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Iron Operations in Northeastern Alabama

Clinton Red Hematites Occur in Comparatively Thin Seams; Brown Hematites Are Found in Residual Clays; Ores Require Little Flux

BY EDWIN HIGGINS

A description of the operations of the Alabama Consolidated Coal and Iron Company will give an idea of the practice in mining the thin red-ore seams and brown-ore banks of northeastern Alabama, and also point out some interesting features in iron blast-furnace equipment and operation. Although the practice may vary slightly, the methods herein outlined may be said to typify operations in this district. In every case where costs are

ATTALLA RED-ORE MINES

As typical of the red-ore operations of the company, the Attalla mine, situated at Attalla, about five miles west of Gadsden, will be described.

Here the ore, which is a Clinton red hematite, outcrops in a northeasterly-southwesterly direction, following the general trend of a ridge which rises to varying heights up to 500 ft. above the surrounding country. On the northwest

phorus, 0.3; manganese, trace. The hard ore has the following range of composition: Iron, 39 to 44 per cent.; lime, 10 to 16; insolubles, 12 to 14; phosphorus, 0.4; manganese, trace.

MINING

This orebody was first mined from adit levels. Headings were turned off and raises put up to the surface, a distance of about 500 ft. This method was followed

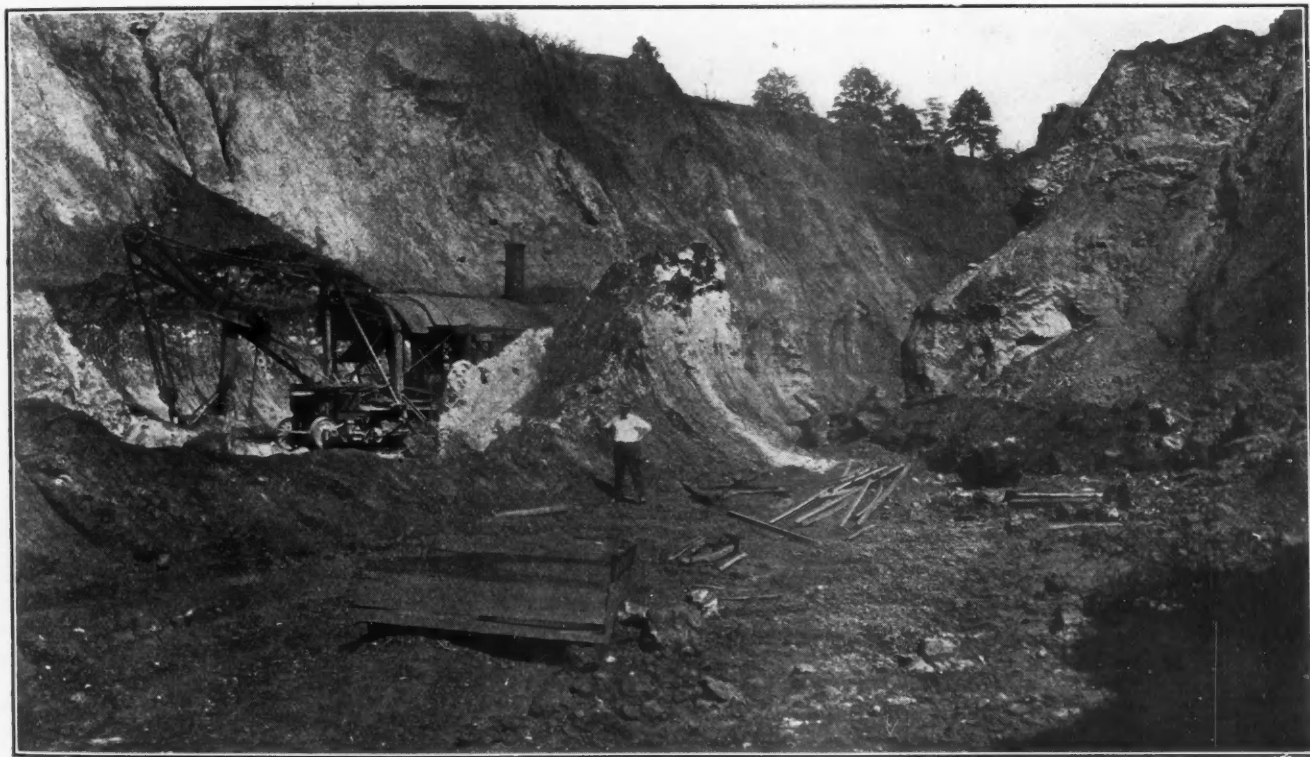


FIG. 1. NO. 3 BROWN-ORE CUT, IRONATON

given they refer to this district generally, and not to the operations of the Alabama Consolidated Coal and Iron Company.

This company has two blast furnaces at Gadsden, Etowah county, and two at Ironaton, Talladega county. The red-ore mines are situated at Etowah and Attalla, in Etowah county, and Hammond (or Gate City), Jefferson county. The chief brown-ore mines are situated at Ironaton, but the company has some brown-ore deposits in Polk county, Georgia.

slope of this ridge Big Wills creek flows southwesterly and empties into the Coosa river near Gadsden. The ore occurs in a well defined bed from 36 to 48 in. in width, and dips from 20 to 25 deg. toward the southeast. Immediately overlying the ore is about 18 in. of slaty material which often comes down when the ore is blasted. Above this is a tough sandstone. The footwall is a medium hard slate. Here the soft ore, which is found to a depth of about 400 ft., has the following range of composition: Iron, 44 to 50 per cent.; lime, none; insolubles, 20 to 28; phos-

until the ground had been worked for a distance of about $\frac{3}{4}$ mile north and $\frac{1}{2}$ mile south. Some little work is still being done in the north end.

The bulk of the ore, however, comes through the new slopes. Two main slopes are used, about 2000 ft. apart. The main haulage entry meets the bed at a point about 500 ft. on the slope from the outcrop. No. 1 slope, the most southerly, is now down 800 ft. below the level of the main entry; No. 2 slope is down 1000 ft. below it. These slopes are about 14 ft. in width and are not timbered.

Headings are turned off from the slopes at 50-ft. centers, and all ore is mined with the exception of a 10-ft. pillar which is left to protect the floor of the level above. The roof is held by white or yellow pine timbers, one stick from 10 to 12 in. wide holding an area about 10 ft. square. On the return the pillars are robbed and the ground is allowed to cave.

Most of the holes are drilled with ratchets (similar to a breast auger) attached to a breast bar. Some Ingersoll-Rand and Leyner drills are used.

After the ore is broken it is shoveled into cars of about two tons capacity. These cars are pushed to the slope, where two of them are loaded onto the double-decked cage. The total weight of the

PUMPING, SURFACE PLANT, LABOR, ETC.

No. 1 slope is equipped with a No. 10 Cameron station pump, which is worked eight hours out of every 24. The water from No. 2 slope is handled by a No. 9 Cameron station pump, which works about the same number of hours.

Just outside of the main entry is the surface plant shown in Fig. 4. Here are two Ingersoll compressors of 800 cu.ft. per min. capacity each, and one Rand of 400 cu.ft. capacity, all of the straight-line, single-cylinder type. There are five boilers ranging from 50 to 100 h.p. each, which furnish a total of 350 h.p. This plant furnishes the power for the pumping, the two inside hoists, and the drills. The Flory hoists are run with air, as well as

BROWN-ORE MINES AT IRONATON

Although the company has brown-ore mines in Polk county, Ga., its chief source of supply is from its deposits in the immediate vicinity of Ironaton. These ores occur in the residual clays overlying the limestone, and have the following range of composition: Iron, 46 to 52 per cent.; insolubles, 9 to 20; phosphorus, 0.2 and less; manganese, 1 to 3.

Within a radius of $\frac{1}{2}$ mile of the furnace there are eight mines, six of which are now in operation. No. 3 cut is shown in Fig. 1. The ore is all transported to the furnace over the company's own equipment. The production at present is about 15,000 tons per month.



FIG. 2. TIPPLE, ATTALLA MINE



FIG. 3. CAR-DUMPING ARRANGEMENT, ATTALLA MINE

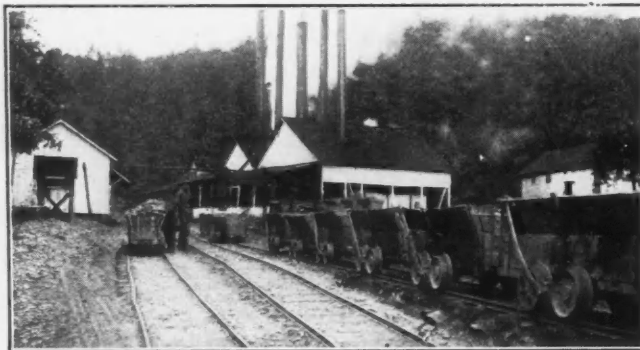


FIG. 4. SURFACE PLANT, ATTALLA MINE



FIG. 5. NO. 3 LOG WASHER, IRONATON

loaded cage is about six tons. For hoisting, a 1-in. 7-19 wire rope is used.

The hoists are placed above the main entry level. They are of Flory single-drum, link-motion type, with drums 48 in. in diameter. No. 1 slope is equipped with a 10x16, and No. 2 with a 12x16 hoist.

On the main entry level the cars are made up into trips of four and are trammed by mules to the outside; here they are lowered by gravity, in trips of 13, to the tippel (Fig. 2), 2300 ft. distant, the grade being .3 per cent. At the tippel the cars dump into a bin, from which the ore is fed to a crusher delivering a 3½- to 4-in. product direct to railroad cars below. The car-dumping arrangement, shown in Fig. 3, is simple and explains itself.

the Leyner and Ingersoll-Rand drills, and the pumps.

There are employed at this mine about 125 men, 75 to 80 of whom are worked underground. The output is about 300 tons per day. The cost of mining red ore in this district varies from 80c. to \$1.10 per ton. Mining is generally done by contract, and is paid for at the rate of 45c. per ton of ore delivered at the slope. When not working on contract, outside labor is paid \$1 per day, inside labor \$1.25 per day. Timbers cost about 10c. per stick of an average length of 5 ft., and an average width of 11 inches.

At the time of my visit there were 10,000 tons of red ore in the stock pile at this mine.

Mining is done almost entirely with Marion steam shovels of one cubic yard dipper capacity. These shovels handle on an average of 300 yards of dirt per day of 12 hours. Although the proportion of ore to dirt varies, it may be said to average 1 to 3. A steam-shovel crew, with the wages paid in this district, is about as follows: One cut foreman, \$2.10; one shovel runner, \$1.90; one crane-man, \$1.50; one fireman, \$1.25; three laborers at \$1, \$3. Each shovel burns on an average of 1000 lb. of coal per day, which will cost about 75c. Repairs, oils, etc., will cost about 25c. per day.

At only one operation is hand work done. The ore is milled down into carts and hauled to the washer, this work being done on contract; the average rate is

12½c. per yard of dirt delivered at the washer. The steam shovels deliver the ore to side-dump cars of two cubic yards capacity; these are hauled to the washer by a locomotive in trips of from six to 10 cars each.

LOG WASHERS

The company has in operation at Ironaton five 4-log washers and one 2-log washer. The ore from the cars is dumped onto a 3-in. grizzly; the undersize goes to the log washers; overs go to a Blake jaw crusher, which breaks the ore to pass a 4-in. ring, delivering it to the log washers. These washers are 30 ft. in length and make from 9 to 20 r.p.m., depending upon the quality of the dirt. The log washers discharge into a revolving 12-mesh screen, which runs at the same speed as the log washers. Here the sand is washed out. The revolving screen discharges onto a picking belt, running at a speed of 20 ft. per min., where quartz

Lewisburg, Jefferson county. The Brookwood and Searles coals are about the same and furnish coke of about the following range of composition: ash, 9 to 13 per cent.; volatile combustible matter, 2.5 to 3; fixed carbon, 79 to 84; sulphur, 0.6 to 0.8. This is a dense, hard coke and is well adapted to carrying a heavy burden and withstanding hard blowing. The Lewisburg coke has the following range of composition: ash, 12 to 16 per cent.; volatile combustible matter, 2.75 to 3; fixed carbon, 79 to 83; sulphur, 0.7. This makes a good blast-furnace coke, but runs a little higher in ash than that made at Brookwood and Searles. Practically all coke is 72-hour coke.

The limestone used comes from the company's quarry at Rock Springs, Etowah county. This limestone contains only from 1½ to 2 per cent. of insolubles, and carries in addition to the calcium carbonate about 3 per cent. magnesium carbonate. The cost of limestone delivered

original Walter Kennedy top, with which this furnace was first equipped.

The blowing-engine room contains seven vertical, long crosshead, Todd blowing engines. Two of these engines are low pressure and are operated compound non-condensing. The boiler plant consists of 14 Rust, four Wickes, and four Babcock & Wilcox boilers, giving a total rated horsepower of 6400.

The power plant contains one direct-connected 200-kw. General Electric generator, 240 volts, with one small 50-kw. generator for emergencies. Both furnaces are filled by electric scale cars of 75 cu. ft. capacity each. Cinder is handled by Pollock steam-dump, self-cleaning cars.

In connection with this plant there is a well-equipped blacksmith shop and a large machine shop; also a locomotive repair shop. For handling cinder at Ironaton the Hartman end-dump and side-dump cars are used; to some extent the Weimer steam-dump car is used.

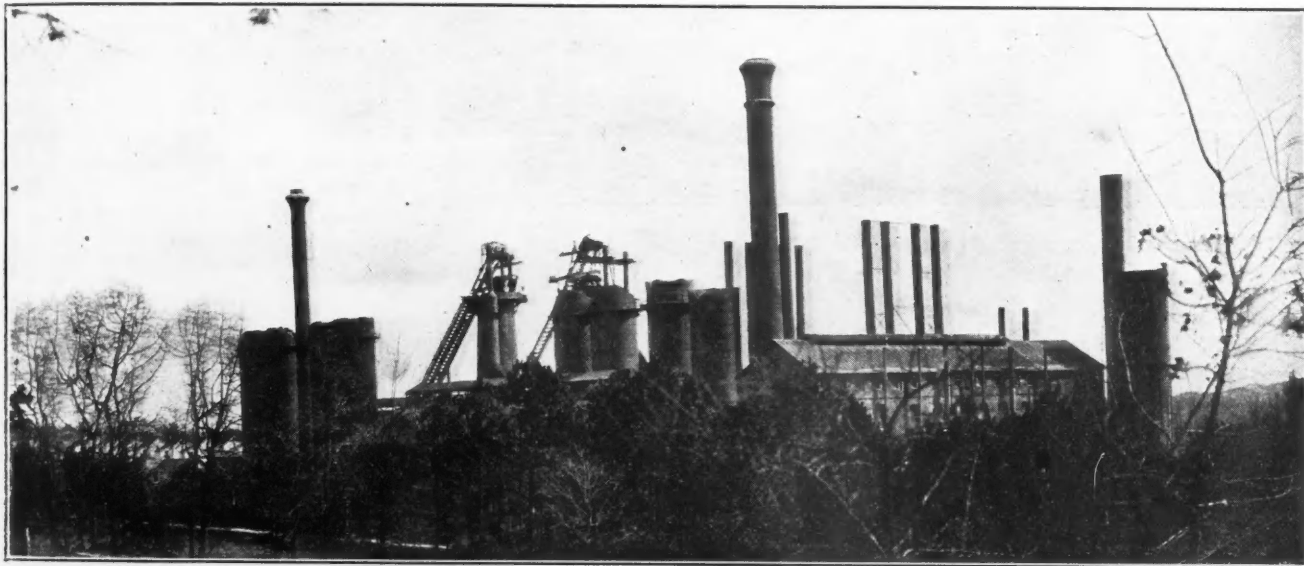


FIG. 6. FURNACE PLANT AT GADSDEN

and other waste material are removed. From two to six pickers are employed, depending upon the quality of the ore. From the picking belt the ore goes to bins, from which it is loaded into railroad cars. No. 3 washer is shown in Fig. 5.

