pennsylvania, g	Cal	5,150,000	51,500	100	284,925	July 1905	.10
Platteville, l. z	Wis	20,000	500	40	89,500	Oct. 1905	10.00
Portland, g	Colo	3,000,000	3,000,000	1	7,387,080	Apr. 1907	.04
Quincy, c	Mich	3,750,000	110,000	25	17,460,446	June 1907	4.50
Rob Roy, z	Mo	15,000	15,000	1	9,600	May 1906	.03
Rocco Homest'k,l.s.	Nevada	300,000	300,000	1	112,000	Dec. 1905	.02
Sacramento, g, q	Utah	1,000,000	1,000,000	1	258,000	Nov. 1906	.00½
Salvator, g. s. l	Utah	200,000	200,000	1	6,500	Aug. 1904	.01
St. Joseph, l	Mo	20,000,000	1,000,000	10	5,258,357	June 1907	.15
Silver Hill, g. s	Nevada	108,000	108,000	1	81,000	June 1907	.05
Silver King, g. s. l	Utah	3,000,000	150,000	20	11,000,000	Jan. 1907	.33½
Shannon, c	Ariz	3,000,000	300,000	10	450,000	July 1907	.50
Snowstorm, s. l	Ida	1,500,000	1,500,000	1	315,000	June 1907	.03
Spearfish, g	S. D	1,500,000	1,500,000	1	165,500	Jan. 1905	.01½
Standard Con., g. s	Cal	2,000,000	178,600	10	5,139,061	Mar. 1907	.10
Stratton's Indei end	Colo	5,500,000	1,000,007	5	4,895,865	Apr. 1906	.12½
Swansca, g. s. l	Utah	500,000	100,000	5	329,500	Mar. 1907	.05
Tamarack, c	Mich	1,500,000	60,000	25	9,420,000	July 1907	4.00
Tennessee, c	Tenn	5,000,000	175,000	25	1,093,750	Jan. 1907	1.25
Tomboy, g. s	Colo	1,750,000	300,000	5	900,000	June 1906	.48
Tonopah of Nev	Nevada	1,000,000	1,000,000	1	3,250,000	July 1907	.25
Tonopah Belmont	Nevada	2,000,000	1,295,007	1	518,003	Apr. 1907	.10
Tonopah Ext'nsion	Nevada	1,000,000	928,433	1	278,530	Apr. 1906	.15
Tonopah Midway	Nevada	1,000,000	1,000,000	1	300,000	Jan. 1907	.05
Uncle Sam, g.s.l	Utah	500,000	500,000	1	130 000	Oct. 1906	.01
United Cop. com	Mont	75,000,000	450,000	100	5,175,000	Apr. 1907	1.75
United, c. pf	Mont	5,000,000	50,000	100	1,500,000	May 1907	3.00
United, z. l., com	Mo.-Kan.	500,000	92,400	5	27,450	Oct. 1903	.05
United, z. l., pf	Mo.-Kan.	500,000	19,556	25	283,250	Apr. 1907	.50
United, (Crip'le C'k)	Colo	5,000,000	4,009,100	1	280,071	Apr. 1905	.00½
United Verde, c	Ariz	3,000,000	300,000	10	18,585,322	May 1907	.75
Un.States,pf.g.s.c.l*	Utah	37,500,000	750,000	50	3,937,500	July 1907	.87½
U.S. Red. & Ref. Pf	Colo	4,000,000	39,458	100	946,317	July 1907	1.50
Utah, g.(Fish Sp'gs)	Utah	1,000,000	100,000	10	267,000	May 1907	.03
Utah Con., c	Utah	1,500,000	300,000	5	6,936,000	July 1907	1.50
Victoria, Utah	Utah	250,000	250,000	1	177,500	Mar. 1907	.04
Vindicator Con., g.	Colo	1,500,000	1,500,000	1	1,605,000	Apr. 1907	.03
Wolverine, c	Mich	1,500,000	60,000	25	4,050,000	Apr. 1907	10.00
Work, g	Colo	1,500,000	1,500,000	1	90,000	Apr. 1907	.01
YankeeCon	Utah	1,500,000	1,500,000	1	140,000	Jan. 1907	.03
Yellow Aster, g	Cal	1,000,000	100,000	10	913,789	May 1907	.10

*Previous to consolidation $1,436,250 were divided.

Coal, Iron and Other Industrials—United States.

Name of Company and Location.		Authorized Capital.	Shares.		Dividends.		
			Issued	Par Val. $	Total to Date.	Latest. Date.	Latest. 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
Amer. Ag. Chem., pf..	U. S	20,000,000	181,530	100	7,375,870	Apr. 1907	3.00
American Cement	Pa	2,000,000	200,000	10	1,108,000	July 1907	.40
American Coal	Md	1,500,000	50,000	25	2,195,000	Mar. 1907	7.50
Associated Oil	Cal	21,000,000	21,000,000	1	630,000	Aug. 1905	.01½
Bethlehem Steel, pf..	Pa	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel	Pa	50,000,000	900,000	50	8,212,500	Feb. 1907	.62½
Caribou Oil	Cal	100,000	80,000	1	56,000	July 1905	.07
Central C. & C., com..	Mo	5,125,000	51,250	100	1,998,750	July 1907	1.50
Central C. & C., pf. ..	Mo	1,875,000	18,750	100	1,289,064	July 1907	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	58,500	June 1905	.01
Col. & Hock. C.& I,pf.	Ohio	7,000,000	69,244	100	176,086	July 1907	1.50
Consolidated Coal	Ill	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal	Md	10,250,000	102,500	100	8,955,400	Apr. 1907	1.50
Crucible Steel, pf	Pa	25,000,000	250,000	100	2,125,000	June 1907	1.50
Empire S. & I., pf	N. J	5,000,000	25,000	100	712,500	July 1907	3.00
Fairmont Coal,	W. Va.	12,000,000	120,000	100	1,384,000	Feb. 1907	3.00
Four Oil	Cal	500,000	300,000	1	105,406	July 1905	.01
General Chem. com..	U. S	12,500,000	74,103	100	1,745,125	Mar. 1907	2.00
General Chem., pf	U. S	12,500,000	100,000	100	4,690,178	July 1907	1.50
George's C'k Coal	Md	2,500,000	22,000	100	1,188,000	July 1904	3.00
Imperial Oil	Cal	1,000,000	100,000	100	880,000	July 1905	.20
International Salt	....	30,000,000	182,280	100	927,060	Dec. 1906	1.00
Jeff. & Cl'f C. & I., cm	Pa	1,500,000	15,000	100	330,000	Aug. 1905	5.00
Jeff. & Cl'f. C. & I.,pf	Pa	1,500,000	15,000	100	825,500	Aug. 1906	2.50
Kern River Oil	Cal	2,000,000	20,000	100	39,500	May 1905	.13
Lehigh Coal & Nav	Pa	17,378,500	346,901	50	25,614,693	May 1907	2.00
Maryland Coal,pf	Md	2,000,000	18,850	100	1,592,560	June 1907	4.00
Monon R. Coal, pf. ..	Pa	10,000,000	100,000	100	3,154,945	Jan. 1906	.97
Monte Cristo Oil	Cal	500,000	500 000	1	120,000	July 1905	.01
National Carbon, pf..	U. S	4,500,000	45,000	100	2,047,500	May 1905	1.75
National Lead, com ..	N. Y	15,000,000	149,054	100	1,974 966	July 1907	1.25
National Lead, pf	N. Y	15,000,000	149,040	100	16,324,328	June 1907	1.75
Nat'l Steel & Wire,pf.	N. Y	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal	Md	1,000,000	50,000	20	350,000	May 1907	.40
New River Coal, pfd.	W. Va.	4,000,000	37,617	100	112,851	May 1907	1.50
Pacific Coast Borax..	Cal	2,000,000	19,000	100	2,086,500	Aug. 1905	1.00
Peerless Oil	Cal	1,000,000	92,000	10	396,320	May 1905	.14
Penna. Salt	Pa	3,000,000	60,000	50	14,528,000	Apr. 1907	3.00
Penna. Steel, pfd	Pa	25,000,000	168,214	100	7,615,744	May 1907	3.50
Phila. Gas, com	Pa	28,953,029	579,061	50	8,050,040	Aug. 1907	.75
Phila. Gas, pf	Pa	5,744,813	114,896	50	1,583,505	Mar. 1905	1.25
Pittsburg Coal, pf	Pa	32,000,000	297,010	100	11,434,962	Apr. 1905	1.75
Pocahontas Coll., pf..	W. Va.	1,500,000	15,000	100	460,000	May 1907	1.50
Republic I. & S., pfd.	Ill	25,000,000	204,169	100	4,893,246	July 1907	3.75
Sloss-Sheffield, com..	Ala	7,500,000	75,000	100	9,480,250	 1907	1.25
Sloss-Sheffield, pf	Ala	20,000,000	67,000	100	3,294,500	July 1907	1.75
Standard Oil	U. S	100,000,000	970,000	100	334,530,000	June 1907	9.00
Tenn. C. & I., com	Tenn	22,553,600	225,536	100	3,131,988	May 1907	1.00
Tenn. C. & I., pf	Tenn	248,000	2,480	100	385,080	May 1907	2.00
Texas & Pacific Coal.	Texas	2,000,000	20,000	100	1,960,000	June 1907	1.50
Thirty-three Oil	Cal	500,000	100,000	5	430,000	July 1905	.10
Union Oil	Cal	10,000,000	100,000	100	1,118,766	May 1905	.50
U. S. SteelCorp.,cm.,	U. S	550,000,000	5,083,025	100	66,041,541	July 1907	.50
U. S. Steel Corp., pf..	U. S	360,281,100	3,603,141	100	181,149,227	May 1907	1.75
Va. Carolina Ch., pf..	U. S	20,000,000	180,000	100	12,180,869	July 1907	2.00
Westmoreland Coal..	Pa	3,000,000	60,000	50	8,580,000	Oct. 1905	2.50

Canada, Mexico, Central and South America.

Name of Company and Location.		Authorized Capital.	Shares.		Dividends.		
			Issued.	Par Val. $	Total to Date.	Latest. Date.	Latest. Amt.
Amistad y Conc'rdia.	Mex	$480,000	9,600	50	$258,064	Jan. 1905	$1.71
Buffalo, s	Ont	1,000,000	900,000	100	108,000	July 1907	.03
Butters' Salvador, g..	Salv	750,000	150,000	5	600,000	Apr. 1905	.25
Cariboo McKin'y, g..	B. C	1,250,000	1,250,000	1	546,837	Feb. 1904	.04
Consolidated M & S..	B. C	5,500,000	48,338	100	594,100	May 1907	2.50
Copiapo, c	Chile	1,125,000	112,500	10	3,000,900	Oct. 1904	1.20½
Crow's Nest Pass	B. C	3,500,000	140,000	25	1,581,148	Apr. 1906	.62½
Dominion Coal, com.	N. S	15,000,000	150,000	100	2,250,000	July 1907	1.00
Dominion Coal, pf	N. S	3,000,000	30,000	100	3,330,000	Jan. 1905	4.00
Dos Estrellas. g. s	Mex	150,000	3,000	50	1,020,555	July 1905	13.65
El Oro, g. s	Mex	5,750,000	1,080,000	5	2,708,800	July 1904	.18
Esperanza, s. g	Mex	2,275,000	455,000	5	6,721,649	July 1907	1.32
Foster Cobalt, s	Ont	1,000,000	1,000,000	1	50,000	Jan. 1907	.05
Granby Con	B. C	15,000,000	135,000	100	2,563,630	Mar. 1907	3.00
Greene Con. Copper..	Mex	8,640,000	864,000	10	5,814,200	Mar. 1907	.40
Greene Con. Gold	Mex	5,000,000	500,000	10	300,000	July 1905	.20
GreenGold-Silv'r,pfd	Mex	3,000,000	300,000	10	120,000	Mar. 1907	.40
Guanajuato	Mex	3,000,000	540,000	5	74,250	Oct. 1906	.07½
Guggenheim Expl	Mex	17,000,000	105,000	100	3,435,000	July 1907	2.50
Kerr Lake, s	Ont	3,000,000	600,000	5	300,000	July 1907	.15
LeRoi No. 2, g	B. C	3,000,000	120,000	25	716,400	Feb. 1907	.24
McKinley-Darragh,s	Ont	2,500,000	2,000,000	1	100,000	Mar. 1907	.02
Mexican Coal & Coke	Mex	5,000,000	50,000	100	600,000	Dec. 1905	3.00
Mex. Con. M. & S. Co.	Mex	2,500,000	240,000	10	480,000	May 1907	.50
Mines Co. of Am.	Mex	2,000,000	2,000,000	1	2,665,000	June 1907	.02
N. Y. & Hond. Ros	C. A	1,500,000	150,000	10	2,287,000	June 1907	.10
Nipissing, s	Ont	6,000,000	1,200,000	5	1,140,000	July 1907	.15
North Star	B. C	1,500,000	1,300,000	1	351,000	Dec. 1904	1.00
N. S. St. & Coal, com.	N. S	5,000,000	49,876	100	938,228	July 1907	1.50
N. S. St. & Coal, pf	N. S	1,030,000	10,300	100	396,550	July 1907	2.00
Penoles*	Mex	250,000	2,500	100	8,213,375	Mar. 1907	20.00
Platanillo	Mex	500,000	206,989	1	5,580	Sept. 1906	.00¼
Reco, g. s.l	B. C	1,000,000	958,000	1	327,082	Apr. 1906	.02
Silver Queen, s	Ont	1,500,000	1,500,000	1	120,000	Jan. 1907	.08
Slocan Star	B. C	500,000	500,000	1	575,000	Dec. 1904	.05
St. Eugene Con	B. C	3,500,000	3,202,000	1	402,120	Oct. 1905	.02
Tezuitlan Copper	Mex	1,000,000	10,000	100	....	July 1907	2.00
Tilt Cove, c	N. F	1,000,000	89,000	2	21,360	Jan. 1905	.48
Tretheway, s	Ont	1,000,000	1,000,000	1	80,000	Mar. 1907	.04
Tyee, c	B. C	940,000	180,000	5	136,800	Dec. 1904	.24

*Mexican Currency.

THE MINING INDEX.

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ABRASIVES

3602—ABRASIVES—Modern Abrasive Materials and Their Use in Shop Practice. J. Royden Pierce. (Eng. News, June 6, 1907; 2 pp.) Enumerates different kinds of abrasives, and discusses principles of construction of abrasive wheels, their form and the bond used. 20c.

ALUMINUM

3603—ALUMINUM—Progress in the Use of Aluminum in 1906. Joseph W. Richards. (Eng. and Min. Journ., June 15, 1907; 2½ pp.) Enumerates a number of uses of aluminum, and discusses briefly the casting, plating and soldering of this metal and its use in different alloys. 20c.

3604 — ELECTRIC TRANSMISSION — The Use of Aluminum as an Electrical Conductor. H. W. Buck. (Journ. Elec., Power and Gas, May 18, 1907; 3 pp.) Enumerates various uses of aluminum as a substitute for copper in electric power production and transmission, with tables of dimensions and resistances of aluminum wires and cables. 20c.

3605—METALLURGY of Aluminum in 1906. J. W. Richards. (Eng. and Min. Journ., June 8, 1907; 3 pp.) Reviews the status of the aluminum industry during 1906, and describes the proposed extensions of plants throughout Europe and the United States. 20c.

ANTIMONY

3606—ANALYTICAL METHOD—Ueber die Quantitative Bestimmung des Antimons durch Elektrolyse Seiner Sulfo-Salzösungen. F. Foerster and J. Wolf. (Zeit. f. Elektrochem., May 10, 1907; 5½ pp.) Reviews the weak points of several electrolytic methods of determining antimony, tabulates the results of many attempts to develop an accurate procedure, and discusses the conditions finally obtained wherein the final result was accurate to within 0.05 per cent. 40c.

BARYTES

3607—BARYTES GRINDING PLANT. E. K. Judd. (Eng. and Min. Journ., May 25, 1907; 1 p.) Description of the arrangement of a typical barytes grinding plant and the machines used in pulverizing, washing and drying. 20c.

CEMENT

3608—CEMENT WORKS—An Electrically-Driven Cement Works. (Electrician, May 17, 1907; 2 pp.) Gives a general account of the operating methods at this modern cement plant where oil engines were recently abandoned in favor of electricity for power purposes. 40c.

3609—CHEMISTRY OF PORTLAND CEMENT, A Review of the. F. H. Mason. (Min. & Sci. Press, June 8, 1907; 1½ pp.) Outlines briefly methods of cement manufacture and analysis and discusses the relation of its chemical constituents to its setting properties. 20c.

3610—PORTLAND CEMENT—The Relation Between the Ultimate Composition and the Physical Properties of Portland Cement. R. K. Meade. (Chem. Engr., May, 1907; 8½ pp.) Paper read before the Am. Chem. Soc., Dec. 28, 1906. A study of the composition of various cements, with an attempt to draw some relation between composition and physical properties. 40c.

3611—WEST VIRGINIA—Portland Cement Resources of West Virginia. G. P. Grimsley. (Eng. and Min. Journ., May 25, 1907; 1½ pp.) Points out the fortunate location of this State as a center for portland cement production, and enumerates some of the more valuable deposits of limestones and marls. 20c.

CLAY

3612—CLAY WORKING—Methods and Estimates of Cost of Handling Clay in Clay Working Plants. J. K. Moore and H. R. Straight. (Eng.-Contracting, June 5, 1907; 2 pp.) Paper read before the Ill. Clayworkers' Assn., giving briefly methods employed in excavating and handling clay from banks to works, with estimates of costs. 20c.

COAL AND COKE

3613—ANKYLOSTOMIASIS—Lutte contre l'Ankylostomasie, Dispensaire du minieur. (Bull. de l'Union des Charbonnages, Jan.-Mar., 1907; 13½ pp.) Reports of the very thorough investigation upon the conditions of the mines and miners in the province of Liege, Belgium, with regard to infection by ankylostomiasis germs, giving the statistics of microscopical examinations made throughout the province.

3614—BRITISH COLUMBIA—The Cassiar Coalfields in British Columbia. J. J. Bell. (Eng. and Min. Journ., May 25, 1907; 1 p.) Gives a few facts as to the extent of deposits of coal in this district, the geological features and its nearness to transportation. 20c.

3615—CALORIFIC POWER OF COAL —Le Pouvoir Calorique des Combustibles et la Formule de M. Goutal. E. Lenoble. (Bull. de la Soc. Ind. du Nord de la France, No. 137, 1906; 3 pp.) Discusses the value of the formula proposed by M. Goutal for determining the calorific power of coal and points out its limitations.

3616—CALORIMETER—The Rate of Combustion and Pressure Developed in a Calorimetric Bomb. F. G. Benedict and F. P. Fletcher. (Journ. Am. Chem. Soc., May, 1907; 18 pp.) Describes the apparatus and method used in an investigation to determine the range of pressure and different rates of combustion which are produced in combustion bombs during tests of various explosives. 60c.

3617—COAL ANALYSIS from the Commercial Point of View. J. T. Dunn. (Coll. Guardian, May 24, 1907; 1½ pp.) Lecture delivered to the Newcastle-upon-Tyne Commercial Inst., dealing with some methods and principles of coal analysis to determine the amount of gas they will yield, and its illuminating power. 40c.

3618—COAL ANALYSIS—On the Analysis of Lignitic and Sub-Bituminous Coals. A. J. Cox. (Journ. Am. Chem. Soc., May, 1907; 8½ pp.) Develops a method for the analysis of non-coking coals, lignite and sub-bituminous coal. 60c.

3619—COAL-DUST — Experiments Illustrative of the Inflammability of Mixtures of Coal-Dust and Air. P. P. Bedson and H. Widdas. (Trans., No. of England Inst. Min. and Mechan. Eng., May, 1907; 4½ pp.) Describes a modification of the apparatus of Holtzwart and von Meyer for testing mixtures of coal-dust and air, and adapted to larger scale operations than the original.

3620—COAL MINING—Investigations of the Waste in Mining and Preparation of Coal. E. W. Parker. (Eng. and Min. Journ., June 22, 1907; 1½ pp.) Outlines the scheme adopted by the U. S. Geological Survey in its present investigation of waste in coal mining and washing. 20c.