A 4-log plant will average 150 tons in 12 hours. About an 80-h.p. boiler plant is required. The cost of washing the ore varies with the quality, but will average about 40c. per ton. A 4-log washer requires the following crew: One foreman, \$1.90 per day; six men for dumping cars and working on the grizzly, at \$1 each, \$6; one engineer and fireman, \$1.50; one dinkey engineer, \$1.55; one dinkey fireman, \$1.25.

COKE AND LIMESTONE

The coke used is made from coal obtained at the company's mines at Brookwood and Searles, Tuscaloosa county, and

in this district is about the same as in the Birmingham district,¹ i.e., 30c. per ton.

GADSDEN FURNACE

There are two stacks at the Gadsden plant, shown in Fig. 6. No. 1 has the following lines: Hearth, 12 ft.; bosh, 18 ft.; top, 13 ft. 6 in.; bell, 8 ft.; total height, 76 ft.; angle of bosh, 71 deg. There are four 20x80 hot-blast stoves, all equipped with Kennedy valves. No. 2 furnace has the following lines: Hearth, 11 ft.; bosh, 16 ft. 8 in.; top, 11 ft. 6 in.; bell, 8 ft.; total height, 87 ft.; angle of bosh, 75 deg. There are four 20x80 hot-blast stoves, equipped with Kennedy valves.

Both furnaces are equipped with Brown tops, No. 1 having a single skip and No. 2 a double skip; the latter is a part of the

¹Eng. and Min. Journ., Nov. 28, 1908, p. 1043.

MATERIALS

Both furnaces are making standard foundry iron of the following range of composition: Silicon, 1½ to 4 per cent.; phosphorus, 1; manganese, 0.5 and under; sulphur, under 0.05; total carbons, 3.25 to 3.50.

The ores used are Alabama brown hematite and Georgia brown hematite, together with Clinton red ores, both hard and soft. The red ores are obtained from the company's mines within a radius of five miles of the furnace. The average composition of these ores is given in another part of this article.

The brown hematites used at the Gadsden plant are bought in the open market and consequently vary in iron content, as well as insolubles. These ores have the following range of composition: iron, 42 to 48 per cent.; insoluble, 16 to 26; phosphorus, 0.4 to 0.8; manganese, 0.3 to 1.

The following mixture is at present being used in No. 1 furnace: brown hematite, 25 per cent.; Clinton red hematite, hard, 75 per cent.; in No. 2 furnace, brown hematite, 25 per cent.; Gate City semi-hard red hematite, 25; Clinton, hard, 50. The burden carried is usually about 15,600 lb. per charge, with a coke unit of 10,400 lb. to the charge, and the necessary limestone. The yields through the furnaces

19 boilers of different makes, which furnish a total of 4600 h.p. The power house contains a 100-kw., 240-volt, Northern Manufacturing Company generator, driven by an Erie ball engine, 12x16 ft.; one Worthington compound pump for handling waste waters from the furnaces to the reservoir; one Cameron simplex pump, and one small Worthington as an auxiliary; one small air compressor for fur-

insolubles, 9 to 20; phosphorus, 0.2 and under; manganese, 1 to 3. The analysis of the red ore is given elsewhere in this article.

The yield through these furnaces is from 40 to 44 per cent., and the capacity of each furnace 125 to 150 tons per 24 hours. The following ore mixture is used in both furnaces: 75 per cent. brown hematite; 25 per cent. Clinton red hematite. No. 1 furnace carries a burden of about 15,800 lb. of ore, with a coke unit of 8000 lb., and the necessary lime. No. 2 furnace carries a burden of 7000 lb. of ore, 3600 lb. of coke and the necessary lime.

The product made is a special brand of low-phosphorus, low-sulphur, high-silicon, high-grade foundry pig iron of the following analysis: Silicon, 1½ to 4 per cent.; sulphur, 0.03 and less; phosphorus, 0.7 and less; manganese, 1 and over; total carbons, 3.5 to 3.75. This iron is especially adapted to making gray-iron castings and for car-wheel work. It commands a premium of from 50c. to \$1 per ton over the iron usually made in this district.

In connection with the blast-furnace plant at Ironaton, there is a well equipped blacksmith shop and a large machine shop, a pattern shop and a foundry. The castings for all the company's operations are made at the foundry here.

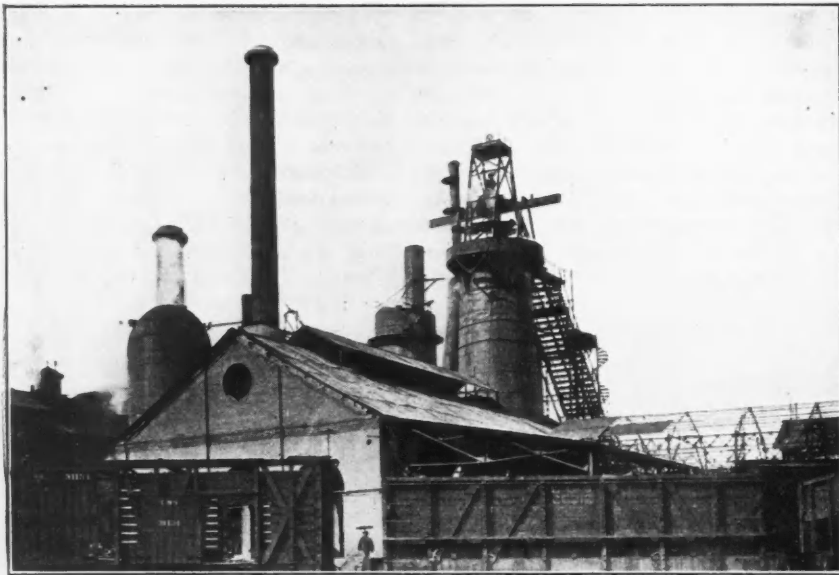


FIG. 7. NO. 1 FURNACE, IRONATON

vary from 38 to 42 per cent. The Gadsden plant is now making from 200 to 225 tons of pig iron per stack, or a total of from 400 to 450 tons per 24 hours.

IRONATON FURNACE

The blast-furnace plant at Ironaton consists of two stacks. No. 1 has the following lines: Hearth, 9 ft.; bosh, 15 ft. 6 in.; top, 11 ft.; bell, 7 ft.; angle of bosh, 76 deg.; total height, 73 ft. No. 2 has the following lines: Hearth, 9 ft.; bosh, 15 ft.; top, 11 ft.; bell, 7 ft.; angle of bosh, 76 deg.; total height, 67 feet.

No. 1 furnace (Fig. 7) is equipped with Baker top (Fig. 9), and has one 20x80 and four 20x60 hot-blast stoves. It is equipped with an electric scale car, built under the direction of David Baker. The car has a capacity of 110 cu.ft., and is fitted with Fairbanks scales and Westinghouse motor.

No. 2 furnace (Fig. 8) has four 18x65 hot-blast stoves, and is equipped with an electric scale car, built by C. W. Hill & Co. The furnace top is of the Miller type; the hoist is vertical.

The blowing-engine room contains two 5x7 Wiemer blowing engines, equipped with poppet valves; two 4x7 Todd (air cylinder) blowing engines, equipped with piston valves; one 5x7 Todd blowing engine, equipped with piston valve; one 4½x7 Weimer blowing engine, equipped with poppet valve.

The boiler plant consists of a total of

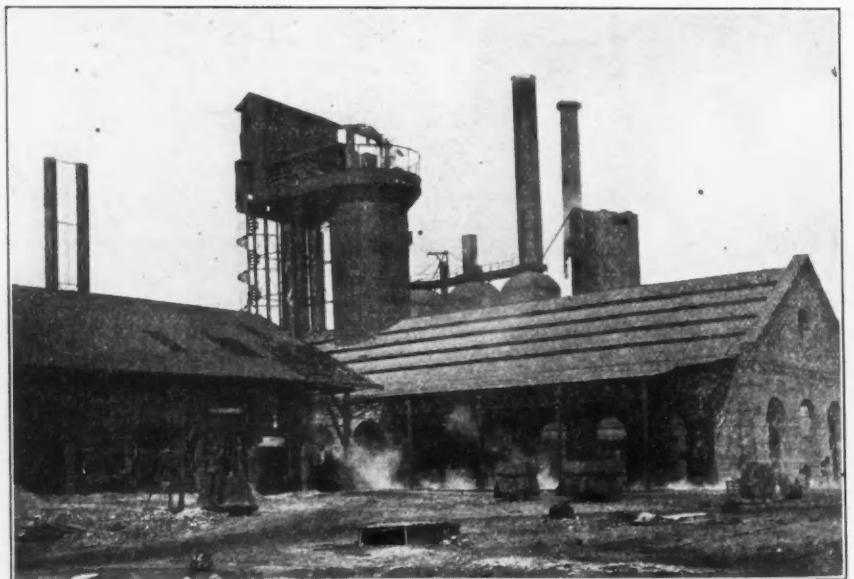


FIG. 8. NO. 2 FURNACE, IRONATON

nishing air to tools required by the plant.

MATERIALS

The ores used at the Ironaton furnace are Alabama brown hematite, obtained in the immediate vicinity, with a small percentage of Clinton hard ore. The latter is shipped from Gadsden. These brown hematites will show the following range of composition: Iron, 46 to 52 per cent.;

The water supply for the operation is pumped from two sources into a reservoir ¾ mile east of the furnace plant. The first pumping station at Fain's creek delivers an 8-in. stream into the reservoir; the second pumping station at Curry's Station, on Chehaw creek, delivers a 10-in. stream. The operations (furnaces and mines) require about 3,000,000 gal. water per day.

Revival of Hydraulic Mining in California

SPECIAL CORRESPONDENCE

In Yuba county, California, there is now considerable mining activity, though for many years, since the closing down

used. In some other portions of the county, however, there is a small revival of hydraulic mining. At Indian Hill some 50 men are building a large restraining dam for the débris, which will permit the working of a rich gravel channel. This section was very productive at one time and may be again. After making application to the California Débris Commission to resume mining under the prevailing

to bring injunction suits, notwithstanding the opinions of the Federal engineers appointed by law to regulate hydraulic mining.

In this same county, near Marysville, the Yuba Consolidated Goldfields is operating 12 modern gold dredges of the largest size and the Marysville Gold Dredging Company is operating two. The Marysville gold-dredging field is considered by many as apt to be the most productive in the State. The ground being dug has laid idle many years and for a long time was not considered worth paying taxes upon. Some people who bought up these tracts at 25c. an acre later sold them to the dredging companies for as much as \$1000 an acre.

Above Camptonville, also in Yuba county, three big restraining dams are being built by as many companies. On Willow creek Fred Joubert is building a substantial concrete dam to hold a large amount of mining débris from the Depot Hill mine. The Brandy City Mining Company is doing extensive work preparatory to commencing hydraulic mining again. A large force of men has been at work over a year and a large dam has been built. The capacity of the Indian Hill dam above referred to will be very great.

All this looks like a real revival of gravel mining in Yuba county, though for many years the miners almost despaired of ever being able to wash a piece of gravel in the county.

Dr. C. K. Gilbert, of the United States Geological Survey, has been for the last few years gathering data relative to the amount of débris or detritus swept into the rivers of the northern part of this State either through the process of hydraulic mining or by natural erosion. Just at present he is investigating the section around Washington, Omega and neighboring places in Nevada county, drained by the South Yuba river. His investigation will cover the whole of the drainage of this river from the point where it empties into the Feather river up into the mountains as far as any mining has been done.

Magnesite Brick

The manufacturers of magnesite brick in the United States are the Harbison-Walker Refractories Company, of Pittsburgh, Penn., and the American Refractories Company, of Chicago, the latter being a new concern. The Harbison-Walker company obtains its supply of raw material from the Veitscher Magnesitwerke Aktiengesellschaft, of Austria. The American Refractories Company has secured control of a large deposit in Styria. This company has already begun the manufacture of magnesite and chrome bricks at its plant at Joliet, Ill.



FIG. 9. NO. 1 FURNACE, IRONATON, SHOWING BAKER TOP

of hydraulic mining, little or nothing has been done in either gravel or quartz mining. At one time some of the more extensive hydraulic mines of the State were in operation in the vicinity of Smartsville. They have been idle and unproductive for many years, but have now come into new ownership and the old ditches are being cleaned out and repaired to bring water on the ground again, though the hydraulic system of mining will not this time be

laws, a permit was granted and work on the dam commenced. It has still to be approved by the Commission, and when this takes place the Indian Hill mine will resume operations with the hydraulic process. They have still the Anti-Débris Association to deal with, however, and this is a body of men intent upon stopping hydraulic mining when it can possibly be done. They care little or nothing about the Government permit and are apt

Prevention of Mine Accidents

Only Four States Have Passed Comprehensive Laws Regulating Metalliferous Mining and Several Important States Have No Law

SUMMARY OF THE LAWS

At the meeting of the American Mining Congress, at Denver, Colo., in November, 1906, a committee was appointed to prepare a modern law governing quarrying and metalliferous mining, with the view to its adoption by the American Mining Congress and recommendation to the various States of the Union for its passage as a uniform law, replacing existing laws which, in the best cases, are more or less imperfect and out of date. The advantages of a uniform law among all the States are so obvious that no discussion of them is necessary. It is well to explain, however, that the work of the committee pertains only to the laws regulating quarrying and mining from the standpoint of public safety, which regulation comes within the police powers of the States, and in no way extends to the laws which determine the titles to mineral lands and the ownership of mines. The investigations of the committee were limited to quarrying and metalliferous mining, because the conditions governing coal mining are so special in character that they can be met properly only by special laws.

The committee that was appointed comprises W. R. Ingalls (chairman), John Hays Hammond, James Douglas, J. Parke Channing, and James R. Finlay. The first step of this committee was to secure copies of the existing laws, for which purpose letters were addressed to the Governments of all the States. The replies to these letters developed that many States in which mining is done have no laws at all. Other States have elaborate laws governing coal mining, but none applying to metalliferous mining; some States have what may be called fragmentary laws, i. e., articles aiming to prevent some limited classes of accidents, the enactment of such having been prompted apparently by the occurrence of some disastrous accidents of that kind. It appeared that Colorado, Missouri, Montana and New York are the only States which have formulated a general mining law of broad scope. It is particularly noteworthy that States in which the mining industry is so important as California and Michigan have no such laws. In Idaho, Robert N. Bell, the State Mine Inspector, has been for years endeavoring to secure the passage of a general law in that State, which at present has clauses covering only a few special cases. South Dakota appears to have no law.