3621 — COAL MINING — Method of Working Seams Occurring Close Together. J. Macvie. (Min. Engineering, June, 1907; 3 pp.) Describes the mining practice of the Houldsworth colliery, showing plans of working and giving costs of driving galleries. 20c.

3622—COAL MINING—The Technics of Coal Mining. G. H. Winstanley. (Min. Engineering, June, 1907; 3 pp.) Continuation of article previously mentioned in this Index. 20c.

3623—COKE—Manufacture of Coke from Western Coal. R. S. Moss. (Min. World, June 8, 1907; 1 p.) Gives a number of facts explaining how it is possible to produce good coke from Western coals provided proper coking methods are used. 20c.

3624—COKE-DRAWING MACHINES. E. H. Abraham. (Mines and Minerals, June, 1907; ½ p.) Supplements a previous article by this author on coke-drawing machines, giving in this instalment data on the amount and kind of work done, the quality of coke produced and operating costs. 20c.

3625—COKE OVENS—Die Semet-Solvay-Koksöfen. (Centralblatt der Hütten und Walzwerke, June 5, 1907; 2 pp.) Deals with the characteristic features of the Semet-Solvay oven for coking coal, the process of operating it, and considers the thermal quantities involved and the by-products obtained. 40c.

3626—COLLIERY OPERATION—Operation and Equipment of the St. Clair Colliery. Floyd W. Parsons. (Eng. and Min. Journ., June 15, 1907; 3 pp.) Describes several unique devices which are used in the power house of this Pennsylvania colliery and gives notes on the equipment for haulage and ventilation. 20c.

3627—COLORADO—The Coals of Routt County, Colorado. A. Lakes. (Min. World, June 15, 1907; 2½ pp.) Contains analyses of some Colorado coals and discusses the geological features of the various coal-fields in this county. 20c.

3628 — COMPOSITION OF COALS. Frank F. Grout. (Econ. Geology, Apr.-May, 1907; 17 pp.) Describes a method of representing by graphical means the comparative qualities of different coals as shown by analysis, and proposes a classification of coal based upon this scheme. 60c.

3629—ELECTRICAL EQUIPMENT—An Alternating-current Coal-mining Installation. T. W. Sprague and C. K. Stearns. (Eng. and Min. Journ., June 8, 1907; 3½ pp.) Gives details of the general station and sub-station equipment at the McKell Coal and Coke Co.'s West Virginia plant. 20c.

3630—ELECTRICAL EQUIPMENT of North Franklin Colliery at Trevorton, Pennsylvania. (Mines and Minerals, June, 1907; 1 p.) Gives general descriptions of the electrically driven fan, centrifugal pumps and locomotives which form part of the equipment of this colliery. 20c.

3631—EXPLOSIONS—Barometric Pressure and Simultaneous Explosions of Gas in European Collieries. M. Mascart. (Eng. and Min. Journ., June 1, 1907; ½ p.) Translation from *L'Echo des Mines*, Apr. 4, 1907, of article previously mentioned in this Index. 20c.

3632—EXPLOSIONS—Colliery Explosions and Their Causes. J. T. Beard. (Eng. and Min. Journ., June 1, 1907; 4 pp.) Reviews the general aspects of mine explosions, and considers various causes which may produce them, paying special attention to barometric changes as contributing causes. 20c.

3633—EXPLOSIVES—Emploi des Explosifs dans les Mines de Houille de Belgique pendant l'Année 1905. Statistique comparative dressée d'après les documents officiels. V. Watteyne and L. Denoël. (Ann. des Mines de Belg., T. XII, 2 livr., 1907; 54 pp.) Gives comparative statistics of the use of explosives in coal mining in Belgium during 1905, and comments at length upon the facts brought out by them.

3634—FUEL TESTING—Comparative Cost of Energy in Different Fuels. Charles E. Lucke. (Journ. Elec., Power and Gas, June 7, 1907; 1 p.) Compares the heating powers of various kinds of fuel with their cost, and computes the thermal efficiency from these data. 20c.

3635—FUEL TESTING—Some Comparative Fuel Values. P. N. Evans. (Purdue Eng. Rev., No. 3, 1907; 4 pp.) Compares briefly the efficiency of solid, liquid and gaseous fuels.

3636—ILLINOIS—Properties of the Willis Coal Mining Co., at Willisville and Percy, Ill. (Elec. Min., May, 1907; 13½ pp.) A general outline of the mining conditions of the collieries of the above company, and description of the power equipment and electrical appliances in use underground. 20c.

3637—MACHINE MINING — Practical Problems of Machine Mining. S. Mavor. (Trans., No. of England Inst. Min. and Mechan. Eng., May, 1907; 7 pp.) Discussion by members of the Institute of the above paper, which was previously mentioned in this Index.

3638—MINE GASES—El Grisu en las Minas de Carbon. (Revista Minera, June 8, 1907; 5 pp.) An extended study of the composition, properties, and occurrence of gases in coal mines, including an investigation of their flaming temperatures. 40c.

3639—MINE GASES—Zur Theorie der plötzlichen Gasausbrüche. A. Becker. (Oest. Zeit. f. B. u. H., June 1 and 8, 1907; 5½ pp.) Considers some of the factors which may cause sudden emissions of gas from coal mines. 60c.

3640—MONTANA COAL MINES. J. P. Rowe. (Mines and Minerals, June, 1907; 3½ pp.) General outline of mining in the Montana coal fields, describing the extent of development at the principal producing mines, the methods of mining and handling coal, and the machinery used. 20c.

3641—PEAT COKE. M. Toltz. (Journ. Assn. of Eng. Soc., May, 1907; 10½ pp.) Reviews the present rate of coal consumption, and its bearing on the future utilization of peat for coke, and gives a description of a plant for coking peat, together with operating costs. 40c.

3642—RESCUE APPARATUS—Liquid Air and Its Use in Rescue Apparatus. O. Simonis. (Trans., No. of England Inst. Min. and Mechan. Eng., Vol. LVII, Parts 2 and 3; 24 pp.) Contains criticisms of various members of the mining profession as to the efficiency of the aerolith apparatus as applied to rescue work in mines.

3643—RESCUE APPARATUS — Ueber den Unfall mit dem Pneumatogenapparat, Type 1 a, auf Zeche Gneisenau. F. Böck. (Glückauf, June 1, 1907; 2½ pp.) Describes an investigation into the causes of the failure of an automatic breathing apparatus of the pneumatogen type, and recommends changes in construction to prevent similar accidents. 40c.

3644—SAFETY LAMPS—The Tommasi Electric Safety Lamps. D. Tommasi. (Eng. and Min. Journ., June 1, 1907; ½ p.) A description of a new electric safety lamp so constructed that the breaking of the glass bulb will not cause the ignition of an explosive mixture by the glowing filament. 20c.

3645 — SHAFT SINKING Through Magnesian Limestone and Yellow Sand by the Freezing Process at Dawdon Colliery, near Seaham Harbor, County Durham. E. S. Wood. (Trans. No. of England Inst. Min. and Mechan. Eng., May, 1907; 41 pp.) A description of shaft sinking by the freezing method, as carried out at this colliery, with very complete and exact data upon the cost and efficiency of operation; illustrates working operations by numerous plates and diagrams.

3646—SLOPE SINKING—Slope Sinking and Timbering. M. S. Hachita. (Eng. and Min. Journ., June 15, 1907; ½ p.) A few notes on the methods of sinking and timbering slopes for coal mines, and estimates of costs. 20c.

3647—STEAM ENGINES—Corliss Engines in Coal-mine Work. P. A. Stafford. (Power, June, 1907; 1 p.) Points out some of the advantages of Corliss engines for use in coal-mine work, and discusses several indicator cards taken from the cylinders of this engine and the compressors which it drives. 20c.

3648—SURVEYING—Methods Used in the Surveys of Coal Mines. L. D. Tracy. (Eng. News, May 30, 1907; 3 pp.) Gives complete notes on extended practice in running surveys underground in coal mines, and gives specimen maps and survey plots; also sample pages of note-books and computations. 20c.

3649—U. S. GEOLOGICAL SURVEY, Colliery Experimental Work of the. C. Hall. (Eng. and Min. Journ., June 22, 1907; 1 p.) From a paper read before the Coal Min. Inst., June, 1907, describing the contemplated experimental plant of the U. S. Geological Survey, in which it is proposed to test properties and characteristics of various explosives, detonators and safety lamps. 20c.

3650—WASHINGTON COAL SITUATION. R. P. Tarr. (Eng. and Min. Journ., May 25, 1907; ½ p.) A review of early operations in the coalfields of this State, with some details of present output, and a few notes on the character of the deposits. 20c.

COPPER

3651—CALIFORNIA—Copper in Shasta County, California. Wm. Forstner. (Min. and Sci. Press, May 18, 1907; 1 p.) Gives some information as to the character of the formations in this district and their bearing upon possible methods of ore genesis. 20c.

3652—COPPER SMELTING PLANT—Chrome Plant of the U. S. Metals Refining Company. Lawrence Addicks. (Eng. and Min. Journ., May 25, 1907; 5 pp.) Gives detailed information as to the methods of sampling and smelting ore at this plant, and the subsequent refining of the copper matte, with details of furnace practice. 20c.

3653—ELECTROLYTIC PROCESS for Extraction of Copper from Ore. W. Stoeger. (Min. Journ., Apr. 27, 1907; ½ p.) Translation from *Revue d'Electrochimie et d'Electrometallurgie*, Mar., 1907, giving some of the details of this process of copper extraction as now carried out at the Miedzianka copper mines in Polish Russia. 40c.

3654—EQUIPMENT—Novel Equipment of Tywarnhaile Copper Mine. Edward Walker. (Eng. and Min. Journ., June 1, 1907; 1½ pp.) Gives details of operation at this Cornwall copper mine, where the Elmore vacuum process is used to concentrate the ores, and where producer gas engines operate dynamos which furnish power for the mine. 20c.

3655—MEXICO—Santa Cruz, a New Copper Camp in Sonora. F. J. H. Merrill. (Eng. and Min. Journ., June 1, 1907; ½ p.) Very brief notes on the character of the country rock in this district and the extent of work done on prospects. 20c.

3656—MEXICO—The Mining District of Asientos, Mexico. B. Newman. (Eng. and Min. Journ., June 1, 1907; 2 pp.) Outlines general conditions of mining and smelting in this Mexican copper camp, and gives some facts as to present output. 20c.

3657—MILLING PRACTICE at the Osceola Mill, Lake Superior. Lee Fraser. (Eng. and Min. Journ., June 22, 1907; 3½ pp.) General account of milling practice at this Lake Superior copper mine, giving details of Nordberg steeple-compound stamps, classifiers, jigs and slime handling apparatus. 20c.

3658—NEVADA—Copper Deposits at Ely, Nevada. W. S. Bullock. (Mines and Minerals, June, 1907; 2 pp.) Gives a general description of the copper deposits of this camp, their character, extent and the development work so far done upon them. 20c.

3659—NEW JERSEY—Copper Deposits of the New Jersey Triassic. J. Volney Lewis. (Econ. Geology, Apr.-May, 1907; 18 pp.) A few brief notes on the history of copper mining in New Jersey and a discussion of various occurrences of copper ores classified according to their association with igneous rocks, supplemented by a new theory to account for their origin. 60c.

3660—NEW SOUTH WALES—The Queen Bee Copper Mine, Bee Mountain. F. Danvers Powers. (Aust. Min. Stand., May 8, 1907; 1½ pp.) Gives details of the mining methods employed in working this copper mine and contains a few notes upon the smelting equipment. 40c.

3661—ORE TREATMENT — Roasting and Smelting Copper Ores. J. W. Richards. (Electrochem. and Met. Indus., June, 1907; 4 pp.) Proposes and solves several metallurgical problems dealing with the composition of copper matte, pyritic smelting of ores and the heat requirements and roasters. 40c.

3662—PHOSPHORUS IN COPPER—Kupfer und Phosphor. E. Heyn and O. Bauer. (Metallurgie, May 8, 1907; 9½ pp.) Continuation of article previously mentioned in this Index, giving many diagrams of properties of different alloys of copper and phosphorus, such as specific volume, density, plots of cooling curves, etc., with an extended discussion of the results shown. 40c.

3663—SOUTH AFRICA—Copper Prospects in the Middelburg District. J. P. Johnson. (South African Mines, May 11, 1907; ½ p.) Brief notes on the deposits of copper minerals in this district, describing their character and the amount of development which has been done. 20c.

3664—SPAIN—The San Vicente Mine, Spain. Edward Walker. (Eng. and Min. Journ., June 22, 1907; 1 p.) A few notes on the character and occurrence of the ore bodies at this new Spanish copper mine. 20c.

3665—TESTING of Copper and Its By-Products in American Refineries. G. L. Heath. (Journ. Am. Chem. Soc., Apr., 1907; 9 pp.) Contains abstract of comments upon various articles which have recently appeared in the technical press, dealing with the analysis of copper during its various stages of refining. 60c.

DIAMONDS

3666—SOUTH AFRICA—The Premier Diamond Mine, Transvaal, South Africa. R. A. F. Penrose. (Econ. Geology, Apr. May, 1907; 10 pp.) Gives a few remarks upon the general features of diamond deposits in South Africa, with specific information as to the mode of occurrence of the diamond-bearing ground at the Premier mine, its geological age and origin. 60c.

FELDSPAR

3667—UTILIZATION OF FELDSPAR—The Use of Feldspathic Rocks as Fertilizers. A. S. Cushman. (Bull. No. 104, U. S. Dept. of Agriculture, May 27, 1907; 32 pp.) Deals with the availability of potash in ground feldspar, cost of grinding the rock and extracting the potash, and its possible effect upon land.

GOLD AND SILVER

3668 — ALASKA — The Beaches of Nome. O. Halla. (Min. and Sci. Press, June 1, 1907; ½ p.) Describes briefly several of the old Nome beaches and mentions the extent of work which has been done, and the amount of gold produced from them. 20c.

3669—BRITISH COLUMBIA PLACERS: Past and Present—II and III. H. F. Evans. (Min. World, June 1 and 22, 1907; 1½ p.) Mentions briefly the location and extent of workings at several of the principal placers in this region. 40c.

3670—BULLION ANALYSIS — Method for Analysis of Gold-Silver Bullion. J. E. Clennell. (Eng. and Min. Journ., June 8, 1907; 2 pp.) Outlines a rapid process for the approximate analysis of bullion, giving procedures for the determination of gold, silver, selenium, lead, copper, iron and zinc. 20c.

3671 — CALIFORNIA — The Ancient River Channels of California. G. W. Kimble. (Min. and Sci. Press, June 8, 1907; 1½ pp.) An interesting presentation of the theories held concerning formation of the old river beds of California which have furnished a considerable part of the hydraulic gold in this State. 20c.

3672—CANADA—New Silver District in the Temagami Reserve. L. H. Mattair. (Eng. and Min. Journ., June 15, 1907; ½ p.) Gives the latest facts in regard to the claims located and the amount of development work which has been done in this Canadian silver camp whose deposits of ore are very similar to those in Cobalt. 20c.

3673—COBALT. (Mines and Minerals, June, 1907; 3½ pp.) Conclusion of article previously mentioned in this Index, dealing in this instalment with methods of mining in the camp, wages paid, and discussing the smelting of Cobalt ores. 20c.

3674—CYANIDATION—Garvin's Cyanide Process. (L. A. Min. Rev., June 1, 1907; 1 p.) Gives an outline of the development of the cyanide process and contains a brief description of the modifications in apparatus and methods which are the essential features of this new process. 20c.

3675—CYANIDATION—Last Drainings. H. A. White. (Journ., Chem., Met. and Min. Soc. of South Africa, Apr., 1907; 1½ pp.) Discussion by members of the Society of the above-mentioned paper which was previously mentioned in this Index. 40c.

3676—CYANIDE PRACTICE at Copala. L. McN. Bullock. (Min. and Sci. Press, June 8, 1907 ½ p.) Gives a few brief notes on varying strengths and alkalinity of cyanide solutions, with a view to finding the best conditions for use on ores from this place. 20c.

3677—CYANIDE PROCESS—Adair-Usher Process: A Criticism. H. T. Brett. (So. African Mines, May 11, 1907; ½ p.) Criticizes this all-sliming process of cyanide treatment in that it has not yet been tested upon a large scale and that too great an outlay of capital is required for its installation in proportion to the advantage gained. 20c.

3678—CYANIDING—On the Lixiviation of an Auriferous Arsenopyrite Concentrate by Cyanide. T. T. Fulton. (Journ. Min. Soc. Nova Scotia, Vol. X, 1907; 27 pp.) Detailed account of a series of experiments to extract gold from auriferous arsenopyrite, the investigation being to determine the relative merits of cyanide and bromocyanide solutions, the best time of leaching, best rate of percolation and most economical strength of solution.

3679—FILTER PRESS—Notes on the Use of the Filter Press for Clarifying Solutions. S. J. Truscott and A. Yates. (Journ., Chem., Met. and Min. Soc. of South Africa, Apr., 1907; 1 p.) Reply by the authors to the discussion of their paper, which was previously mentioned in this Index. 40c.

3680—GOLD DREDGING—Die Goldbaggerei in Europa. L. St. Rainer. (Oest. Zeit. f. B. u. H., May 4, 11, 18, 25 and June 1, 1907; 15½ pp.) Continuation and conclusion of article previously mentioned in this Index, dealing with the present status of this industry in Europe, with brief accounts of the equipment of some of the larger operators. Also describes the testing of dredging ground in the Balkans, giving tables showing depths drilled, size of holes, and value of gold per cubic inch. $1.40.

3681—GOLD DREDGING in Tierra del Fuego. J. D. Roberts. (Min. Journ., June 1, 1907; ½ p.) Contains a general statement as to dredging operations in this South American country. 40c.

3682—GOLD DREDGING—Placer Dredging in California. G. L. Holmes. (Min. Wld., May 25, 1907; 2 pp.) Gives a general review of dredging conditions in this State, and a few brief notes on the construction of several typical dredges. 20c.

3683—GOLD TELLURIDES. W. J. Sharwood. (Min. and Sci. Press, June 8, 1907; 1 p.) Studies the occurrence of gold in telluride in Goldfield, Nev. ores by means of micrographs of thin sections. 20c.

3684—GOLD VEINS—Distribution of Bedded Leads in Relation to Mining Policy. J. E. Woodman. (Journ. Min. Soc. Nova Scotia, Vol. X; 18 pp.) Considers some characteristics of bedded leads with their accompanying cross-veins, and the modifications which they require in mining practice.

3685—IDAHO—The Murray Gold Belt, Idaho. T. L. Lammers. (Min. and Sci. Press, May 18, 1907; 1½ pp.) A few observations on the geological features of this gold belt near the Coeur d'Alene district, and some notes on the mining operations. 20c.

3686—MEXICO—Metallurgical Development at Guanajuato. T. A. Rickard. (Min. and Sci. Press, May 18, 1907; 2½ pp.) Outlines the progress in gold and silver extraction in this camp, and the changes in practice necessitated by variations in the character of the ore. 20c.

3687—MEXICO—The Lluvia de Oro District, Mexico. R. H. Burrows. (Min. and Sci. Press, May 25, 1907; 3 pp.) Gives an account of the geological features and describes the rock formations in this Mexican camp, which is remarkable for the richness of its free-milling ore. 20c.

3688—MILLING at Gladstone, Colo. George P. Scholl. (Mines and Minerals, June, 1907; 1½ pp.) Gives some details of the practice at this mill which concentrates a pyritic lead and zinc bearing ore, and describes also milling practice at the Mogul mill which successfully concentrates low-grade complex ore containing considerable amounts of zinc blende. 20c.

3689—NEVADA—Goldfield, Nevada. (Min. and Sci. Press, June 8, 1907; 3 pp.) General account of the mining discoveries in this camp, with some notes on methods of development and the distribution of the ore bodies. 20c.

3690—NEVADA—Tonopah, Nevada. (Min. and Sci. Press, June 1, 1907; 1½ pp.) Gives a brief history of the discovery and the mining operations in this camp, but pays most attention to the milling of the low-grade ores. 20c.

3691—NEVADA—Water Resources of Nevada. H. Thurtell. (Min. and Sci. Press, May 25, 1907; 2½ pp.) Enumerates and gives brief notes on principal rivers and their tributary districts. 20c.

3692—NEW ZEALAND—The Undeveloped Gold Deposits of New Zealand. W. Green. (N. Z. Mines Rec., Apr. 16, 1907; 10½ pp.) Considers the various sources of gold which are yet undeveloped on this island, including mention of sea-coast deposits, raised sea beaches and vein deposits. 40c.