Summarizing briefly the present status of this matter, the following States have

laws which apply to collieries only: Alabama, Illinois, Iowa, Michigan, Ohio, Pennsylvania and West Virginia. The following States have a general law applying to metalliferous mining: Colorado, Missouri, Montana and New York. The following States have special laws pertaining to metalliferous mining, but with few provisions as to safety: Arizona, Idaho, Michigan, Nevada, New Mexico, North Carolina, Oregon, Utah and Wyoming. The following States have no laws: California, Connecticut, Kansas, Louisiana, Massachusetts, New Hampshire, Rhode Island, South Dakota, Vermont, Virginia and Washington. Underground mining is, or has been, conducted in all of these States. Tennessee has an elaborate law as to the inspection of mines, but it contains few provisions as to safety. Michigan also has a law providing for mine inspection. The other States either have no law, or the few provisions covering the subject are so incorporated in other laws as to be not readily available and consequently remain generally unknown. The elaborate factory laws of many States contain some provisions that apply to mining and metallurgical work, but only to surface operations in so far as mining is concerned.

The committee recommended to the American Mining Congress at the meeting at Joplin, Mo., November, 1907, that the laws of Colorado, Missouri, Montana and New York be printed, believing that such a publication would be of value to everyone engaged in mining, and also that it would enable the invitation to be extended to everyone to criticize the existing laws, both for shortcomings and for improper provisions, and thereby assist the committee. The report of the committee to this effect was adopted and the committee was continued. As a matter of convenience and to insure the widest possible circulation, the officers of the American Mining Congress requested that the first publication of this matter be made in the ENGINEERING AND MINING JOURNAL, which is now done with the approval of the committee and the officers of the American Mining Congress. It is hoped that this publication will lead to many suggestions as to provisions that ought to be included in, or excluded from, a composite, comprehensive mining law. Communications upon this subject should be addressed to the undersigned.

In making the present publication of the laws of Colorado, Idaho, Missouri, Montana, New York and Utah, the latter have

been edited in order to save space and facilitate consideration. This editing has been done with great care and in no way alters the expression of the substance of the law. The editing has consisted only of the excision of matter not pertaining to the subject of quarrying and metalliferous mining, a slight re-arrangement of paragraphs in some cases in order to bring together the same subject matter, and the modification of certain unimportant legal verbiage. Also, certain sub-heads, not to be found in the originals, have been added in order to assist classification.

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Colorado

EXPLOSIVES

Storage of Explosives—Explosives must be stored in a magazine far enough from the working shaft, adit or incline to insure that, in case all the explosive should explode, the adit or shaft will not be wrecked. All explosive in excess of the amount required for one shift's work must be kept in this magazine, and no powder or other explosive shall be stored in underground workings where men are employed. No oils or other combustible substances shall be kept or stored in the same magazine with the explosives. Every mine shall employ a suitable device for thawing dynamite sufficiently so that it can be used safely.

Tamping Sticks—In charging a hole with nitroglycerin powder or other explosive, no one shall use a tamping stick made of steel or iron.

HOISTING

Hoisting Engineer—No person addicted to the use of intoxicating liquors, or under 18 years of age, shall be employed as a hoisting engineer.

Hoisting Machinery—All hoisting engines shall be equipped with an indicator placed near to and in clear view of the engineer.

Signals—The commissioner of mines shall establish a code of signals, embracing those most generally used at metal mines, and these shall be used in all mines. A legible copy of this code of signals shall be securely posted in the engine room, at the collar of the shaft, and at each level or station. Wherever possible all shafts and cages shall be fully equipped with a system of electrical sig-

nals from cage and stations to the engineer.

Code of Signals—The code of signals is as follows: One bell, hoist; one bell, stop if in motion; two bells, lower; three bells, men on, run slow; seven bells, accident, hoist or lower by verbal orders only; 3-2-1 bells, ready to shoot. After signal 3-2-1, engineer shall raise the bucket or cage 2 ft., lower again, and remain at his post until the final signal is given and the command executed. The station signals are as follows:

1-1 bells,	1st level.	4-1 bells,	11th level.
1-2 "	2d "	4-2 "	12th "
1-3 "	3d "	4-3 "	13th "
1-4 "	4th "	4-4 "	14th "
1-5 "	5th "	4-5 "	15th "
2-1 "	6th "	5-1 "	16th "
2-2 "	7th "	5-2 "	17th "
2-3 "	8th "	5-3 "	18th "
2-4 "	9th "	5-4 "	19th "
2-5 "	10th "	5-5 "	20th " etc.

Rules Governing Signals—In giving ordinary signals, make strokes on the bell at regular intervals. When men are to be hoisted or lowered, give signal three bells. After that signal has been given, the men must get on the cage or bucket; when ready to be hoisted or lowered, ring final signal, one or two bells. After the signal 3-2-1 bells, the engineer must indicate that he is ready to hoist by raising and lowering the bucket or cage. Miners must give the answering signal "men on" (three bells), then spit the fuse, get on the bucket or cage, and give the final signal to hoist. The signal three bells means "men on," and nothing in conflict with it will be allowed in any set of signals. Signals to meet local demands and not in conflict with the code given above may be added by local operators, but these signals must be posted in clear and legible form in connection with the regular code.

False Signals—All persons giving, or causing to be given, false signals, or riding upon any cage, skip or bucket upon signals that designate to the engineer that no employees are on the cage shall be deemed guilty of a misdemeanor.

Lowering Supplies—All timbers, tools, etc., longer than the depth of the bucket or placed erect upon the cage, must be securely lashed before being hoisted or lowered.

Riding With Supplies—No person shall ride upon any cage, skip or bucket that is loaded with tools, timber, powder or other material, except for the purpose of assisting in passing these through the shaft or incline, and then only after a special signal has been given.

Number of Men Allowed on Cage—The maximum number of men permitted to ride at one time upon or in the cage, skip or bucket, shall be posted at the collar of the shaft and at each level. All employees riding upon or in an overloaded cage, skip or bucket shall be guilty of a misdemeanor.

MANWAYS

Shaft Ladders and Landings—All shafts, more than 200 ft. deep and equipped with

hoisting machinery, shall be divided into at least two compartments, and one of these compartments shall be partitioned off and set aside for a ladderway. In vertical shafts, landings shall be constructed not more than 20 ft. apart; these landings, except for an opening large enough to permit the passage of a man, shall be closely covered. The ladders shall be inclined at the most convenient angle that the space allows; they must be firmly fastened and kept in good order. In incline shafts the landings shall be put in as previously described, but a straight ladder having the inclination of the shaft shall be used. Ladders in raises and winzes shall be likewise provided and kept in order, but where the winzes are used only for ventilation and exit, on each level, only one such winze need be so equipped.

Fire Exits—When the only means of exit from the mine is a shaft covered with a building and equipped with machinery, this shaft shall be divided into at least two compartments. One of these compartments shall be tightly partitioned off and used for a ladderway as hereinbefore ordered. This ladderway shall be securely bulkheaded at a point at least 25 ft. below the collar of the shaft, and below this bulkhead, if the shaft is situated upon a side-hill, a drift shall be driven to the surface; if the shaft is situated in a level country, this drift shall be driven to a safe distance beyond the walls of the building and from there a raise made to the surface. This ladderway and landings shall be kept in good repair and shall afford an easy escape in the event of fire.

Double Exits for "Tunnel" Mines—At a safe distance from their mouths all tunnels or adit levels shall connect with the surface; this connection shall be provided with suitable ladders so as to serve as an exit in case that fire destroys the building at the mouth of the adit.

Fire Protection—At all mines where the mouth of the shaft or adit is covered with a building containing the mechanical plant, furnace room and blacksmith shop, fire protection shall be provided. This shall be water if possible, but at mines where water is not available chemical fire-extinguishers or hand grenades shall be kept in convenient places for immediate use.

SHAFTS

Chain Ladders—Employees engaged in sinking a shaft or incline shall at all times be provided with chain or other kind of ladder.

Guard Rails at Shafts and Winzes—At all shafts the collars shall be protected so that persons or foreign objects cannot fall into the shaft. Safety clutches shall be used on all cages; if the hoisting is done with buckets, shaft doors must be constructed which will prevent any material from falling into the shaft while dumping the bucket. At all shaft stations

a guard rail shall be provided and kept in place across the shaft. All winzes and mill-holes extending from one level to another shall either be covered or protected with a guard rail.

Passageway Around Shafts—All stations or levels shall, when practicable, have a passageway around the working shaft so that crossing over the hoisting compartments may be avoided.

Shaft Pillar—When any shaft is sunk on a vein, oreshoot or orebody, a pillar of ground large enough to protect and secure the shaft shall be left standing on each side of the shaft, and stoping shall not be permitted within such close proximity to the shaft as to render the same insecure, unless the mine is being abandoned.

Abandoned Shafts—All abandoned shafts or other excavations endangering life shall be securely covered or fenced, and any person removing this covering or fencing shall be deemed guilty of a misdemeanor.

MISCELLANEOUS LAWS

Removing Old Timber—All old timber shall be removed as soon as practicable from the mine, and shall not be permitted to decay underground.

Misrepresentation—Any owner or person in charge of any metal mine, who shall wilfully misrepresent or withhold facts or information regarding the mine from any inspector or other officer of the Bureau of Mines, such as the length of time timbers have been in place or who shall make any misrepresentations tending to show safety when the reverse is true, shall be deemed guilty of a misdemeanor.

Visitors—Strangers or visitors shall not be allowed underground in any mine, unless accompanied by the owner, official or employee deputized to accompany them.

Reporting Accidents—The person in charge of a metal mine at which occurs an accident either fatal or serious enough to cause the injured person to stop work for two consecutive days shall immediately notify the commissioner of mines, reporting to him all facts regarding the accident. The commissioner upon being notified shall investigate the cause of the accident, and shall file a report of this accident in his office.

Power of Commissioner—The commissioner of mines and inspectors under him have authority to examine any mine and the machinery used at it so as to see whether the mining laws are being complied with. The commissioner has the right to appear at all coroner's inquests held over the remains of anyone killed in a mine accident, and, if he deems it necessary, he can call, examine and cross-examine witnesses.

RECOMMENDATIONS OF THE STATE BUREAU OF MINES

After investigating many accidents, the

State Bureau of Mines, of Colorado, makes the following recommendations:

HOISTING PLANTS

An auxiliary throttle valve should be used on all hoisting engines. At all shafts equipped with cages, a set of automatic chairs should be placed in the headframe, a few inches more than the length of the cage below the sheave wheel. A detaching device should be used at all shafts to prevent overwinding; the Humble safety hook and the Akron safety hook are devices worthy of adoption as their utility has been amply proved both in operation with and without the automatic chair.

In connection with the detaching device it will be necessary to provide, at the point in the headframe at which the cage or bucket is stopped, some means to keep the men from falling from the cage or bucket back into the shaft. This can be done in various ways when a cage is used, but when buckets are used, the only way of effecting this is by means of a platform and doors which close the shaft opening at that point. The safety clutches should be carefully tested at intervals of not more than one week apart so as to insure their working in case of necessity.

At all adits the head-house should be built at some distance from the mouth of the adit. A shaft-house should not be constructed over the collar of the shaft. A double exist must be provided in the case of both shaft and adits, and the only exception to this arrangement should be in the event of ample connections being made with others means of exit.

Idaho

INSPECTION OF MINES

Mine Inspector—The inspector has authority to examine any and all mines whenever he desires. Whenever the inspector finds a mine to be in an unsafe condition, he shall at once notify in writing the persons operating this mine. In this notice the inspector shall state in detail in what particulars the mine is dangerous, and he shall require all changes necessary to render the mine safe to be made without delay.

Inspection Upon Complaint—Whenever the inspector shall receive a complaint in writing, signed by three or more persons, setting forth that the mine in which they are employed is dangerous in any respect, he must examine that mine in person. In case he finds the conditions so dangerous as to warrant the closing of the mine or portions of the mine, he shall order all mining to cease in the dangerous portions until they have been made safe.

Accidents—Whenever a serious or fatal accident occurs, the person in charge of the mine shall immediately notify the inspector of mines by the quickest means available. Upon being notified the in-

spector, or his deputy, shall investigate fully the cause of such accident. The inspector, or his deputy, shall be present at every coroner's inquest held over the remains of any person killed in any mine accident, then the statements of those who the inspector has power to examine and cross-examine witnesses, and to compel the attendance of witnesses. Whenever the inspector, or his deputy, cannot immediately visit the scene of the accident, it is the duty of the person in charge of the mine to have statements made and verified by those who have seen the accident; in case no one was present at the time of the accident, then the statements of those who first arrived after the accident occurred shall be taken and verified so as to be sent to the inspector of mines.

Marking of Dynamite—No persons or corporation shall deal in or use any high explosive containing nitroglycerin, unless on every box and wrapper containing this explosive there shall be plainly printed the name and place of business of the manufacturer of the explosive, the percentage of nitroglycerin or other high explosive contained in it, and the date of its manufacture.

ADDITIONS RECOMMENDED

Robert N. Bell, inspector of mines for Idaho, has recommended to the legislature many additional provisions. In his recommendations the sections regarding the storing of explosives, tamping sticks, old timbers, number of men allowed to ride on cage, riding on a loaded cage, signals, more than one exit from mine, shaft ladders, chain ladders while sinking shafts, guard rails at shafts and winzes, shaft pillars, abandoned shafts, false reports, visitors and power of inspection are the same as those given in the laws of Colorado, and are, therefore, not here repeated. The provisions regarding hoisting engineers are the same as those for Colorado, but cages do not have to be used until a depth of 300 ft. has been attained in the shaft. The following sections of Mr. Bell's recommendations are not included in the mining laws of Colorado.

Extra Tunnel Exits—Every adit, at the mouth of which is a timber shed, blacksmith shop or building containing the mechanical plant, shall connect, at a safe distance from the portal, with the surface by means of a raise that is provided with safe and suitable ladders; and in such adits, near the mouth, doors shall be provided that can be closed from the outside buildings by pull wires, so as to keep the gases of combustion from entering the mine in case that fire destroys the building at the mouth of the adit.

Bonnets on Cage—The collars of all shafts shall be fixed so that persons or foreign objects cannot fall into the shaft. The cage shall be equipped with safety clutches and a steel hood or bonnet. If solid, this hood shall be oval in shape; if divided in the middle and hinged at the

sides, the angle of the sides when closed shall not be less than 45 deg. nor the steel less than 3/16 in. thick.

Indicator on Hoist—All machinery used for the purpose of hoisting or lowering employees and material into metal mines shall be equipped with an indicator geared positively to the shaft of the drum and so adjusted with dial or slide as to provide a target or indicator that at all times shows the exact location of the cage, bucket or skip in the shaft. This indicator must be placed near to and in clear view of the engineer, and shall be free from gongs, bells or automatic attachments.

Cager—All mines, equipped with cages or skips, when hoisting material from two or more levels, shall employ a man to be known as a "cager" whose duties shall be to load and unload the cage or skip, and to give all signals to the hoisting engineer.