3693—QUEENSLAND—Some Croydon Gold Mines. B. Dunstan. (Queens. Gov. Min. Journ., May, 1907; 12 pp.) Outlines the geological features of the Croydon goldfield, and gives an account of the extent of the present mining operations. 60c.

3694—SCREEN ASSAY on the Meyer and Charlton G. M. Under "The New Metallurgy." C. Toombs. (Journ., Chem. Met. and Min. Soc. of South Africa, Apr., 1907; 1 p.) Discussion by F. T. Chapman of the above-mentioned paper, which was previously mentioned in this Index. 40c.

3695—TUBE MILL LINING. (Mines and Minerals, June, 1907; ½ p.) A brief description of a tube mill lining made of hard cast iron segments, provided with riffles which catch the pebbles and carry them nearly to the top of the mill. Tests made upon this lining show that it outwears silex. 20c.

3696—TUBE MILL PRACTICE. Notes of Some Recent Improvements in. K. L. Graham. (Journ., Chem., Met. and Min. Soc. of South Africa, Apr., 1907; 3½ pp.) Discusses the relative efficiency of quartz and flint pebbles in tube mills and takes up briefly the question as to proper percentages of water to solids, and the percentage of material to be reground. 60c.

3697—WASHINGTON—The Great Silver-Lead District of the Cascade Range in Washington. (N. W. Min. Journ., June, 1907; 4 pp.) Gives the results of a rapid survey and investigation of the mineral deposits of this range, with brief notes on the quantity and quality of ore in some of the exploited veins. 20c.

3698—WESTERN AUSTRALIA—The Laverton, Burtville, and Erlistoun Auriferous Belt, Mt. Margaret Goldfield, C. G. Gibson. (W. A. Geol. Surv., Bull. No. 24, 1906; 77 pp., with many geological maps). Contains the report of investigations on the Mount Margaret goldfield, including descriptions of the different ranges, and the extent of mining developments.

IRON AND STEEL

3699—BLAST-FURNACE—Induced Draft with Hot-air Economizers for Steel Works and Blast-Furnace Boilers. A. J. Capron. (Engineering, May 24, 1907; 4 pp.) Paper read before the Iron and Steel Inst., May 10, 1907, Describing a system of induced draft in combination with hot-air economizers which utilize the waste heat from the boiler in heating the air required for combustion. The application of this principle to blast-furnaces is briefly discussed. 40c.

3700—BLAST-FURNACE GAS—Production Économique de la Force Motrice dans les Usines Métallurgiques par l'Utilisation du Gaz du Hauts-Fourneaux et des Fours a Coke. L. Greiner. (Rev. Univ. des Mines, T. XVIII, 1907, 2 trimestre; 47 pp.) A thorough study of the conditions which make for the economic use of blast-furnace gas in gas engines for the production of power, as found in European practice. Detailed figures of costs are given, and the relative efficiencies of blast-furnace and coke-oven gases are compared.

3701—BLAST-FURNACE SLAGS—Zur Bestimmung der Schmelzpunkte von Hochofenschlacken. M. Simonis. (Stahl u. Eisen, May 22, 1907; 2 pp.) Gives an account of tests made upon 16 types of blast-furnace slags to determine their fusing points. Samples of the slags were finely crushed and formed into cones of the same size as Segar cones, alongside of which the slag is tested. 40c.

3702—CARBON AND PHOSPHORUS in Steel, Behavior of. Henry M. Howe. (Eng. and Min. Journ., June 8, 1907; 3 pp.) A discussion of J. E. Stead's explanation of the banding of carbon and phosphorus and the theory of incompatibility. 20c.

3703—CASTINGS—Heavy Steel Castings without Flaws. (Mod. Machinery, June, 1907; 2½ p.) Description of a new device for preventing piping in steel ingots by maintaining the upper part of the casting in liquid form until the entire block has become solidified, thus preventing flaws. 20c.

3704—CHARCOAL PRODUCTION—Gasverhaltnisse bei der Holzverkohlung. E. Juon. (Stahl u. Eisen, May 22 and 29, 1907; 10½ pp.) An investigation into the process of charcoal burning, with reference to proper temperatures for the operation, the character of the gases and the heating of the ovens; the facts obtained are to be made the basis of improvements in new oven construction. 60c.

3705—CHEMISTRY IN STEEL WORKS—Laboratoriumsbuch für den Eisenhüttenchemiker. M. Orthey. (Pub. by Wilhelm Knapp, Halle a. S., Germany, 1907; 50 pp.) A handbook for the chemist in a steel plant, giving analytical procedures for the quick and accurate analysis of ores, iron and steel, slags, coal and coke, according to the best and most modern methods. $1.00.

3706—CLASSIFICATION OF STEEL—Einheitliche Benenmung von Eisen und Stahl auf dem Kongresse des Internationalen Verbandes für die Material prüfungen der Tecknik in Brussel 1906. H. Wedding. (Stahl u. Eisen, May 29, 1907; 4½ pp.) Proposes a definite classification of all forms of iron and steel, and discusses and explains various changes in nomenclature which appear in the new tables. The new classification is intended to be international in its scope, and the article includes the tabulated classification in six different languages, so that the equivalent to English designations may readily be found. 40c.

3707—DETERIORATION OF STEEL—The Ageing of Mild Steel. C. E. Stromeyer. (Engineering, May 31 and June 7, 1907; 7 pp.) Paper read before the Iron and Steel Inst., May 10, 1907. An interesting and extended account of tests on the properties of samples of steel boiler plates and other shapes, showing the tendency of certain kinds of steel to become brittle with age. 60c.

3708—ELECTRIC FURNACE—The Stassano Thermo-Electric Furnace. E. Stassano. (Eng. and Min. Journ., June 15, 1907; 3 pp.) Describes all the important features of this type of electric furnace, with notes upon its operation, and gives experimental data by which its efficiency is computed. 20c.

3709—ELECTRIC SMELTING—Die Gewinnung von Eisen und Stahl auf elektrischem Wege und deren Aussichten für die Zukunft in Norwegen. (Eisen-Zeitung, May 11, 1907; 1½ pp.) Discusses the production of iron and steel from ores by electricity from an economic standpoint, comparing the cost of reducing ores by gases generated from coke, and by the electric current. To be continued. 40c.

3710—FORGING PRESS at Halesowen, England. (Iron Tr. Rev., June 13, 1907; 3 pp.) Describes the general arrangement and equipment of a large steel plant where hydraulic presses are preferred to hammers for forging blooms and billets. 20c.

3711—GAS PRODUCER as an Auxiliary in Iron Blast-Furnace Practice. (Bi-monthly Bull, A. I. M. E., May, 1907; 4 pp.) Discussion of the paper of the above title by R. H. Lee, which was previously read before the Institute.

3712—HEATING FURNACE—A Continuous Heating Furnace. (Iron Age, May 23, 1907; 1 p.) Describes by means of several sectional cuts the construction of a new patented heating furnace designed to secure better distribution of flame and gas, and provide against the drawback resulting from the closing of exit ports by the feeding of billets. 20c.

3713—IRON MINING—Achievements on the Mesabi. (Iron Tr. Rev., May 23, 1907; 1½ pp.) Reviews the remarkable progress made in mining and stripping on the Mesabi during the winter season. 20c.

3714—IRON MINING PRACTICE on the Marquette Range. Reginald Meeks. (Eng. and Min. Journ., June 15, 1907; 4 pp.) A description of modern operating conditions in this Michigan iron range, illustrating the schemes used in stoping and caving. 20c.

3715—IRON ORE RESERVES of the United States. John Birkinbine. (Cassier's Mag., June, 1907; 7 pp.) Reviews the present rate of consumption of iron ore, and discusses its bearing upon the possible exhaustion of present known supplies. 40c.

3716—MINNESOTA—Developments in the Coleraine District. (Iron Tr. Rev., June 20, 1907; 3 pp.) Gives a general review of mining operations in the Caniteo and Holman pits of this iron district, with a few notes on the extent and capacity of the present equipment which is installed. 20c.

3717—RAILS—Das Richten von Eisenbahnschienen im kalten und warmen Zustande. S. von Schukowski. (Stahl u. Eisen, June 5, 1907; 3 pp.) Discusses in a general way the methods of straightening rails in either hot or cold condition, and the effects of each process on the structure and properties of the rails. 40c.

3718—RIVETING—Nouvelle Machine à rivet les Assemblages de Constructions Metalliques. (La Métallurgie, May 15, 1907; 1 p.) Describes the construction of this riveting machine which is designed to rivet steel shapes by using metal pins whose two ends are simultaneously flattened and headed over. 40c.

3719—ROLLS—Commande électrique d'un Laminoir Réversible aux Aciéries Hildegardehütte (Silésie autrichienne). G. de Taube. (Génie Civ., June 8, 1907; 3 pp.) Describes and illustrates the workings of electric reversible rolls installed at the Hildegarde smelter in Austrian Silesia, and gives diagrams showing the power requirements of the roll train. 40c.

3720—SAMPLING AND ANALYSIS—Probenahme und Analyse der Proben auf Eisenhüttenwerken. M. Orthey. (Metallurgie, May 8, 1907; 10½ pp.) Discusses methods of sampling and of analysing the samples as carried out in iron smelters and foundries. 40c.

3721—SAMPLING of Iron Ores. L. S. Austin. (Min. World, June 22, 1907; 1½ p.) Abstract of paper to be read before the Lake Superior Min. Inst., July 24-27, 1907; describing present methods of iron ore sampling, pointing out their weak points and methods of improving them. 20c.

3722—SCRAP IRON—The Growth of the Scrap Movement. B. E. F. Luty. (Iron Tr. Rev., May 30, 1907; 2½ pp.) Gives some figures as to the utilization of scrap iron, and analyzes the extent to which it is used in various departments of steel production. 20c.

3723—SMELTING PROCESS—Ueber die Fortschritte in der Flusseisenerzeugung. H. Wedding. (Zeit. f. angew. Chem., June 7, 1907; 5½ pp.) Discusses recent advances in the production of ingot iron, taking account of the bessemer, martin, open-hearth and electric processes. 40c.