Fire Protection—All mines having but one exit and that covered with the building containing the mechanical plant, furnace room and blacksmith shop shall have fire protection. Where steam is used, hose of sufficient length to reach to the farthest points of the plant shall be attached to the feed pump or injector, ready for immediate use. In mines where water is not available, chemical fire extinguishers or hand grenades shall be kept in convenient places, ready for immediate use.

Storage of Inflammable Material—Oils and other inflammable material shall be stored in a building, kept only for them, situated at a safe distance from the other buildings and from the powder magazine. Only sufficient oil, etc., shall be removed to meet the requirements of one day.

Missouri

MISCELLANEOUS LAWS

Mine Maps—The owner or operator of every mine employing 10 or more men shall make, at the discretion of the mine inspector, an accurate map of the workings of his mine. On this every vein shall be shown together with the general inclination of the strata. A copy of this map shall be deposited with the clerk of the court of the county in which the mine is situated, and another copy sent to the inspector of mines. During the month of January of each year the owner or operator shall furnish the inspector a map showing the work that has been done from the time of the last report to the end of the preceding December, and the inspector shall correct his map or plan of the workings of this mine in accordance with this addition. When any mine is worked out or abandoned, that fact shall be reported to the inspector, and the plan or map of that mine in the office of the clerk of the county court shall be carefully corrected and verified.

Inspector May Make Maps—Whenever the owner or operator of any mine shall neglect or refuse to furnish the inspector

and clerk with the map or additions to the map, the inspector is authorized to cause an accurate map of such workings to be made at the expense of the owner or operator.

MINE INSPECTION

Bureau of Mines—The Governor shall appoint two inspectors of metal mines, who shall have had practical experience in lead and zinc mining. These inspectors have the power to examine and inspect all mines and the machinery belonging thereto, at all reasonable times, but they shall not hinder or obstruct more than is necessary the working of the mine. If, after examining any mine workings and the machinery pertaining thereto, the inspector shall find that the mine is being worked contrary to the provisions of the mining law, or that it is unsafe for the workmen employed therein, he shall, after giving at least two-days' notice to such owner or operator, proceed, by injunction, against the owner or operator of that mine. If it is shown that the mine is unsafe or that it is worked contrary to the provisions of the mining law, the court shall prohibit the working of that mine, until it has been made safe and the requirements of the law have been complied with.

LAWS REGARDING SAFETY OF MINES

Oils for Illuminating Purposes—Nothing but a pure animal or vegetable oil, or other oil as free from smoke as is a pure animal or vegetable oil, and not the product or by-product of rosin, and which on inspection complies with the following test, shall be used for illuminating purposes in the mines of this State. All such oils must be tested at 60 deg. F. The specific gravity of the oil must not exceed 24 deg., Tagliabue. The test of the oil must be made in a glass jar of 1 1/5 in. diameter by 7 in. deep. If the oil to be tested is below 45 deg. F. it must be heated until it reaches about 80 deg. F., and should the oil be above 45 deg. F. and below 60 deg. F., it must be raised to 70 deg. F., then after being well shaken it should be allowed to cool gradually to 60 deg. F. before finally being tested. In testing the specific gravity of the oil the Tagliabue hydrometer must be, when possible, read from below, and the last line which appears under the surface of the oil shall be regarded as the true reading. Where the oil is tested under difficult circumstances, before condemning the oil for use in the mine, an allowance of 1/2 deg. shall be made for possible error in parrallax.

Mine Timbers—At every mine a sufficient supply of timber suitable for props shall be kept, so that the miners may at all times be able promptly to secure the workings from caving, and the owners or operators must send down props whenever they are required.

Bore Holes—When advancing toward a mine working that is suspected to contain inflammable gases or to be filled with water, a bore hole must be kept at least 20 ft. in advance, not only of the face, but also, if necessary, on both sides of the working place.

Passageway Around Shafts—The bottom of every shaft shall be supplied with a traveling way so that the men can pass from one side of the shaft to the other without passing under or over the cages. All sumps shall be securely planked over.

HOISTING

Cage—Guides shall be used in all shafts in which the hoisting is done with cages, and this cage shall be provided with safety catches and a bonnet made of boiler iron.

Signals—At all shaft mines a suitable means of signaling in the shaft shall be provided. The owners or operators of every shaft mine shall use the following code of signals: One bell or whistle signifies stop when in motion, hoist when not in motion; two bells or whistles, lower; three bells, hoist rock; four bells, men on cage; five bells, turn on or off air; six bells, turn on or off steam; seven bells, mule on cage.

Hoisting Engineer—No one but an experienced, competent and sober person, not under 18 years of age, shall be employed as hoisting engineer.

Lowering Supplies—No timbers or rails shall be lowered on a cage while men are descending or ascending out of the mine.

Number of Men on Cage—The number of persons permitted to ride on the cage shall be determined by the mine inspector, but in no case shall the number be more than 12 nor less than 4; nor shall men be hoisted or lowered more rapidly than 500 ft. per minute. No person shall ride upon a loaded cage.

Entrance to Mine—The top of all shafts and the entrance to all adits must be securely fastened by gates properly covering and protecting the shaft or adit entrance. The entrance to every abandoned incline or vertical shaft must be securely fenced off.

ACCIDENTS

Reporting Accidents—Whenever a serious or fatal accident occurs in any mine, the person in charge must report the facts regarding the accident to the State mine inspector without delay. The inspector, upon receiving the report, shall, if he deem it necessary, go to the scene of the accident, and make suggestions and render such assistance as he may deem necessary for the safety of the men. The inspector shall investigate the cause of all accidents, and shall file in his office a report regarding each. In order to make this investigation he has the power to take depositions, to summon witnesses, and to administer oaths.

Wilfulness on Part of Miners—Any

miner, who does any wilful act whereby the lives and health of persons working in the mines, or the security of the mine or miners, or the machinery, is endangered, shall be guilty of a misdemeanor.

EXPLOSIVES

Blasting Explosives—Owners or operators of coal, lead, zinc, or copper mines shall require all miners or other persons using black powder or high-power nitro-explosives to keep in a strong box all explosive not for immediate use. These boxes shall be fastened with a lock, and shall not be kept within 100 ft. of the place of blasting. In all mines shot-firers or blasters shall be employed to fire all shots after the miners in the vicinity of the blast have retired to a safe distance. After the blasts have been fired the shot-firer shall make a thorough examination of each hole that he charged, and shall ascertain whether it has been discharged or has misfired. The holes that have misfired shall be marked in some way, and the shot-firer shall report the position of such holes to all employees working in that part of the mine.

Electric Blasting in Shafts—At all mines where 10 or more men are employed on any shift, all holes in the shaft must be fired by an electric battery placed above ground, and in no case shall caps and fuse, or any other method than electric blasting be employed for exploding holes in shafts.

Montana

INSPECTION OF MINES

Mine Inspectors—The Governor must appoint an inspector of mines and a deputy inspector, each of whom shall be at least 30 years of age, a resident of Montana at least one year, theoretically and practically acquainted with mining in all its branches. Each shall hold his office for four years, unless removed by the Governor. No person shall hold the office of inspector or deputy inspector, while an employee or officer of any mining, milling or smelting company. The inspector of mines and his deputy must devote their entire time to the duties of their office.

Duties of Inspectors—It is the duty of the inspector of mines, by himself or by deputy, to visit every mine in the State once every year, and to inspect its working, timbering, ventilation, means of ingress and egress, and the means taken to protect the lives and to insure the safety of the miners. For this purpose the inspector or his deputy shall at all times have access to any part of any mine. Whenever the inspector shall find any mine or part of any mine in an unsafe condition, he shall at once notify in writing the owner or person in charge of that mine of this condition. In this notice he shall set forth the nature of the defects which render the mine unsafe and the

point or place in the mine where such defect exists; and he shall require that the repairs necessary to remedy these defects shall be made within a specified time. If in his judgment the circumstances require it, the inspector shall forbid the operation of that mine or the portion that has been declared unsafe until it has been rendered safe. No work shall be done in that portion of the mine, except for the purpose of rendering it safe, until the inspector gives permission.

Complaints to Inspector—Whenever the inspector of mines receives a complaint in writing signed by one or more persons, setting forth that the mine in which he or they are working is dangerous in any respect, the inspector or deputy inspector must in person examine that mine as soon as possible. Every complaint must set forth the nature of the danger and also the time that the danger was first observed.

Recommendations as to Working Methods—The inspector, while visiting a mine, shall make such recommendations as in his judgment are necessary to insure the safety of the workmen.

Accidents—Whenever a serious or fatal accident occurs in any mine, the person in charge of the mine must immediately notify the inspector. Upon receiving that notice the inspector or his deputy must in person go at once to the place of the accident, and investigate as fully as possible the cause of that accident. Whenever possible, the inspector or deputy inspector shall be present at every coroner's inquest held over the remains of a person killed by a mining accident, and he shall testify as to the cause of this accident and state whether in his opinion the accident was due to the negligence or mismanagement of the person in charge of the mine. Whenever the inspector or his deputy cannot immediately be present at the scene of the accident, the person in charge of the mine must secure a written statement made by those who witnessed the accident. In case no one was present at the time of the accident, then the verified statement of those first present at the scene of the accident must be taken, and such statement must be given to the inspector or deputy inspector. If, after making such investigation, the inspector deems the fact warrant it, he may criminally prosecute the owners or person in charge of the mine in which the accident occurred, but the provisions of this paragraph do not apply to mines in which less than five men are employed.

PROTECTION TO MINERS UNDERGROUND

Two Exits from Mine—At all mines that have been worked to a greater depth than 100 ft., and at which the vein has been driven on for more than 200 ft. after it has been reached by a crosscut, in case the collar of the shaft is covered with a building that is not fire-proof, it is necessary to provide more than one

means of exit from the mine. When, at the time that stoping begins, there is no such escapement shaft or opening, work upon this means of exit must be commenced immediately afterward and be diligently carried on until completed. This escapement shaft must be connected with the deepest workings in the mine, and it must afford an easy passageway; if it be a raise or a shaft, it must be provided with good, substantial ladders from the deepest workings to the surface. Whenever the exit or outlet is not in a direct or continuous course, sign boards, plainly marked so as to show the directions to be taken, must be placed at each departure from the continuous course. This paragraph shall not apply to mines in which less than nine men are employed; nor to mines not actually producing ore by stoping; nor to mines at which the shaft is not covered by a shaft-house and which has no building within 30 ft. of it; nor to mines in which the shaft or opening is covered by a fireproof shaft-house or building.

Building at Entrance of Adit—After an adit has been driven a distance of 300 ft., it is unlawful for any person or corporation to erect or maintain any building or inclosure over or around the mouth of that adit unless that structure is fireproof in its construction.

HOISTING

Shaft Pillars—It is unlawful for any corporation or person, operating a mine that is worked through a vertical or inclined shaft, to stope closer than 25 ft. to the shaft when other work is being carried on below that level.

Hoisting Speed—It is unlawful for any person or corporation to hoist men out of, or lower men into, a mine at a speed greater than 800 ft. per minute. When it is shown that in running his engine at a greater speed than 800 ft. per minute the engineer has violated the orders of his employer, the engineer alone shall be subject to prosecution.

Cage for Hoisting Men—It is unlawful for any corporation or person to sink, or work through, a vertical shaft deeper than 300 ft. unless an iron-bonneted, safety cage is used for hoisting and lowering men. This cage shall be provided with sheet-iron or steel casing, not less than $\frac{1}{8}$ in. thick, or with a netting composed of wire not less than $\frac{1}{8}$ in. diameter. Except when the cage is used only for sinking, these cages shall be provided with doors, made of the same material, either hung on hinges, or working in slides. These doors shall extend at least 5 ft. above the bottom of the cage, and must be closed when lowering or hoisting the men. The safety apparatus, whether extension springs or some other device, must be securely fastened to the cage, and must be of sufficient strength to hold the cage at any depth to which the shaft may be

sunk. The iron bonnet must be made of boiler iron of good quality, and at least $\frac{3}{16}$ in. thick, and this bonnet must cover the top of the cage in such a manner as to protect as much as possible those on the cage from objects falling in the shaft. The mine inspector and his assistant must see that all cages are kept in compliance with this paragraph, and that on all cages the safety dogs are kept in good condition.

SIGNALS

Preparation of Signal Code—The inspector of mines shall prepare a complete code of signals for use in all mines that are worked through a shaft more than 75 ft. deep, and at which 10 or more men are employed. The inspector may add to or change this code of signals as circumstances may require, but no change of signals shall go into effect until the time specified by him, which shall not be less than 60 days, nor more than 90 days from the time that the change is ordered by him.

Signal Code—One bell, hoist; one bell, stop, if in motion; two bells, lower; three bells, men on cage; four bells, blasting signal; engineer must answer by raising bucket a few feet, letting it back slowly; then one bell, hoist men away from the blast; five bells, steam on; six bells, steam off; seven bells, air on; eight bells, air off; 3-2-2, send down drills; 3-2-3, send down picks; nine bells, danger signal, to be used in case of fire or other danger; then ring number of station where danger exists. No person except the station tender shall ring any bell except in case of danger, or when the main shaft is being sunk. Engineers must slow up when passing stations when men are on the cage. The station signals are:

Bells.	Pause.	Bells.	Station.
2	"	1	1
2	"	2	2
2	"	3	3
2	"	4	4
2	"	5	5
3	"	1	6
3	"	2	7
3	"	3	8
3	"	4	9
3	"	5	10
4	"	1	11
4	"	2	12
4	"	3	13
4	"	4	14
4	"	5	15
5	"	1	16, etc.

Call Signals—Where electric bells or flash signals are installed in connection with other signaling device, the electric bell or flashing device is to be used only for call signals. If the cage is wanted, ring station signal; the station tender will answer one bell; reply one bell to go up, reply two bells to go down. If station is full of ore and the station tender is wanted, ring station signal and do not answer back. If 2-1-2 bells are rung, engineer or station tender does not understand; repeat signal. In case of danger or accident, ring station signal; the station tender will reply one bell; ring nine bells.

STORING EXPLOSIVES

Record of Explosives—A record of all transfers of black powders, gunpowder or nitro-explosives shall be kept in a book that is at all times open to the inspection of the State inspector of mines, or any peace officer.

Explosives in Mines—No person or company shall store or keep in any mine more than 3000 lb. of blasting powder or other high explosives, and these explosives shall not be stored in any place where their accidental explosion would cut off the escape of the miners working in that mine.

Liability of Employer—Every company or individual operating any mine shall be liable for any injury sustained by an employee when the accident is caused by the negligence of any superintendent, foreman, shiftboss, hoisting or other engineer, or trainman, provided there is no contributory negligence on the part of the miner. No contract of insurance, release, benefit or indemnity in case of injury or death, or any other contract entered into, before the injury, between the person injured and any of the employers named in this paragraph shall constitute a bar or defense to any cause for action brought under the provision of this paragraph.

New York

INSPECTION

Duties of Commissioner of Labor—Among the duties of the commissioner of labor is to see that every precaution is taken to insure the safety and health of employees in mines, and to examine carefully into the methods of timbering shafts, drifts, inclines, slopes and tunnels, performance of daily labors, and to see that all persons or companies owning or operating mines in this State shall comply with the laws regarding the operation of mines.

Two Exits from Mines—Whenever the commissioner of labor thinks that the safety of the employee demands two entrances to a mine, he has the right to forbid the working of that mine, whether it is worked through a vertical or inclined shaft or through an adit, until two means of exit have been provided. The escapement outlet shall be so constructed as to provide at all times a safe and separate passageway from and to the surface.

Ventilation—In each mine a ventilating current shall be circulated along the face of all working places and through the roadways in sufficient quantities to insure healthful conditions for the employees and the removal of smoke and obnoxious gases.

Timbering—Each mine must be properly timbered, and the faces and roofs of all working places properly secured from caving. No person shall be required or permitted to work in any unsafe place or under dangerous ground except to make it safe.

PROVISIONS FOR THE SAFETY OF MINERS

Riding On Loaded Cars—No person shall be allowed to ride into or out of a mine on any loaded car, cage or bucket.

Inspection of Boilers and Apparatus—The owner or person in charge of the mine must have the boilers inspected once in six months by a competent person, approved by the commissioner of labor; a duplicate of the certificate showing the results of this inspection must be sent to the commissioner of labor, and the original kept on file at the mine office. All engines, brakes, cages, buckets, ropes and chains shall be kept in good order, and inspected daily by the superintendent of the mine or by some person designated by him. All lifts, hoists, ropes and other mechanical devices shall be properly designed and maintained so as to sustain the weights intended to be placed on or suspended from them, the factors of safety generally accepted by competent engineers being used. All cars and lifts shall be provided with safety brakes. Hoisting ropes shall at all times have a breaking strength of not less than five times the gross load suspended from them, including the weight of the rope itself. Each boiler or battery of boilers shall be provided with a proper safety valve and with steam and water gages to show respectively the pressure of the steam and the height of water in the boilers. A steam gage shall be attached to the steam-pipe in the engine room and so placed that the engineer can readily ascertain the pressure carried.

Storage of Inflammable Material—No powder nor oils of any description shall be stored in a mine, tunnel, or quarry, or in or around a shaft, engine or boiler house, but all supplies of an inflammable or destructive nature must be stored at a safe distance from the mine opening.

ACCIDENTS

Reports of Accidents—Whenever a serious or fatal accident occurs at a mine, the owner or person in charge must report, in writing, to the commissioner of labor all the facts connected with the accident.

Notice of Dangerous Conditions—If in the opinion of the commissioner of labor a mine or anything used in the operation of the mine is unsafe, he shall immediately serve upon the owner or person in charge of the mine a written notice specifying the defects. If this notice is not complied with, the commissioner of labor shall begin an action in the Supreme Court to enforce compliance with the notice, and, if the facts warrant, the Court may grant an order restraining the working of that mine. In carrying out his work, the commissioner of labor shall have the right of entering any mine at any time.

Traveling Ways—A traveling way, not less than 5 ft. high and 3 ft. wide, shall be cut around the side of every hoisting shaft or driven through the solid strata at the bottom thereof so as to permit travel

from one side to the other without crossing the shaft.

Shaft House—Every underground working where the depth exceeds 40 ft. shall be equipped with a proper head house and trap doors.

Wash-Room—Every mine employing more than 25 men shall maintain a suitably equipped and heated wash-room which shall at all times be open to employees.

Duties of the Superintendent—The superintendent shall see that all rules and laws regarding mining are enforced at his mine, no matter whether the work is done on day's pay or on contract.

Daily Inspection—The superintendent shall designate a competent person who shall each day make an inspection of all mining appliances, boilers, engines, magazines, shafts, shaft-houses, underground workings, roofs, pillars, timbers, explosives, bell ropes, telephones, tracks, ladders, etc., and this person shall at once report in writing any defects to the superintendent.

Timbering—The timbers shall be of ample size and strength, and shall be used freely and wherever there is any chance of danger. Only new and properly seasoned timber, which has been inspected carefully for rot or other defects shall be used. All timbering shall be inspected periodically for decay.

HOISTING

Signals—Special care must be taken to keep the signaling apparatus in order. The bell lines must be of ample strength, and must be kept clear of all rock and timbers. Shafts more than 400 ft. deep must have speaking tubes or telephones from the foot of the shaft to the engine room. A code of signals together with a notice of the penalty for a wrong signal, shall be posted at different parts of the workings and particularly at the shaft-house. Mistakes in signals should be severely punished.

Ladderways—Ladders shall be strong and kept intact. In vertical shafts and highly pitching inclines, landings should be placed not more than 20 ft. apart and closely covered except for a hole large enough to allow a man to pass through to the next ladder. In incline shafts there shall be a hand-rail, attached to the ladder, and wherever possible steps shall be used with hand-rails attached.

Shafts—The collar of the shaft shall be covered and guarded so as to prevent accidents from persons or foreign objects falling into it; in most cases, automatic doors should be used. The manway shall be around and not across the shaft head. The timbering in shafts shall be examined often, for it decays rapidly under certain conditions. Inside shafts, raises, and chutes shall be carefully guarded. When sinking the shaft below levels on which mining is being done, the shaft shall be bulkheaded at the lower level; this bulkhead must be made of timbers not less than 4 in. thick.

Hoisting Engineers—Superintendents should use great care to see that their hoisting engineers are mentally and physically qualified for their positions. When persons are lowered into or hoisted out of a mine, the hoisting engineer must be not less than 21 years old; when rock is hoisted, not less than 18. The hoisting engineer shall never delegate the control of the machinery to any other person, and no one shall interfere with him in his duties. The hoisting engineer shall be in constant attendance at his engine or boiler whenever men are working underground. The engineer shall not permit anyone to loiter in the engine room except those whose duties require them to be there, and he shall hold no conversation with anyone while the engine is in motion or while his attention is occupied with signals. A notice to this effect shall be posted on the door of the engine house. Whenever men are on the cage, the hoisting engineer must run the engine with extra care and at only moderate speed.

Hoisting Machinery—All hoisting machinery must be inspected once in 24 hours. The cage or car used for hoisting or lowering men in the shaft must be provided with a proper safety catch and with a sufficient overhead covering to protect the men from falling rock. The hoisting drum must be provided with flanges extending more than 4 in. higher than the rope when the entire length is wound on the drum. Adequate brakes must be attached to the hoisting drum, and safety gates must be placed at all shafts so as to prevent persons from falling down the shaft. The main governing chain attached to the socket of the wire rope shall be made of the best quality of iron and properly tested. When the cage is used in lowering or hoisting men, a bridle chain shall be attached to the hoisting rope above the socket from the top part of the carriage or cage, and no single chain shall be used to fasten the cage to the hoisting rope. Notice of the maximum number of men allowed to be lowered or hoisted at any one time shall be posted in a conspicuous place at the top of the shaft, and no greater number of persons shall be lowered or hoisted at any one time than is permitted by the commissioner of labor. All machinery which is liable to cause accidents should be suitably fenced off with a guard rail.

Fire—All oil, waste, candles, etc., shall be stored at a safe distance from the boiler house, engine room and shaft house, and a quantity of water shall be stored at such places to guard against fire. All shaft houses shall have ample fire protection, and the appliances shall be kept in condition for instant use. All mining plants using steam should have a hose attached to the injector or feed pipe to be used in case of fire.

EXPLOSIVES

Storing Explosives—All explosives in

excess of that required during one shift shall be stored in a magazine placed far enough from the working shaft, stopes or adit that, in case the whole quantity should explode, no damage will be done to the mine workings. This magazine should be fire-proof, and so constructed that a bullet from a modern rifle or pistol cannot penetrate it. Exploders and powder shall not be kept in the same room. A suitable place separate from the boiler or engine room shall be provided for preparing charges. One man shall have full charge of the powder magazine.

Storing Dynamite—Dynamite must be stored in a building isolated from other buildings and from traffic. Caps and electric exploders must never be stored in the same building with dynamite, but must always be kept apart until the time for preparing the charge.

Thawing Room—A suitable place for thawing dynamite shall be provided. Either a hot-water or steam bath device should be used; dry heat must never be used. A receptacle for carrying explosives shall be provided.

Thawing Dynamite—When large quantities are used, a separate building should be provided in which the dynamite is thawed by the heat from steam radiators. Use only exhaust steam for heating this building, and, if possible, keep the temperature of the room at 80 deg. F. The dynamite should be placed in racks as far as possible from the radiator. When only small quantities of dynamite are to be thawed, a thawing kettle consisting of two water-tight kettles should be used. The dynamite should be placed in the smaller kettle, the smaller kettle placed inside the larger one, and the space between filled with water having a temperature of from 120 to 130 deg. F. Never place the kettle over a fire, but when more heat is required, empty the kettle and fill with more hot water. Never attempt to thaw the dynamite by placing it in hot water, or by exposing it to the direct action of steam.

Precautions in Handling Dynamite—Powder must never be placed on, in, nor near hot steam pipes, boilers, hot stoves, nor any other hot metal, nor close to radiated heat from a hot fire or stove. Never roast, toast, or bake dynamite in any way, nor take it near a blacksmith's forge. Never allow a person to smoke near dynamite, nor fire of any description to be brought near it; nor shall any loose caps or fuse be left lying near dynamite.

Blasting—No person shall use explosive who has not been judged competent by the person in charge of the mine. When a blast is about to be fired, timely warning must be given. All blasting must be done by the head blaster or by his helpers who are designated by the superintendent for that purpose. No person who is addicted to the use of intoxicants shall use or handle any explosive. All tamping of high-power explosives shall be done with a wooden stick. After blasting

no one except the blaster shall be allowed in that part of the mine until the blaster has made a personal examination and pronounced everything safe. After a misfire, no one except the blaster and his helper shall be allowed in that part of the mine until three hours have passed, unless the blaster has made a personal examination and pronounced everything safe.

Moving Dynamite—When dynamite is moved in wagons, railroad trains, mine cars, etc., the greatest care must be exercised, and neither percussion caps, exploders, fulminators, friction matches, nor any articles of like nature shall be loaded in the same vehicle.

Preparation of Charge—Cut a piece of fuse the right length and then, after seeing that the cap is free from any particle of sawdust, carefully insert the freshly cut end into the blasting cap as far as it will go. Crimp the other end of the cap tightly around the fuse with a pair of cap nippers, but do not under any conditions disturb the foundation or filling in the cap. Then carefully open one end of a dynamite cartridge, and, after making a hole in the dynamite with a sharpened lead pencil, or pointed wooden stick, insert the capped end of the fuse, being careful to see that at least $\frac{1}{4}$ in. of the cap remains out of the dynamite. Finally, draw the paper closely about the fuse and tie it with a strong cord.

Tamping Stick—No iron or steel-pointed needle or tamping bar shall be used for charging holes with explosives, unless the end of the bar is tipped with at least 6 in. of copper or other soft material.

Charging the Drill-hole—The cartridge must be pushed gently to the bottom of the drill-hole with a wooden stick, putting the cartridge on top. Having placed the required quantity of explosive in the hole, cover with 6 or 8 in. of loose tamping, and press it down firmly with a wooden stick. After that the hole may be, if desired, tamped to the top, ramming the tamping down hard. Never use an iron or metal bar; wood is always sufficient.

Exploding Blasts—In electric blasting a current having higher voltage than 250 volts must not be used.

Misfire—In the case of misfire, never attempt to remove the tamping or draw the charge; always drill a new hole.

RULES FOR THE DAILY GUIDANCE OF EMPLOYEES

Riding on Loaded Cage—No employee shall ride on any loaded skip, car, cage or bucket, nor shall any employee walk up or down any slope, or shaft, while any skip, car, cage or bucket is above.

Examining Stope Walls—The pit boss shall carefully examine the roof of all slopes, levels and working chambers daily. Machine runners shall carefully examine and sound the roof at the working face, and remove all loose rock or ore before beginning to drill.

Utah

MISCELLANEOUS LAWS

Fire Protection—All mines having but one exit and that covered with a building containing the mechanical plant, furnace room or blacksmith shop shall be provided with fire protection. Where steam is used, hose of sufficient length to reach to the farthest part of the plant shall be attached to the feed pump or injector, and kept ready for immediate use. In mines where water is not available, chemical extinguishers or hand grenades shall be kept ready for immediate use.

Mine Cages—In all shafts deeper than 200 ft., a cage, if used, must be covered with an iron bonnet. This bonnet must be made of boiler sheet iron of good quality at least 3/16 in. thick. The bonnet must cover the top of the cage in such a manner as to afford the greatest protection to life and limb from any falling objects. The safety apparatus, whether consisting of eccentrics, springs, or other device, must be securely fastened to the cage, and be of sufficient strength to hold the loaded cage at any depth.

EXPLOSIVES

Storage of Explosives—No mining company or person operating a mine employing more than 10 men shall, at any time, store at any shaft house or at any covering over any adit or incline, or within the underground workings of any mine, more powder or high explosive than is required in 24 hours.

Care of Injured—At all mines where 10 or more men are employed, a woolen blanket, a waterproof blanket, a supply of linseed oil, antiseptic gauze, carbolated vaseline, sponges, soap, liniment and carbolic acid, rubber bandages, suitable towels and a wash basin shall be kept readily accessible for the comfort and treatment of anyone injured.

Mineral Production of Japan

From official returns published in the *Chamber of Commerce Journal* of Yokohama, it appears that the production of metals in Japan for the six months ended June 30 was as follows:

	1907.	1908.	Changes
Gold, oz.....	36,847	35,905	D. 942
Silver, oz.....	1,306,784	1,706,443	I. 399,659
Copper, lb.....	23,841,475	24,348,834	I. 507,359
Iron, long tons....	21,365	18,318	D. 3,047

The exports of copper for the first half of 1908 were 2,458,253 lb. The production of non-metallic minerals is reported as follows:

	1907.	1908.	Changes.
Sulphur, lb.....	1,592,893	1,716,603	I. 123,710
Petroleum, gal....	28,726,177	27,915,197	D. 810,980
Coal, long tons....	5,783,896	5,945,718	I. 161,822

The copper figures appear to be only a partial statement of the production.

Nevada Consolidated Copper Company

The report of this company for the year ended Sept. 30, 1908, covers a period largely devoted to development and preparation for future production. An important part of it is the report on the property made by Pope Yeatman, consulting engineer, an abstract of which was published in the *JOURNAL* of Nov. 14, page 972. The balance sheet at the close of the year was as follows:

Capital stock, 1,600,000 shares.....	\$8,000,000
Surplus realized on sales of stock, etc.	3,122,711
Mortgage bonds.....	2,994,000
Accounts payable.....	178,153
Profit and loss.....	109,176
Total liabilities.....	\$14,404,040
Cost of mine and construction.....	\$4,481,208
Stock of other companies.....	4,848,500
Trusted capital stock.....	3,994,000
Materials on hand.....	120,688
Ores in process of treatment.....	152,869
Accounts collectable.....	12,835
Cash and call loans.....	793,940
Total assets.....	\$14,404,040

The trusted stock is stock of the company held in trust to provide for the conversion of the first mortgage bonds of the company and those of the Nevada Northern Railroad. The stocks owned include shares of the Steptoe Valley Smelting, the Cumberland-Ely Copper and the Nevada Northern Railroad companies.