3724—SPECIAL STEEL—Chrome-Nickelstähle. (Stahl u. Eisen, May 8, 1907; 5 pp.) Gives the results of an extended investigation of the properties of nickel-chrome steel, as compared with ordinary steels, the experiments being made upon a series in which the percentages of nickel, carbon and chromium varied respectively from 4.5 to 32; 0.14 to 1.04; and 0.49 to 20.6. 40c.

3726 — STEEL ANALYSIS — A New of the Evolution of Modern Tool-Steel. H. C. H. Carpenter. (Engineering, May 17, 1907; 1½ pp.) Conclusion of article previously mentioned in this Index. 40c.

3726—STEEL ANALYSIS—A New Shaking Device for the Chemical Laboratory. J. M. Camp. (Iron Tr. Rev., May 30, 1907; 1 p.) Describes the construction of a device for automatically shaking chemical solutions, and especially applicable to the determination of phosphorus in steel. 20c.

3727—STEEL MANUFACTURE—Manufacture of Steel from Pig Iron Containing Chromium, Cobalt and Nickel. A. W. Richards. (Engineering, May 24, 1907; 1 p.) Paper read before the Iron and Steel Inst., May 9, 1907, describing a method for producing chromium steel from pig iron, from which nickel and cobalt are eliminated in a basic open-hearth furnace. Tests on the steel produced by this method are included. 40c.

3728—TEMPERING FURNACES—Ueber Härteöfen. O. Goldschmidt. (Stahl u. Eisen, May 29, 1907; 7½ pp.) Illustrates many types of tempering furnaces and discusses their characteristic features, such as methods of heating, manipulation of the pieces to be tempered, etc. 40c.

3729—TINNING and Galvanizing Cast Iron Castings. W. L. Churchill. (Metal Industry, June, 1907; 1 p.) Explains briefly the technicalities involved in the method of tinning and galvanizing by electrodeposition, with some practical pointers which will ensure the success of the process. 20c.

3730—UPPER SILESIA—Description of the Iron Works. Fredrik Carlsson. (Bihang till Jern-kontorets Annaler, April, 1907; 19 pp.) Notes made by the author when visiting Upper Silesia, 1900. 80c.

3731—VIRGINIA IRON INDUSTRY. J. J. Porter. (Manufacturers Rec., June 20, 1907; 2½ pp.) Studies the past history, present conditions and future prospects of the iron industry in this State, giving several analyses of characteristic ores, and enumerating the more important productive mines. To be continued. 20c.

3732—WELDING—Thermit Rail Welding. M. J. French. (Electrician, May 17, 1907; 1 p.) Paper read before the Street Ry. Assn. of N. Y., Jan 11, 1907, giving experiences met with in the use of thermit for rail welding, including notes on the best method of making molds for the joint and the precautions to be observed during the process of welding. 40c.

MICA

3733—LITHIA-MICA—Irvingite, a New Variety of Lithia-mica. S. Weidman. (Am. Journ. Sci., June, 1907; 3 pp.) Describes the physical and chemical characteristics and gives analyses of this new variety of mica which was discovered near Warsaw, Wisconsin. 60c.

PETROLEUM

3734—BAKU—The Oil Industry of Baku during 1906. (Petrol. Rev., May 25, 1907; 2 pp.) Reviews briefly the general conditions of the petroleum industry of this district, and describes the improved types of pumps and compressors which are now being put to use there. 40c.

3735—OIL TESTING—Investigation of Kerosene Oils and Gasolenes. E. J. Babcock. (School of Mines Bull., Univ. of N. D., 1907; 14 pp.) Explains the purposes of various tests required by law to be made upon oils, interprets the results of the analyses, and points out some important considerations in determining the safety and illuminating value of oils.

3736—RUSSIA—The Petroleum Trade of Batoum during 1906. (Petrol. Rev., May 25, 1907; 1½ pp.) Abstract of the consular report giving a résumé of the events during 1906 at this center of the Russian petroleum export trade. 40c.

3737—RUMANIAN PETROLEUM INDUSTRY during 1906. (Petrol. Rev, June 8, 1907; 1 p.) Outlines the course of the oil industry in this country during 1906. 40c.

3738—COLORADO—Sketch of the Oil Fields of Colorado.. Arthur Lakes. (Min. Wld., June 1, 1907; 1p.) Enumerates several districts where oil prospects are known in Colorado, and gives a few comments upon the character of the formation and the indications which have been shown by putting down wells. 20c.

3739 — SOUTH AFRICA — Petroleum Prospects in South Africa. C. Sandberg. (South African Mines, May 18 and 25, 1907; 2 pp.) A few notes on geological features which generally indicate the occurrence of petroleum, and a discussion of the advisability of prospecting for this substance in certain South African districts. 40c.

PHOSPHATE ROCK

3740—FRANCE—Der Abbau der Phosphate in Nordfrankreich. O. Tietze. (Glückauf, May 25, 1907; 4 pp.) Notes on the location and working methods used in the phosphate deposits of northern France, where open cuts, worked after the manner of the Michigan iron ranges, are in favor. 40c.

POTASH

3741—POTASH DEPOSITS and Mining in Germany. Gordon Ryce. (Ores and Metals, June 5, 1907; 2 pp.) Gives a general account of potash mining as carried out at the Stassfurt deposits, and deals with the origin of the mineral, and the uses to which the products are put. 20c.

QUICKSILVER

3742—CHINA—Native Methods of Mining and Smelting Quicksilver Ore in Kweichow, China. H. Brelich. (Cassier's Mag., June, 1907; 12½ pp.) Gives data relating to the wages, prices, exchange, laws, and customs used by the natives of this district in quicksilver mining. 40c.

SALT

3743—SALT MINING—The Rock Salt Deposits at Preesall, Fleetwood, and the Mining Operations Therein. F. J. Thompson.. (Coll. Guardian, May 24, 1907; 1 p.) Paper read before the Manchester Geol. and Min. Soc., May 14, 1907, considering briefly the history and geology of the rock salt deposits at Preesall, and the methods of shaft sinking and mining in use there. 20c.

SODIUM SALTS

3744—SODIUM NITRATE DEPOSITS of Colorado. H. W. Turner. (Min. and Sci. Press, May 18, 1907; 1½ pp.) Describes several occurrences of sodium nitrate deposits in this State, and gives a few notes on their geological features. 20c.

TIN

3745—CORNWALL—Revival of the South Crofty Tin Mines, Cornwall. Edward Walker. (Eng. and Min. Journ., June 8, 1907; 1½pp.) Outlines the proposed methods of mining and concentrating to be used in this tin district where a large amount of tungsten in the ore caused trouble in earlier times. 20c.

3746 — CORNWALL — The Tin-stream Works of Red River, Cornwall. Edward Walker. (Eng. and Min. Journ., May 25, 1907; 2½ pp.) Notes on the construction, operation and efficiency of the "rag frames," a device peculiar to Cornwall and used in obtaining concentrates, which can be treated on buddles or round tables. 20c.

3747—METALLURGY — Fortschritte und Neuerungen in der Metallurgie des Zinns, Speziall in Elektrochemischer Hinsicht im Jahre 1906. H. Mennicke (Elektrochem. Zeits., May, 1907; 3 pp.) Continuation of article previously mentioned in this Index. 40c.

3748—SMELTING of Tin Slags. L. Parry. (Min. Journ., Apr. 27 1907; 1 p.) Gives details of patented methods for the recovery of tin from slags either as an iron-tin alloy or a lead-tin alloy. 40c.

3749—TASMANIAN TIN INDUSTRY. R. Stokes. (Min. World, June 8 and 22, 1907; 3½ pp.) Describes the mining operations of several of the principal tin producers of Tasmania. 40c.

3750—WASHINGTON—A Tin Deposit near Spokane. A. R. Whitman. (Min. and Sci. Press, June 1, 1907; 1½ pp.) Gives a description of the mineralogical occurrences in the vicinity of a vein of cassiterite, which has been discovered near Spokane. 20c.

TUNGSTEN

3751—ANALYSIS — Composition and Analysis of Wolfram and Hubnerite. P. Nicolardot. (Min. Journ., May 18, 1907; ½ p.) Translated from *Comptes Rendus*. Describes a procedure for the analysis of tungsten ores in which the effects of interfering elements are considered. The method of analysis makes it possible to fix exactly the formula of definite minerals. 40c.

ZINC

3752—ORE DEPOSITS—Origin of Lead and Zinc Ore Bodies in Joplin, Missouri, District. Otto Ruhl. (Min. Reporter, June 20, 1907; 4 pp.) Describes the characteristic features of the ore formations in this Missouri district, and derives a theory as to the mode of their formation. 20c.

3753 — ORE DRESSING — Calamine Dressing Works at Monteponi. Erminio Ferraris. (Eng. and Min. Journ., June 8, 1907; 2½ pp.) Gives several illustrations and a sectional elevation of a plant for separating calamine from a dolomite gangue. 20c.

3754—ZINC OXIDE—Versuche über die Reduktion von Zinkoxyd. F. O. Doeltz and C. A. Graumann. (Metallurgie, May 22, 1907; 3 pp.) Investigates the efficiency of various solids and gases as reducing agents for zinc oxide, and tabulates the different results secured. 40c.

3755—ZINC PRODUCTS—Zinc-Oxide and Zinc-Lead Pigment Manufacture. W. F. Gordon. (Eng. and Min. Journ., June 1, 1907; 4 pp.) Reviews the general principles of zinc-oxide production, and discusses the development of old smelting methods requiring pure ores and anthracite fuel into the present smelting practice which utilizes complex ores and soft coal. 20c.

ECONOMIC GEOLOGY—GENERAL

3756—ALASKA—A Reconnaissance of Admiralty Island. C. W. Wright. (U. S. Geol. Surv., Bull. No. 287, 1907; 20 pp.) Points out the general distribution of the mineral deposits and their commercial importance, and describes the different rock formations exposed on this island.

3757—ALTERATION OF PYRITE—The Oxidation of Pyrite. A. N. Winchell. (Econ. Geology, Apr.-May, 1907; 3 pp.) An attempt to solve the problem as to whether pure water charged with gases by aeration will attack pyrite. Experiments to determine this are described and results obtained are given. 40c.