The report of James Phillips, Jr., president, says, in substance; "For the final four months of this fiscal year your company has been, upon a constantly increasing scale, an actual producer and shipper of copper, and is today marketing the metal. From the data at hand, it may be accepted with confidence that in January, 1909, our monthly production will be at a rate equivalent to an annual production of at least 35,000,000 lb., and that by April next, when the additions to the concentrating and smelting plant now under way are completed, the increased facilities will result in raising our annual output to 50,000,000 or 55,000,000 lb. of copper. Should still another unit be added to our plant it is well within the range of probability that by September next your company will take its place as one of the six largest copper producing companies of the world. A year ago your consulting engineer reported that the actual tonnage blocked out in the Eureka and the Ruth Groups then aggregated 14,432,962 tons; to which total more than 5,500,000 tons have been added by development operations during the current year. In view of the fact that only a small portion of the territory, consisting of 850 acres, has been prospected, the possibilities for a large increase of developed tonnage in the near future, are great; and the latest returns from drillings on both groups are calculated to confirm this prediction. Despite the intervention of a financial panic and the delays incidental to prosecuting construction during two winters, just 18 months elapsed between the turning of the first spadeful of earth on the smelter site and the beginning of the

concentration and the reduction of ores in the first section of your plant, and at this time the treatment of ore and the production of copper are being carried on in five thoroughly equipped sections of the works, three of which are treating Nevada Consolidated ore, while the fourth unit now being built will be finished in April, 1909. It is confidently expected, since we possess the ore to warrant it, that the construction of the additional unit, the fifth of the series, will raise our annual production of blister copper to approximately 70,000,000 lb. yearly.

"In this construction, it may be mentioned that the works have now been in operation a sufficient length of time to assure us that when the full measure of mining and smelting capacity is reached, the Nevada Consolidated will produce copper as cheaply as any copper company. The utilization of steam shovels at Copper Flat during the current year has demonstrated the great economy of this method of mining, and the fact that the ordinary coals of adjacent States have given excellent results has also proved a factor in the cheap production of copper. Our shipments of copper to date aggregate about 3,000,000 lb. The development of the company's water rights for mining, milling and smelting during the past year has progressed satisfactorily, and the works are now supplied with an abundance of water for all present purposes, and we have sufficient for operations many times greater than the capacity of the present plant.

"Concerning the transportation facilities to your mines and to the several departments of the plant by the Nevada Northern, owned jointly with the Cumberland-Ely company, the railroad is thoroughly equipped and in successful operation.

"It is the intention of your officers to supplement the annual reports from time to time, as existing circumstances warrant, with interim reports, treating not only of the progress of development and production at the company's mines and works, but also of the financial details of its operations. On April 1, 1908, the company issued on its property \$3,000,000 in 6 per cent., first mortgage bonds, convertible into stock, which were sold at par, the proceeds are being used for the expansion of the property and the development of the same."

The United States Smelting Company, of Salt Lake City, Utah, intends to engage in the manufacture of white arsenic, utilizing the fumes collected by the bag-house which filters the smoke from the leading smelting furnaces. The arsenic plant, which will comprise two Brunton furnaces, is now about 30 per cent. completed.

The deepest shaft at Butte, Montana, is the High Ore shaft, which is 2900 ft. deep. The deepest level from this shaft is the 2800-ft. level.

The Goldfield Type of Ore Occurrence

Ransome Shows That the Peculiar Occurrence Is Due to the Action of Acidic Non-ferruginous Vapors Incidentally Causing Alunitization

BY ROBERT T. HILL*

Goldfield is *sui generis* in that nowhere else, not even in Nevada with its many gold camps, until recently, has another locality of a similar geological type of ore occurrence been discovered. *Every natural condition of topography, outcrop, country rock, and of other "indications" considered by the prospector, is different from those with which precedent is familiar.* It is safe to say that had not the ores been discovered accidentally a great majority of prospectors, practical mining men, geologists and engineers would today pass over the ground without thinking it worthy of serious consideration.

The Goldfield ores are a conspicuous

which has appeared for years, should be available to every mining man.

DEPARTURE FROM PRECEDENT

Some of the ways in which the ores differ from the previously known ore occurrence are as follows: (1) The ores do not occur in mountains, but are found in eroded valleys between the adjacent mountains. (2) There are no strong iron outcrops. (3) Coarse quartz veins and well defined true fissure veins are conspicuously absent. (4) The ores do not outcrop strongly at the surface. (5) It is usually difficult, except in exceedingly "high-grade," to tell ore from country rock. (6) It is very difficult to detect or

form to come under the usual definition of vein, yet they have the same genesis as what is usually termed a metasomatic replacement fissure vein, i.e., values disseminated throughout the country rock adjacent to the fissures." The key to the peculiar occurrence of the Goldfield ores is the fact that the mineralizing vapors were acidic and nonferruginous, instead of alkaline and ferruginous, as in previously recorded instances, resulting in different aspects of alteration and alteration products in the country rock, and the absence of or feebleness of iron stains.

THE COUNTRY ROCKS

At Goldfield the country rocks con-



THE FLORENCE PROPERTIES, GOLDFIELD, NEV., SILICIFIED RIDGES AND ALTERED ALUNITIZED GROUND

example of ores occurring in a manner entirely different from any known precedent. They are neither true filled fissure veins, magmatic segregations, nor contact deposits. The aspects and principles of the Goldfield type of ore occurrence have recently been worked out and defined by Dr. F. Leslie Ransome, of the United States Geological Survey.¹ These principles are so absolutely different from precedent that we believe that Doctor Ransome's results and conclusions, which make one of the most important contributions to the geology of ore deposits

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¹"The Association of Alunite with Gold in the Goldfield District, Nevada." By Frederick Leslie Ransome, U. S. Geological Survey. *Economic Geology*, Vol. II, No. 7, October-November, 1907.

tell the average ore at all, except by panning, and not always by the latter method.

As worked out and discovered by Doctor Ransome *the Goldfield ores are clear examples of deposition or replacement in a favorable matrix by acidic, gold-bearing, solfataric vapors, which, penetrating the igneous rocks from below through fissures, deposited or disseminated the gold in the adjacent country rock coincidentally as they altered the feldspars into alunite and kaolinite.*

As stated by Ransome: "*The recognition of alunite as a characteristic constituent of the Goldfield ores and the demonstration of its genetic relation to them establishes a new type, that of 'alunitic and kaolinitic gold-quartz veins.'* While the Goldfield deposits are too irregular in

consist of volcanic intrusions and eruptions of Tertiary age, cutting through and overflowing a plexus of older sedimentaries and surrounded by desert wash; and at both localities the introduced gold occurs in kaolinized or alunitized "porphyries" of the andesitic family. The ores of Goldfield occur in middle or early Tertiary rhyolite, latite, andesite and dacite. Nearly all of these are extrusive flows, or intrusions.

At Goldfield the ores are largely in an intrusive sheet of dacite, a rock species at the silicious extreme of the andesite, although Collins asserts that the ores of the Little Florence are in andesite. It is very difficult for the layman to distinguish dacite from andesite; in fact, dacite is merely andesite containing free

silica and, in the classification of rocks, is near the boundary between andesites and rhyolites. The field worker in Nevada who encounters either of these rocks intensely altered, as they should be if they contain gold or silver, will be lost in distinguishing them, except in some locality where their aspects have been pointed out after microscopic search.

STRIKES AND STRUCTURE

Goldfield is in the vicinity of an old volcanic eruptive site which broke through at a point of structural weakness along the Nevada fault zones. After their eruption the rocks were in turn fractured so that Goldfield is now an area of numerous cross-faults and fractures in many directions making favorable intersections, fracturelets and other channels for the upward circulation of the volcanic vapors which continued to ascend long after the country rock was laid down, and accomplished the alteration and mineralization of the rocks.

According to Collins, "in the Combina-

to see, even in the richest ore, until the specimen is wetted; then it is seen in dull yellow bands formed by minute particles. The gold is sufficiently free, however, to permit the use of the pan in ascertaining what is rich ore; only the material must be ground exceedingly fine before panning.

"It is utterly impossible, in many instances, to distinguish ore from country rock, and the pan and assay must constantly be resorted to in prospecting."

"The milling ore of the Combination would be taken for country rock by anyone not knowing from tests that it is ore. The exceedingly 'high grade' is often in the fine-grained quartz; and in some instances where the specimen is from one-third to one-half of its mass in gold, it requires considerable concentration of vision to determine the gold, it is so finely disseminated."

ORE OCCURRENCE

A peculiarity of the Goldfield type of ore occurrence is that the outcrop and superficial zones are poorer, and the good

level, these are largely filled with small fragments of quartz mixed with a characteristic yellow or reddish ochery material which is mainly kaolin (alunite) formed by the decomposition of the feldspar in the original rock."

The lodes are shattered and fissured zones of silicification, mineralized by hot solutions under pressure from below, which, following the lines of least resistance, the fracturelets and fractures, alunited the feldspar and deposited the silica and the minerals in the zone of fracturing. As stated by the authors named:

"These silicified zones may be regarded as veins, and ore may be looked for either on the foot- or hanging-wall side, or even throughout the whole of the silicified mass. As a rule, however, the oreshoots follow lines of shattering somewhat diagonal to the general course of the silicified zone itself.

"When the sulphide zone is reached the rich stringers in the lode are easily followed, as the shattered clayey material is



MINES AT GOLDFIELD. THE WHITE TALUS WAS, BEFORE ALTERATION BY VOLCANIC VAPORS, DARK-COLORED IGNEOUS ROCKS

tion, the general course of the silicified zone is northwest-southeast, while the average course of the richer streaks is nearly north-south. These north-south seams do not extend into the country rock for more than a few feet beyond the limits of the silicification. Where the lode has been rather more shattered than usual and has, therefore, offered a better channel for the mineralizing solutions, the oreshoots may include the whole silicified material."

THE ORES

The ore at Goldfield is simply the mineralized altered country rock, a mixture of soft kaolinized material and alunite, with hard igneous rock in all stages of silicification, from rock showing the original porphyritic structure to the dense flinty, fine-grained quartz. Ransome states that: "The native gold of the ores is usually in particles so fine and so closely crowded in the gangue that the precious metal is usually invisible to the naked eye, but when seen resembles a streak of yellow ochre. The gold itself is not easy

orebodies are not, as a rule, encountered until reaching the sulphide zone. The bottom of the zone of oxidation was between 105 and 115 ft. below the surface at Goldfield. In the Mohawk ground the pay ore usually did not extend upward into the oxidized zone, but in the Sheets, Ish and the Combination, it reached to the surface.

Ransome says: "The ores, it should be noted, do not occur in typical veins, but in masses of shattered, altered rock of very irregular shape. In small part only do they appear to have filled visibly open cavities or fissures."

Like all replacement-mineral occurrences in intensely altered rock the ore does not have sharply-cut boundaries and grades or fades into the adjacent country rock. According to Collins, Rickard and other writers: "There are no true veins. The lode-channel has become by silicification harder than the surrounding country. The best ore is found in the small stringers and veinlets that traverse the main body of the lode. In the oxidized portions of the mine, above the 130-ft.

heavily impregnated with sulphides forming a well marked dark seam. The richest ore in the mine is usually found on the 'faces' forming the sides of these points, where the gold-bearing solutions have had the best opportunity to precipitate."

The common gangue of the unoxidized ore, the altered andesitic country rock, is quartz, kaolin and alunite. Again quoting Ransome: "The quartz is usually compact, almost flinty in texture, although porous in mass, and in most cases bears unmistakable evidence of having resulted from the silicification of dacite, rhyolite or andesite. Large vugs and conspicuously crystalline quartz, such as are found in typical veins the world over, are practically absent from the Goldfield district, where the free development of quartz crystals in open spaces is represented only by drusy films, lining pores left by the solution of phenocrysts or incrusting small interstitial cavities in brecciated material.

"In general the heavy metals brought in by the solutions remained within, or very

close to the multitude of small, irregular fissures that afforded opportunity for the depositional process. The sulphur acids, on the other hand, penetrated the wall rock for considerable distances.

"By faulting, the coördinated fissures have been shifted so as to accentuate the multiplicity of fracturing and assist mineralization. The lode-channel, thus formed, has been dislocated in many places by cross-faults; but the rich streaks within the lode-channel appear only to have been diverted, that is, the later enrichment following the fault lines."

Silicification is greatest often on surface, and is less marked as each succeeding level is reached.

CHARACTER OF THE ORES

The aspects of the Goldfield ores under scientific examination are described by Ransome as follows:

"The typical unoxidized ore as it occurs in the dacite near Goldfield consists of pyrite, bismuthinite and a reddish-gray cuprifera mineral having the general composition of tetrahedrite. Native gold is usually associated with these minerals, particularly with the bismuthinite and tetrahedrite. Only the rich ore is easily visible. These minerals are often arranged in successive layers or crusts around silicified fragments of dacite, the inner crust being usually the richer.

"The following minerals have been observed in the Combination mine, the names being quoted in the order of their importance. In the oxidized zone, quartz, kaolin, iron pyrite, gypsum, hydrous ferric oxide, alum, some silvery scales of a mineral that gave blowpipe reactions for bismuth oxide, and small quantities of a tellurite of iron. Near the water level, ferrous sulphate. In the sulphide zone, kaolin, iron pyrite, marcasite, tetrahedrite, bornite, bismuthinite, and very small quantities of chalcopyrite and zinc blende. The gold is accompanied by a small proportion of silver.

"Of these minerals, the tetrahedrite and the bornite are particularly important as being intimately associated with the gold. Free gold is often seen mixed with the cuprifera sulphides, but even when this is not the case, and no gold can be seen under the powerful glass, the specimen will almost invariably assay exceedingly rich in gold; from which it is presumed that the gold is either chemically combined with the bornite and tetrahedrite, or else present in a very fine state of division.

"Gypsum, while not known with actual sulphide ore, is very abundant in the altered rocks within 100 ft. or so from the surface, and does occur crystallized with quartz and pyrite on the Goldfield-Belmont mine, below the belt of oxidation.

"The brownish, copper-bearing mineral, here provisionally called tetrahedrite, contains antimony and sulphur, as chemically determined by Dr. W. T. Schaller, and is, therefore, not bornite, although it goes

by that name in the district. It appears so commonly as a constituent of the best ore that there is a strong suggestion that it is auriferous, particularly as the microscope fails in some specimens of reputed rich ore to reveal any free gold. Further investigation of the mineral is in progress.

"The proportion of silver is rather small, the average of 34 assays of rich ore from the Mohawk mine, made for J. W. Finch, giving 330 fine oz. of gold and 46.5 oz. of silver to the ton.

"Tests and chemical analyses of the ores made for scientific and technical purposes nearly all show a little tellurium, although no tellurium mineral has been recognized in the mines close to Goldfield."

FUMAROLIC ACTION

The intense faulting at Goldfield permitted the ascent of hot fumarolic vapors from underlying igneous magmas. These vapors, penetrating the minute fractures and reacting upon the feldspar in the dark-colored andesites, altered them so intensely as to make them appear as entirely different formations, and introduced the valuable metals as irregular disseminations. The subsequent topographic development of the lower ground at Goldfield is due to the intense shattering of the cross-faults and the ascending of the fumarolic vapors, which so softened the rocks relative to the harder unaltered rocks as to permit more rapid erosion.