3758—BRITISH COLUMBIA—The Similkameen District of British Colmbia. C. Camseli. (Brit. Col. Min. Rec., Apr., 1907; 6½ pp.) Abstract from Summary Report of the Geological Survey of Canada for 1906. Deals with the physiography, evidences of glaciation and surface geology of this region, and gives a few notes on ore deposits and extent of mining operations. 20c.

3759—ECONOMIC GEOLOGY and Mineral Deposits—XII. F. C. Nicholas. (Min. World, June 15, 1907; 1 p) Enumerates various minerals of economic minerals, with a list of indications by which their presence may be detected. 20c.

3760—FAULTS—How Should Faults be Named and Classified? B. Willis and J. A. Reid. (Econ. Geology, Apr.-May, 1907; 14 pp.) Contains suggestions as to the best way to conduct future investigations upon fault characteristics, with a view to their proper classification. 60c.

3761—FOSSILS—North American Index Fossils. II. A. W. Grabau and H. W. Shimer. (Sci. Mines Quart. Apr., 1907; 101 pp.) Continuation of the monograph which was previously mentioned in this Index. 60c.

3762—INDIA—General Report of the Geological Survey of India for the Year 1906. T. H. Holland, Director. (Records of Geol. Surv. of India, Vol. XXXV, Part 1, 1907; 59 pp.) Outlines the work accomplished during the year 1906 by the Indian Survey and deals with the deposits of minerals of economic value.

3763—INDO-CHINA—Note sur la Géologie et les Mines de la Région Comprise Entre Lao-Kay et Yunnan-Sen. H. Lantenois. (Ann. des Mines, T. XI, 3 livr., 1907; 82½pp.) Studies the geological features of the above region of Indo-China, and illustrates the main characteristics of the district by many maps and sections.

3764—NEW HAMPSHIRE — Contributions to the Geology of New Hampshire; No. III, on Red Hill, Moultonboro, L. V. Pirsson, with analyses by H. S. Washington. (Am. Journ. Sci., June, 1907; 14½ pp.) Deals with the petrography of the rocks occurring in the dikes in about Red Hill, and gives some general considerations regarding their origin. 60c.

3765—ORE DEPOSITION—Effect of Wall Rock on the Deposition of Ore. G. W. Miller. (Ores and Metals, May 20, 1907; 2 pp.) Interesting observations on the geology of the metal-bearing veins of Silver mountain and vicinity in the San Juan region of Colorado. 20c.

3766—ORE GENESIS—Magmatic Emanations. F. C. Lincoln. (Econ. Geology, Apr.-May, 1907; 16 pp.) Gives a condensed statement of the facts thus far established upon the nature of emanations from cooling igneous magmas. 60c.

3767—SILICATE ROCKS—Les Roches Vertes. Paul F. Chalon. (Rev. Univ. des Mines, T. XVIII, 1907, 2 trimestre; 32 pp.) A general study of green basic rocks, investigating their composition, occurrence, properties, classification and their relations to metalliferous deposits.

3768—UNDERGROUND WATERS—The Interaction between Minerals and Water Solutions with Special Reference to Geologic Phenomena. E. C. Sullivan. (Bull. No. 312, U. S. Geol. Surv., 1907; 69 pp.) Gives the results of experimental work in applying chemical methods to the investigation of geological processes brought about by action between underground waters and minerals, with special reference to secondary depositions of ore.

3769—VEIN FORMATION — Mutual Displacement by Intersecting Veins. Walter Harvey Weed. (Eng. and Min. Journ., June 15, 1907; 1½ pp.) Discusses a number of interesting cases of intersecting veins in igneous rocks, and gives a few theories concerning their formation and significance. 20c.

MINING—GENERAL

3770—AFRICA—The Otavi Copper and Lead Mines. J. Hartley Knight. (Eng. and Min. Journ., June 15, 1907; 1½ pp.) A few notes on the mineral occurrence and the nature of the ore deposits in this region of German West Africa. 20c.

3771—BORE HOLES—Determining the Direction of Deep Bore Holes and Testing Their Water Tightness. (Eng. News, May 23, 1907; 1 p.) Describes the construction of several devices for determining directions of deep bore holes, also of ascertaining the water tightness of diamond drill holes in their entire length or of specified sections. 20c.

3772—COLOMBIA, Its Resources and Its Development. J. T. O'Brian. (Min. Wld., May 25, 1907; 1½ pp.) Outlines the mineral resources of this country, with especial reference to gold dredging and placer operations. 20c.

3773—DIAMOND DRILLING—Die Ursachen der Abweichung der Tiefbohrungen vom Lot. A. Fauck. (Oest. Zeit. f. B. u. H., May 11, 1907; 2½ pp.) Reviews and discusses some of the causes of divergence of bore-holes from the perpendicular. 40c.

3774—DRILLING — Nouveau Système d'Attache des Trépans. (Journ. du Petrole, May 20, 1907; 1 p.) Describes a new method of attaching the boring bit to a string of drill tools, so that it may be quickly removed if a break occurs. 20c.

3775—DUTCH EAST INDIES—Mining in the Dutch East Indies. (Min. Journ., May 18, 1907; ½ p.) Gives statistics of minerals and metal production of the Dutch East Indies for the year beginning Feb. 4, 1905, and ending Jan. 24, 1906, and sums up the general mining situation. 40c.

3776—EXPLOSIVES — Dinitroglyzerinsprengstoffe. (Bergbau, May 30, 1907; 1p.) Gives a few notes on the properties and characteristic features of the new explosives made from dinitroglycerine bases. 20c.

3777—EXPLOSIVES—Dynamite Thawing House. W. E. Joyce. (Mines and Minerals, June, 1907; ½ p.) Gives drawings and plans of a house for storing and thawing dynamite, which is used by the Lehigh and Wilkesbarre Coal Co., at their collieries. 20c.

3778—EXPLOSIVES — Extrait d'une Enquete sur les Mèches de Sureté. (Ann. des Mines, T.. XI, 2 livr., 1907; 12 pp.) Condenses the results of an investigation into the properties of safety fuses for explosives, reviewing the experiments performed, and the conclusions reached.

3779—FEDERATED MALAY STATES, Gold and Tin Mines of, with Especial Reference to Pahang. J. B. Scrivenor. (Min. Journ., June 8 and 15, 1907; 3 pp.) Abstract from Official Report of the Geologist to the Federated Malay States, giving a general account of the extent of mining operations on the gold and tin deposits of Pahang. To be continued. 60c.

3780—HAULAGE—Results Obtained in Transportation with Mining Locomotives. S. Schauberger. (Bihang till Jern-kontorets Annaler, April, 1907; 10 pp.) Gives the cost of transportation, etc., when using benzine locomotives and compressed air locomotives. 80c.

3781—HOISTING—L'Extraction par le Système Koepe. S. Moulin. (Bull. de la Soc. de l'Ind. Minerale, T. VI, 2 livr., 1907; 45½ pp.) Describes in detail all of the features of the Koepe system of hoisting, which is essentially an endless rope running in the shaft and over pulleys on the surface, and with cages attached.

3782—HOISTING—Stresses in Hoisting Ropes. J. F. Howe. (Mines and Minerals, June, 1907; ½ p.) Derives several formulas for calculating stresses in hoisting ropes, taking into account the stresses due to starting and stopping the cage. 20c.

3783—HOISTING AND HAULAGE in the Mines of Butte. B. H. Dunshee. (Ores and Metals, May 20, 1907; 1 p.) Abstract of address before the Mont. Soc. of Engrs., considering present conditions of haulage and hoisting in the Butte district, where steel skip-bins and automatic dumping skips are much used. 20c.

3784—HYGIENE—L'Hygiène de l'Industrie Minière au Congrès International de Milan. Dr. Gilbert. (Ann. des Mines de Belg., T. XII, 2 livr., 1907; 46 pp.) Reviews very thoroughly the considerations and discussions of various diseases peculiar to the mining and metal industry, as brought out during the proceedings of the International Congress of Hygiene at Milan, Italy.

3785—IDAHO—The Priest Lake District, Idaho. Robt. N. Bell. (Min. Wld., June 22, 1907; ½ p.) Reviews the extent of mining operations and the character of the ores in this district of Idaho. 20c.

3786—LABORATORY — The Mining Laboratory of Dalhousie University, Halifax, N. S. F. H. Sexton. (Can. Min. Journ., June 1, 1907; 7 pp.) General description of the arrangement and equipment of the mining and metallurgical laboratories of this college. 20c.

3787—MEERSCHAUM — Mining Meerschaum in New Mexico. A. F. Collins. (Min. Wld., June 1, 1907; 1 p.) A few brief notes on the New Mexico occurrences of this substance, showing by illustrations the extent of mining operations. 20c.

3788—MINE HOSPITALS—Medical Department of the Colorado F. & I. Co. Lawrence Lewis. (Eng. and Min. Journ., June 22, 1907; 2½ pp.) An account of the organization and equipment of the medical department of this company, which furnishes medical and surgical attendance to employes and their families for a nominal sum. 20c.

3789—MINE LABOR—Experiences with Austrians as Iron Miners. Robt. B. Brinsmade. (Eng. and Min. Journ., June 8, 1907; 1 p.) Describes the racial characteristics of these miners, their efficiency as workmen and the effects of rivalry between different clans. 20c.

3790—MINE ORGANIZATION—Suggestions for Mine Staff Organization. J. Boyd Aarons. (Eng. and Min. Journ., June 22, 1907; 2½ pp.) Detailed description of a plan for apportioning duties and responsibilities of members of the operating force of a mine and conducting the work of the different departments. 20c.

3791—MINE SUBSIDENCE. A. Richardson. (Journ., Chem., Met. and Min. Soc. of South Africa, Apr., 1907; 4 pp.) Discussion by members of the paper of above title, which was previously mentioned in this index. 60c.

3792—MINE SUBSIDENCE— Etude sur les Affaisements dus aux Exploitations Houillères. M. Sainte-Claire-Deville. (Bull. de la Soc. de l'Ind. Minèrale, T. VI, 2 livr., 1907; 29 pp) Reviews causes of mine subsidence in all its details, and studies the phenomena met with in the region around Westphalia; also attempts to derive a few laws which appear to govern this subject.

3793—MINING COSTS — Concerning Costs. George Huston. (Min. and Sci. Press, May 18, 1907; 1 p.) Explains how diminished efficiency in mining and milling operations was concealed by an incorrect method of cost-keeping. 20c.