The gold and accompanying minerals were disseminated in the country rock, and the country rock altered by these hot, supposedly acid volcanic vapors, rising from some deeper magma below. These vapors altered the feldspar into kaolinite and alunite and segregated the quartz into the fine hornstone-like masses. And still more important, they at the same time carried, introduced and disseminated gold into this altered matrix, thereby mineralizing the altered ground.

The following quotations from Ransome deal with the ore-depositing solutions:

"The mineralogical character of the Goldfield ores and the alteration of the wall rock show that the solutions or vapors which deposited them carried gold, bismuth, antimony, a little arsenic and tellurium, hydrogen sulphide and probably sulphurous and sulphuric acids.

"Two general hypotheses are entertainable with reference to the source of these solutions. They came from above, either the sulphurous or sulphuric acid having been derived from the overlying deposits of oxidizing sulphides; or they came from below. In the former case the solutions were, presumably, cold; in the latter case they were in all probability hot. The intensity of the alteration and the character of the solution, as shown by the composition of the ores and by the metamorphism of the country rock, point to hot ascending waters as the effective agent. *The difficulties in the way of the descensional hypothesis appear to be unsurmountable.*

"In spite of the mass of evidence which indicates the deposition of a large class of gold veins by highly silicious alkaline solutions, it is clear that some deposits, and those of remarkable richness, may be formed by acidic solutions. *The metamorphic agent was evidently a strong acid solution carrying sulphydric and sulphuric acids, and possibly sulphurous acid.*

"The large percentage of loss in calcium, potassium and sodium shows that the active solution was far below its saturation point for these elements and was, therefore, entirely different in character from the supposedly alkaline solutions which deposited the large class of sericitic and calcitic gold-quartz veins exemplified by those of California.

"Whether the sulphuric acid which was doubtless the direct agent in the formation of the alunite was present in the original solution from the first, or whether it was derived from the hydrogen sulphide by oxidation at some stage in the movement of the solution toward its point of attack upon the rocks now visible, is an undecided question.

"The absence of sulphates from contact ore deposits indicates, however, that oxygenated sulphur compounds are not given off directly from solidifying magmas.

"Whether the solutions were notably ferruginous is doubtful. As compared with other districts, the pyrite at Goldfield is not abundant, and all of that in the country rock can, as has been shown, be accounted for without any addition of iron. There has, in fact, been an abstraction of iron which may have been sufficient to form the pyrite in the actual ore, upon the supposition that the dissolved iron, like the silica, migrated toward the fissures."

ASPECTS OF THE ALTERED AND MINERALIZED ROCKS

One of the most important points for the intelligent prospector of the future is that he must be able to distinguish original unaltered igneous rocks from the altered aspects and alteration products. It is difficult for the prospector, engineer, or even the geologist, at first glance, to realize that vast outcrops of white, rhyolitic looking rocks were originally black andesitic porphyries, which have been altered by volcanic vapors; and still more difficult to believe, as the writer has seen, that areas of pulverulent gypsiferous adobe soil are still another residual extreme of the same process.

The following descriptions of the character and alteration of the volcanic rocks by fumarolic vapors are given by Ransome:

"Although comparatively unaltered, representatives of most of the rocks named may be found within the district, yet the metamorphism which they have undergone over much of the area is of a most conspicuous kind. Dark pyroxene-andesites, dacite and rhyolite have alike been

changed to nearly white aggregates of secondary minerals. Such products, as a rule, retain only traces of the original textures of the igneous rocks from which they have been derived. To detect and interpret these traces requires patient field observation of the progressive stages of alteration supplemented by microscopical study.

"The altered rock at Goldfield is light gray, flecked with numerous dull white spots which represent the original feldspar phenocrysts. The few quartz phenocrysts are unchanged, but the ferromagnesian or, more briefly, 'femic minerals,' have wholly disappeared. Pyrite in small, disseminated crystals is abundant."

The alteration (alunitization) is characteristically associated with unoxidized ores, and gold, pyrite, tetrahedrite, bismuthinite and the other minerals found in such ores were deposited at the same time that the neighboring rocks were changed to quartz, alunite and kaolinite.

From comparative chemical analyses of the altered and unaltered rocks, Ransome concludes that:

"It appears that the altered rock has lost a little of its silica, more of its alumina, nearly all of its magnesia and lime, three-fourths of its soda and two-thirds of its potash. On the other hand, the water has greatly increased, a large amount of sulphuric anhydrite has been added and the iron has been converted into pyrite."

Three types or stages of alteration are recognizable at Goldfield, as stated by Ransome:

"First, where the chemical activity has been most intense, the rocks have been changed to porous, fine-grained aggregates consisting essentially of quartz. This is the material of which is composed the hundreds of craggy points and ledges which are one of the most characteristic features of the topography of the district. Although most of these ledges, so far as known, contain no orebodies, yet until recently no ore has been found that was not in or alongside such quartz rock.

"Some of the discoveries at Goldfield, made in 1906, however, show that very rich bodies of ore occur at places where there is no silicious outcrop.

"The second type of alteration is one in which the rock is changed to a comparatively soft, light-colored mass of quartz, kaolinite, alunite and pyrite. At any given locality the boundaries between the rocks representing two kinds of alteration may be fairly sharp; but the proportions of quartz, kaolinite and alunite vary widely and consequently, over the field at large, gradations in composition and hardness may be found between these two typical metamorphic products.

"The third type of alteration has effected less conspicuous results than the other two, and its products are not closely associated with the ores. It consists in

the development of calcite, quartz, chlorite, epidote and pyrite, at the expense of the original minerals and groundmass, and is thus propylitic in character. It is rather sharply marked off from the second type by the presence of calcite and the absence of alunite, these minerals not having yet been observed together in the same specimen. Rocks which have undergone this form of alteration, chiefly andesite, latite and dacite, still retain something of their original color and texture, the principal external sign of change being a greenish tint instead of the usual gray of the fresh rock, and a lack of luster in phenocrysts.

"Just what became of the lime and magnesia removed from the altered dacite has not been determined. A part, at least, of the calcium was probably taken into solution as hydrous sulphate and deposited in fissures as gypsum, this mineral being known to occur in the district in places where its formation can scarcely have resulted from the action of surface waters.

"The solvent action of the solution upon quartz was comparatively slight, as shown by the fact that the original phenocrysts of the dacite still retain their characteristic 'embayed' outline when the rest of the rock is altered to quartz alunite and kaolinite.

"Large masses of coarsely crystalline vein quartz are absent from this district and it seems necessary to conclude that the ore-bearing solutions were not only poor in silica, but that, in spite of their energetic attack upon the rocks, they were not good solvents for quartz.

"The quartz set free by the decomposition of the silicates has for the most part recrystallized as fine-grained aggregates, constituting the hornstone-like quartz."

THE MINERAL ALUNITE

Associated with the quartz in much of the ore at Goldfield are soft white substances such as the miners commonly call "talc," kaolin," etc. Chemical and microscopical tests of the white material, as made by Dr. Ransome, show that in most cases it is either alunite or kaolinite, or a mixture of the two. Alunite, a rare and seldom found mineral, is a decomposition or alteration product of the feldspars of igneous rocks, acted upon by hot sulphurous volcanic vapors penetrating the rocks from deep-seated volcanic magmas. Alunite is a hydrous sulphate of potassium and aluminum with the formula $K_2O \cdot 3Al_2O_3 \cdot 4SO_3 \cdot 6H_2O$. Concerning this mineral Ransome says:

"The recognition of alunite as a characteristic constituent of the Goldfield ores and the demonstration of its genetic relation to them establishes a new type, that of 'alunitic and kaolinitic gold-quartz veins.'

"In the Goldfield district alunite is so abundant and so generally associated with the intense alteration accompanying ore deposition that it must be looked upon as

one of the most characteristic minerals of the gold deposits. Microscopic studies of the bleached, altered rocks of the district have revealed alunite in nearly all of them.

"At Goldfield, the intimate association of the kaolinite with the alunite, gold and sulphites shows that all were formed at the same time and by one general process which was anterior to and entirely independent of oxidation or weathering.

"Alunite is very abundant in the altered andesite and dacite of Preble mountain and the vicinity and is present in practically all of the altered dacite which forms the country rock of the Combination, Florence, January, Red Top, Jumbo, and other mines near Goldfield.

"As a rule, the gold and auriferous sulphides are embedded in quartz. Alunite, however, is often so close to the gold as to appear in the same microscopic field and the telluride of gold in the Jumbo Extension mine is partly embedded in alunite.

"Alunite is found in some islands of the Grecian Archipelago, near Muszay in Hungary, on Mount Dore in France, and in a few other localities in Europe, as well as with the opal of Queretaro, in Mexico. In the United States it has been described in the Rosita hills, on Calico peak near Rico, in the National Belle mine near Silverton, and at Cripple Creek, all in Colorado. It occurs also at Tres Cerros, Mariposa county, California. In all four of the Colorado localities the alunite occurs in regions which contain ore deposits."

Pension Fund for Indiana Coal Miners

SPECIAL CORRESPONDENCE

James Epperson, State mine inspector of Indiana, has prepared a bill to be presented to the next Legislature providing for a pension fund for the benefit of disabled miners, to be maintained jointly by the miners and operators and of which the State shall be the trustee. The purpose of the fund to be so created, is to provide relief for the wives and dependents of men who are killed or permanently injured in accidents in and about the mines of the State; also relief for aged mine employees. The plan is to assess a tax of a stated number of mills for each ton of coal produced, this tax to be paid by the operators, and a small percentage tax on wages earned by the employees.

The money, according to the plan, will be paid into the State treasury and distributed to those entitled to a benefit in sums proportionate to the extent of injury. The law will provide that in each case the benefits will be paid without question as to contributory negligence of the employee injured or killed.

The Rare Metals, IV—Tantalum

BY CHARLES BASKERVILLE*

Tantalum is a rare acid-forming¹ element related to columbium, with which it enters into the composition of a large number of minerals. These minerals are found principally in pegmatites, and are of limited occurrence.

TANTALUM MINERALS.

	Tantalum Pentoxide Content.
Tantalite, iron tantalate.....	42-84%
Yttrotantalite, tantalite containing yttrium, etc.....	46%
Manganotantalite, iron manganese tantalate.....	2-80%
Stibiotantalite, tantalite containing antimony.....	51%
Columbite, iron niobate.....	1-77%
Manganocolumbite, manganiferous columbite.....	1-58%
Samaraskite, a tantalate of cerium, yttrium, etc.....	14-18%
Loranskite, a tantalate of zirconium, yttrium, etc.....	47%
Skogböllite, a nearly pure iron tantalate.....	42-84%
Tapiolite, a tantalate and niobate of iron.....	74%
Ixiolite, a niobo-tantalate of iron and manganese.....	.....
Pyrochlore, a niobate of the cerium metals, etc.....	.....
Microlite, calcium pyro-tantalate.....	68%
Tantallic ochre, probably tantallic acid.....	.....
Hatchettolite, a tantalate of uranium.....	30%
Fergusonite, a metaniobate and tantalate of yttrium.....	2-43%
Helmite, a stannio-tantalate of yttrium, iron, manganese, etc.....	54-72%
Polymignite, a niobate and titanate of cerium, zirconium, etc.....	2%
Koppite, a pyroniobate of cerium, calcium, etc.....	1%
Sipyllite, a niobate of erbium, etc.....	1-2%
Mossite, a tantalate and niobate of iron.....	73%
Annerödite, a pyro-niobate of uranium and yttrium.....	.....
Aeschynite, a niobate and titanate of the cerium metals.....	21%
Euxenite, a niobate and titanate of yttrium, erbium, etc.....	.....
Polycrase, a niobate and titanate of yttrium, etc.....	0-4%
Melanocerite, a fluo-silicate of the cerium and yttrium metals.....	0-4%
Tritomite, a fluo-silicate of thorium, etc.....	1-3%
Dysanallyte, a titanate niobate of calcium and iron.....	0-5%
Cassiterite (ainalite), tin dioxide.....	0-9%

The important tantalum minerals are tantalite, yttrotantalite and samarskite. Tantalite is the chief source of the metal; the supply of this mineral so far is mainly from Scandinavian districts. The new mineral loranskite, from the same locality, may be of importance in the future.

Tantalum is utilized in making filaments for incandescent lamps, known as "tantalum lamps;" these lamps have an energy consumption between 1.5 and 2.5 watts per c.p., and have become of considerable importance in the electric-lighting industry. Tantalum is also employed for manufacturing writing pens, and, either pure or alloyed with iron, silicon, boron, aluminum, titanium, or tin, in the manufacture of watch springs, clock movements, anvils, and cutting edges which are subject to mechanical wear. Tantalum in its purest state unites the hardness of best steel with a greater toughness and ductility than is known to be possessed by any other metal.

The market for tantalum is good.

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

TANTALITE

This mineral, which often contains small percentages of cupric oxide and lime, is generally found in granite associated with beryl, tourmaline, chrysoberyl, cassiterite, samarskite, microlite or monazite, depending on the locality. It occurs more or less isomorphously commingled with columbite. Tantalite is found in Alabama, North Carolina, Connecticut, Massachusetts, Maine, New Hampshire, New York, Virginia, Colorado, South Dakota and California. Tantalite is found in iridescent prismatic crystals, also in large groups of parallel crystals, and massive. The color of the mineral varies from grayish black to iron-black and brownish black, while its luster is sub-metallic, often very brilliant. Specimens are generally brittle and opaque, and have a hardness of 6, and a specific gravity of 5.3-7.3.

Before the blowpipe, tantalite is infusible. With borax it slowly dissolves, yielding an iron glass; this glass at a certain saturation assumes a grayish white color by flaming, especially after treatment in the reducing flame. When completely saturated, it becomes of itself cloudy on cooling. In salt of phosphorus tantalite dissolves slowly to a bead colored with iron, which, if free from tungsten, becomes pale yellow on cooling after being treated in the reducing flame; when treated with tin on charcoal, it becomes green. Many specimens give metallic tin when treated with soda on charcoal, and adding enough borax to dissolve the iron oxide. It is decomposed on fusion with potassium bisulphate in a platinum spoon, and gives a yellow solution and heavy white powder on treatment with dilute hydrochloric acid; on adding metallic zinc to this solution, a smalt-blue color results, but dilution with water causes the blue color to disappear. On boiling the product obtained by the fusion of the finely divided mineral with potassium hydroxide with tin, a deep-blue solution is also produced. Tantalite is insoluble in acids. The streak is dark red to black.

YTTROTANTALITE

Yttrotantalite is found in Sweden in prismatic and tabular crystals. The color is black, brown, brownish yellow, straw yellow and pale yellow. Its luster is sub-metallic to greasy, and the streak is gray to colorless. The hardness is 5-5.5, and the specific gravity is 5.5-5.9.

In a closed tube the mineral yields water and turns yellow. On intense ignition before the blowpipe it becomes white, but is infusible. With salt of phosphorus it dissolves completely in a strong heat, and generally gives a glass tinted rose red from the presence of tungsten. It is not decomposed by acids. When fused with potassium bisulphate, it is decomposed; the product assumes a pale-blue color in the solution formed by boiling it with hydrochloric acid to which metallic zinc

has been added. This color soon fades, however.