3794—MINING COSTS—Expenses of Development in Sonora. F. J. H. Merrill. (Eng. and Min. Journ., June 15, 1907; ½ p.) Notes on wage scales, costs of supplies and general conditions attending mining development work in this Mexican State. 20c.

3795—MINING COSTS, RECORDS, ETC. —Costs, Methods and Records as Applied to Small and Medium-Sized Mines. W. A. MacLeod. (Min. Journ., June 1, 1907; 1 p.) Paper read before the No. Queensland Min. and Mill Mgrs. Assn. Analyses methods of cost keeping as usually practiced in small mines, and comments upon defects in these methods and suggests improvements. 40c.

3796—MINING LAW — A Celebrated Case. H. M. Hoyt, 2nd. (Min and Sci. Press, June 1, 1907; 2 pp.) Reviews the finding of the Court in the case of Lavagnino vs. Uhlig, 198 U. S., 443, and gives the author's opinions as to what extent this decision will form a precedent in similar cases. 20c.

3797 — MINING LAW — Extralateral Rights. (L. A. Min. Rev., June 15, 1907; 1 p.) Describes several interesting cases where peculiar types of veins led to litigation under the present apex law. The geological features of these cases are touched on very briefly. 20c.

3798—MINING LAW—The Reform of the United States Mineral Land Law. R. W. Raymond. (Eng. and Min. Journ., June 8, 1907; 1 p.) A dissertation on the weaknesses of the present mining laws in the United States, especially in regard to mineral land laws, extralateral rights, and the recording of locations. 20c.

3799—MONTANA—Early Mining History of Montana. K. T. Hammond-Fogarty. (Min. World, June 8, 1907; 1½ pp.) Reviews the early discoveries of minerals in Montana, and gives brief notes on early mining operations in this State. A few approximate statistics of production are included. 20c.

3800—PROSPECTING in Ungava. (Can. Min. Journ., June 1, 1907; 1 p.) Continuation of article previously mentioned in this Index. 20c.

3801—SHAFT SINKING at Bowburn Winning, England. A. L. Steavenson. (Trans. No. of England Inst. Min. and Mechan. Eng., May, 1907; 3 pp.) Contains some brief notes on the use of piling for shaft sinking through glacial clay and sand.

3802—SHAFT SINKING—Das Schachtabteufen nach dem Gefrierverfahren von Poetsch. Kegel. (Bergbau, June 6 and 13, 1907; 6 pp.) An account of the Poetsch system of shaft sinking with the help of the freezing method, giving attention to the circulation and compression of the freezing liquids, and regeneration of the ammonia and carbon dioxide. 40c.

3803—SHAFT SINKING — Mechanical Production of Low Temperatures. Sydney F. Walker. (Eng. and Min. Journ., June 22, 1907; 4 pp.) Discusses principles of different refrigerating processes which are used in shaft sinking, with details on the compressing system, forms of condensers and the absorption system. 20c.

3804—SOUTH AFRICA—Broken Hill Base Metals. (South African Mines, May 8, 1907; 2 pp.) An account of the extent of exploitation at this South African lead-zinc district, and a general review of the properties comprising the western group of copper mines. 20c.

3805—SOUTH AFRICA—Mineral Prospects and Resources of Rhodesia. (South African Mines, May 4, 1907; 1 p.) Reviews briefly the present condition of several of the principal mines here, and outlines probable future development. 20c.

3806—SOUTH AFRICA — Mining in Rhodesia, South Africa. (Eng. and Min Journ., May 25, 1907; 1½ pp) Gives a few statistics of mineral production of this South African territory and reviews the recent progress in mining, which has taken place. Accompanied by map. 20c.

3807—SOUTH AFRICA—The Selukwe Mining District. (South African Mines, May 25, 1907; 1 p.) Deals briefly with the mining and operating conditions of several of the principal mines of this important Rhodesian district, with a few notes on the chrome iron ore deposits. 20c.

3808—SOUTH AFRICA — The Truth About Swaziland. (South African Mines, May 11, 1907; 2½ pp.) Gives a few facts about the conditions in this South African region which was recently thrown open to prospectors, and summarizes the terms under which prospecting is allowed by the Henderson Consolidated Corporation, which controls much of the territory. 20c.

3809—SURVEYING—Photographic Surveying. Wm. Griffith. (Mines and Minerals, June, 1907; 1 p.) Brief description of a method of constructing topographic surveys and maps from photographs of a region taken from different points outside it. 20c.

3810 — TIMBER PRESERVATION — Methods and Economic Aspects of Modern Timber Preservation. G. Alleman. (Proc. Engrs. Club, Apr., 1907; 34 pp.) A thorough study of all the features of timber preservation, including investigatons of the injury done by the preservative and the economic features which allow a saving by the use of preserved woods. 40c.

3811—TUNNEL LINING—Revêtements de Galeries en Béton Armé aux Mines de Béthune. (Génie Civ., June 8, 1907; 1¼ pp.) Notes on the lining of tunnels and drifts in mines with reinforced concrete, giving illustrations of methods of making forms and placing the concrete. 40c.

3812—VALUATION of Mineral Properties. T. A. O'Donahue. (Trans., No. of England Inst. Min and Mechan. Eng., May, 1907; 20 pp.) Develops a new method for valuing mine with special reference to present practices in discounting deferred values. A number of examples in calculating sinking funds and amortization charges are included.

ORE DRESSING

3813 — FLOTATION PROCESSES at Broken Hill. F. H. Jackson. (Min. and Sci. Press, June 8, 1907; 2½ pp.) An account of ore concentration by the use of the Potter and the Delprat processes, with descriptions of the apparatus used, and the general working of the flotation systems. 20c.

3814—FREE SETTLING VELOCITIES —Velocity of Galena and Quartz Falling in Water. R. H. Richards. (Paper read before the A. I. M. E., N. Y. Meeting, April, 1907; 26 pp.) Describes the apparatus and methods used in determining the velocity of grains of quartz and galena near the limit of sifting size when falling under free settling conditions, and tabulates the results secured.

3815—SCREEN—A Hand Screen Used at Monteponi, Sardinia. Erminio Ferraris. (Eng. and Min. Journ., June 1, 1907; ½ p.) Illustrates by elevations and photograph the construction of a hand screen which is useful in mining camps where no milling plant is at hand. 20c.

METALLURGY—GENERAL

3816—ALLOYS — Kupfer, Silber und Blei. K. Friedrich and A. Leroux. (Metallurgie, May 22, 1907; 30 pp.) Very extended inquiry into the formation, composition and properties of alloys of copper, silver and lead, both binary and tertiary types. 60c.

3817—COOLING CURVES—Methods in Obtaining Cooling Curves. C. L. A. Schmidt. (Cal. Journ. of Tech., May 1907; 4 pp.) Describes the construction and use of apparatus for recording automatically the cooling curves of heated substances, in which the corrections for errors of observation are very small. 20c.

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MINING AND METALLURGICAL MACHINERY

3822—AIR COMPRESSION—The Use of Coolers in Air Compression. F. Richards. (Eng. and Min. Journ., June 1, 1907; 1 p.) Discussion of the principle of cooling in air compression and of the relative merits of anti-coolers and inter-coolers and after-coolers. 20c.

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3826 — BOILER WATERS — How to Judge Boiler Waters from Analyses. J. G. A. Rhodin. (Engineer, Lond., May 31, 1907; 1 p.) Gives the experience of the author in making many analyses of boiler water, and his conclusions as to the inferences to be obtained by a consideration of the results of the analyses. 40c.

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3837 — HOISTING — Modern German Winding Plants. A. S. Ostreicher. (Journ. Transvaal Inst. Mechan. Eng., Mar., 1907; 10 pp.) Gives a critical review of recent improvements in steam winding engines in Germany as presented in two papers read before the Society of German Engineers. 60c.

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3851—PIPE DESIGN—A Solution of the Problem of Determining the Economic Size of Pipe for High-Pressure Water-Power Installation. A. L. Adams. (Proc. A. S. C. E., May, 1907; 4 pp.) Gives a comparative data for determining the economic size of pipe for conveying water under high pressures.

3852—POWER COSTS—C. E. Lucke. (Elec. Rev., May 18, 1907; 3 pp.) Paper read before the N. Y. Section of the American Electrochem. Soc., Feb. 26, 1907. A consideration of the principles for depreciation of the plants in the cases of oil, water, steam and gas power plants. 20c.

3853—POWER TESTS—Some Suggestions for Carrying Out Power and Efficiency Tests on the Mine. H. C. Behr. (Journ. Transvaal Inst. Mechan. Eng., Apr., 1907; 4 pp.) Continued discussion of the paper of the above title which was previously mentioned in this Index, giving attention to the heat unit basis of buying coal, methods of choosing the best coal for a particular mine, and the consumption of steam and power. 60c.

3854—PRODUCER GAS—Ueber Gasgeneratoren. J. Körting. (Stahl u. Eisen, May 15 and June 5, 1907; 34 pp.) An extended discussion of the theory of producer gas, tracing the changes which take place in a producer and giving many analyses of gas, also a thorough review of the present status of gas producers, with illustrated descriptions of many types now in use. 60c.

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3856—PRODUCER GAS ENGINES.* G. W. Bissell. (Iowa Engr., May, 1907; 5 pp.) Critical discussion of some of the results obtained by the U. S. Geological Survey in testing the value of coals as sources of producer gas.

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3858—PUMP—The Roturbo Centrifugal Pump. (Engineer, Lond., May 17, 1907; 1 p.) Describes the essential features of construction of this new type of centrifugal pump, which is claimed to overcome the defects of the ordinary pump running at constant speed, but with varying heads. 40c.

3859—PUMPING—Mine Pumping with Direct-Connected. Electrically Driven Turbine Pumps. P. H. Moore. (Can. Min. Journ., May 1, 1907; 2 pp.) Paper read before the Nova Scotia Min. Soc., describing a method of using turbine sinking pumps, and comparing them with steam and jack-head pumps. 20c.

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3864 — STEAM PLANT — Unfallim Dampfkesselbetriebe. (Zeit. des Oberschlesischen Berg- u. Hüttenm. Vereins Mar., 1907; 4 pp.) Describes an accident to the steam plant of the Dubensko mine, Czerwionka, Silesia, where the change to the use of superheated steam caused the bronze steam pipes to fall out of place. 40c.

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