LORANSKITE

Loranskite is a brittle mineral, having a conchoidal fracture and submetallic luster. It has a hardness of 5 and a specific gravity of 4.6. The streak is greenish gray.

SAMARSKITE

This mineral occurs in reddish-brown feldspar, with crystallized aëschynite and columbite. In the United States it is found in North Carolina, Connecticut, Maryland, Colorado; and in Quebec, Canada. It occurs commonly massive and in flattened embedded grains, but sometimes in prismatic crystals. Samarskite is a velvet-black mineral with a resinous luster. It is brittle and opaque, and the hardness is 5-6 and the specific gravity is 5.6-5.8. The streak is dark reddish brown.

When heated in a closed tube, samarskite decrepitates, glows similar to gadolinite, and cracks open. Before the blowpipe it fuses on the edges to a black glass. The borax bead in the oxidizing flame is yellowish green to red; in the reducing flame it is yellow to greenish black, but on flaming becomes opaque and yellowish brown. With salt of phosphorus it yields an emerald-green bead in both flames. With soda it gives a manganese reaction. Samarskite is decomposed on fusion with potassium bisulphate; a yellow mass is produced which, on treatment with dilute hydrochloric acid and metallic zinc, gives a blue color on boiling. Pulverized samarskite is sufficiently decomposed by boiling with concentrated sulphuric acid to give the blue coloration when the acid fluid is treated with tin or zinc.

MICROLITE

Microlite is found at Chesterfield, Mass., with tourmaline, spodumene, columbite and cassiterite; and at Amelia Court House, Va., with monazite, columbite, beryl and fluorite. It is a pale yellow to brown mineral, with a resinous luster, and yellowish or brownish streak. The hardness is 5.5 and the specific gravity is 5.5.

Microlite is infusible before the blowpipe. It is decomposed by potassium bisulphate, but the solution of the fusion remains uncolored when boiled with metallic tin. It is slowly decomposed by sulphuric acid. The salt of phosphorus bead is colored pale bluish green in the reducing flame after continued blowing. In the oxidizing flame this bead is yellow.

During the six months ending May 31, 1908, the Broken Hill Proprietary Company treated at its mills 262,165 tons of crude ore, as compared with 298,327 tons for the previous six months.

For grade to mine tracks, J. Bowie Wilson (*Aust. Min. Stand.*, Sept. 16, 1908) recommends a fall of 1/2 per cent. as sufficient aid to the loaded cars.

Sylvanite, New Mexico, the New Gold Camp

The Hachita Range Has Been Worked for Turquoise, Lead and Copper, the Tellurium-Gold Ores Being Until Recently Overlooked

BY FAYETTE A. JONES*

The new gold camp of Sylvanite is situated on the west side of the range of the Little Hatchet mountains in southwestern Grant county, New Mexico. The town Sylvanite is about 12 miles southwest of Hachita, a station on the El Paso & Southwestern railway, and at the point of junction made by a branch line known as the Lordsburg & Hachita railway, which forms a link in the chain of railway transportation that reaches the great copper camps of Clifton and Morenci in Arizona. Sylvanite lies in latitude 31 deg. 48 min.

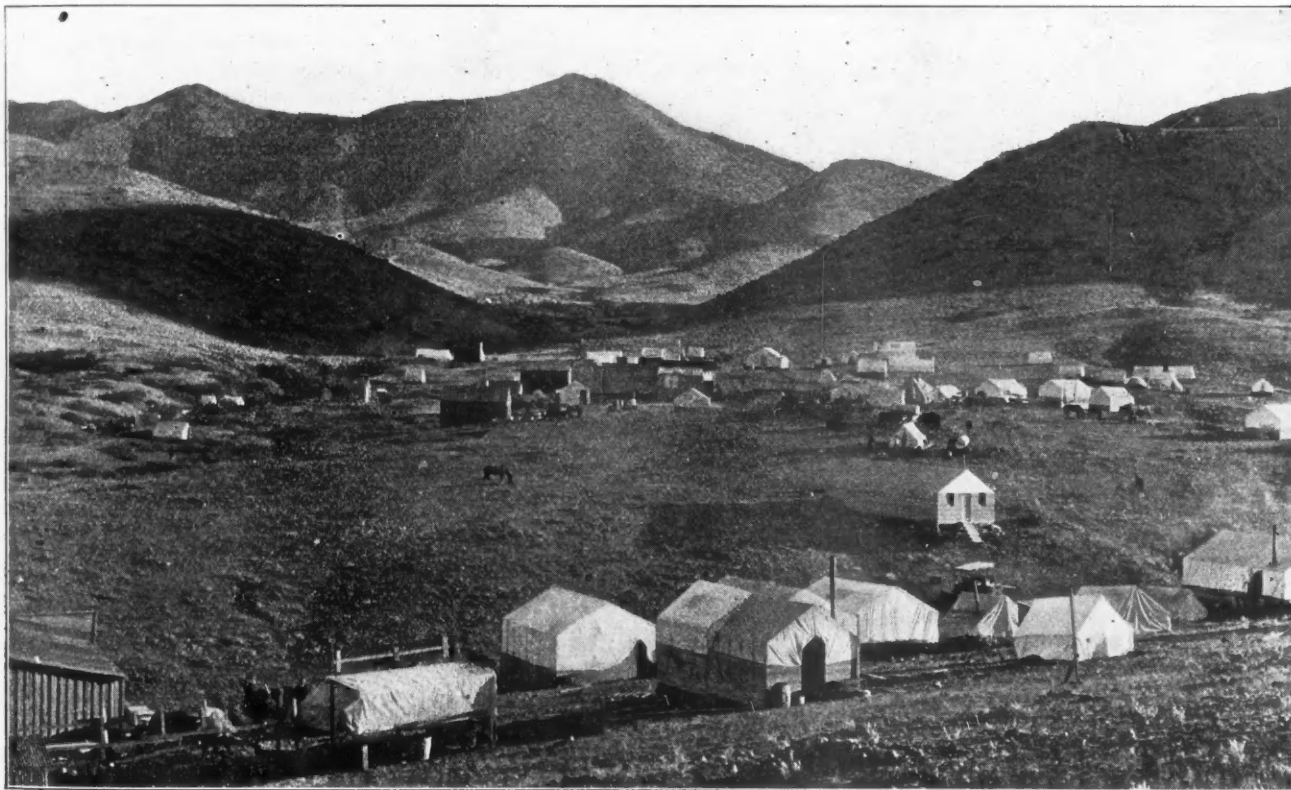
of the cañons are deep and narrow incisions in the mountain sides.

Abundance of fairly good water is found in springs and shallow wells about the base of the range. As shown on the sketch map, two small lakes occupy a portion of the Playas plain. These lakes are filled during the wet season of the year. At best they are rather shallow; in cases of prolonged drouth they sometimes dry up entirely.

The mountain sides usually have a good growth of grama and other grasses, while

there were found a number of prehistoric workings at and near the mining camp of Old Hachita. The prospectors, elated about the discovery, called the district "Eureka," which name it still retains. Sylvanite camp is in the Eureka district. In the old dumps and pits were found fragments of ancient pottery, as well as crude stone hammers and other implements, furnishing conclusive proof of the antiquity of the workings.

These ancient workings were the scene of mining for turquoise, as was the case



SYLVANITE. LOOKING NORTHEAST, ONE WEEK OLD.

N., longitude 108 deg. 30 min. W. from Greenwich. The accompanying sketch map shows its position with respect to Hachita and the El Paso & Southwestern railway system. Hachita is 117 miles west of El Paso, Texas.

The Little Hatchet range of mountains reaches an elevation of 6700 ft. at the central and highest peak; the surrounding desert plain has an average elevation of 5000 ft. above sea level. The side slopes of the range are rather abrupt, though not excessively rugged in character. Many

of the surrounding plain is covered with a species of salt grass, all of which make nutritious food for the prospector's burros and saddle animals. These mountains are practically destitute of any trees or timber; grease wood and a few other kinds of desert growths furnish the chief fuel supply.

HISTORY OF THE DISTRICT

The mining district which embraces the Little Hatchet range, was called Eureka by the first American prospectors who invaded the region about the year 1878. To the great surprise of these prospectors,

in ancient excavations in other parts of New Mexico.

Old Hachita is the principal point where mining has been carried on in more recent years in the Little Hatchet range. The metals mined were lead, silver and copper; within the last few years some zinc has also been mined. In addition to what was done at the old camp of Hachita, there are a number of prospect pits in various parts of the range made by the early-day miners. Some of these old phosphate holes in several instances were sunk remarkably close to and even on the veins that are responsible for the present ex-

*Economic geologist, Albuquerque, N. M.

citement at Sylvanite. Since tellurium ores were not known to the early prospector, the gold escaped notice.

THE BOOM BEGINS

The brothers Ed. and Doc. Clark are responsible for the recent discovery of gold which led to the finding of tellurium ore by Sol Camp a few months later.



WAKE-UP-CHARLEY LOCATION, THE SCENE OF THE FIRST RICH TELLURIUM ORE DISCOVERY

About one year ago Doc. Clark, while assisting in some assessment work in the Eureka district, is said to have discovered accidentally a fine particle or two of gold in some gravels. This incident was made known some weeks afterward to Ed. Clark, his brother. Thereupon Ed. began a systematic search for placer gold, which he discovered about the latter part of February, 1908. About three weeks later the secret of the discovery of placer gold in the Little Hatchet mountains leaked out and considerable excitement prevailed during the early spring months of the present year.

The Clark brothers took out several hundred dollars of placer gold, as did a number of others who had located placer claims. It is estimated that nearly \$2000 in placer gold has been taken from these diggings since the discovery last spring. This gold was mostly recovered by dry washing; but some gravels were prospected by wet panning. The ground, which proved the best and was first worked, lies in the north central part of the range west from Howell's well and south of the main traveled Hachita wagon road. Below the townsite of Sylvanite and various portions of the mountain range placer gold is also found. The largest nuggets found weighed about 1 penny-weight.

After the placer excitement had subsided, most of the prospectors quit the district. Those who remained devoted their time to prospecting for the source

of the gold, and a number of lode claims were located early in the summer. The Clark brothers located several claims among which was the Wake-up-Charley. It was on this claim that tellurium ore was first discovered by Sol Camp, an experienced miner from Cripple Creek. In August, Camp notified his partner, who was in Mexico, to come to Hachita forth-

of central Arizona, Nevada, and southern California. The range forms a portion of the continental divide and is surrounded by vast stretches of Quaternary plains.

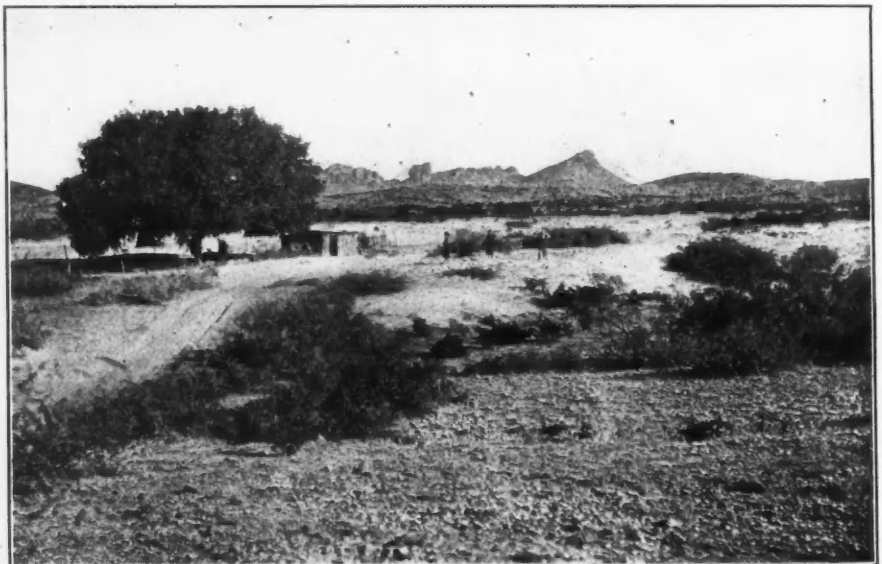
In all probability the general uplift of the mountain range took place in the early Tertiary. Subsequent faulting and a readjustment in the rock formation resulted from acidic intrusives and from still later eruptives of a somewhat basic character. Induced mineralization occurred during this latter interval and may have extended into the late Pleistocene. The whole of the rock aggregation is generally silicious, indicating intense hydrothermal activity. Owing to the appearance of stratification in the now wholly silicious rocks, we are led to believe that metasomatism in the limestone is responsible for this alteration.

Limestone occurs near the northeast and southwest extremities of the range, perhaps representing portions of both Devonian and Carboniferous rocks. No definite demarkation between the two series of rocks was observed; the absence of fossils and lack of time leaves the age and probable division of the limestone in doubt.

Near the southwest portion of the range is a small core of reddish rock, apparently granitoid in its nature, the only rock of the kind observed in the region.

ORE OCCURRENCE

In the central part of the district there



SUNNY SLOPE SPRING, NEAR SYLVANITE

with, and apprised him of his find. On Oct. 8 the discovery of tellurium ores high in gold became known in Douglas, Ariz., and the secret was out. A few days later Sylvanite was placed on the map.

At this writing the town of Sylvanite with its environs contains about 500 people; the average influx is perhaps 20 each day.

GEOLOGY

The Little Hatchet range of mountains is characteristic of the desert basin ranges

is a prominent dike of a porphyritic nature, and denominated by the miners as trachyte, having an east and west strike; on each side of this occurs a parallel zone of tellurium ores in which gold is intimately associated. The gold and tellurium ores so far as our present knowledge extends do not occur along the contact; neither does the dike seem to be mineralized. Development is not yet sufficiently advanced to determine the relation existing between the ore zones and the dike. The mineral gangue in the vicinity of this

dike is of a chloritic quartz composition, containing tellurium and free gold, and has a slightly schistose structure.

Toward the south end of the district the tellurium occurs in a sort of lime-spar and serpentine gangue, as on the Nederland location.

Again, gold is found associated with tel-

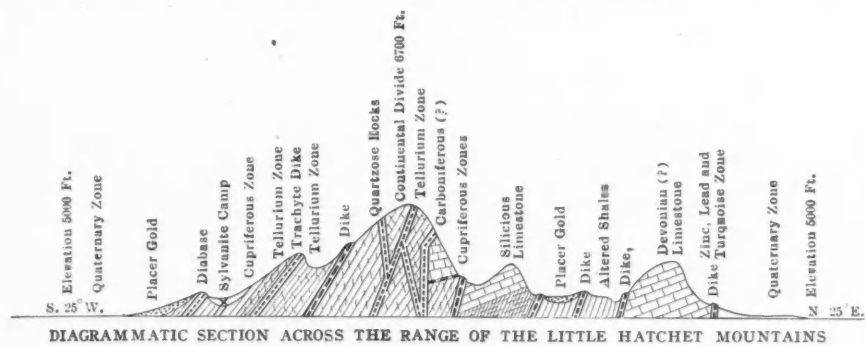
not in combination with tellurium or other elements. The appearance of the mineral is much like sylvanite, but it cannot well be classed as that mineral, either chemically or physically. Possibly it may be a new mineral species, but this is scarcely probable.

Many assays run phenomenally high in

seem to be sufficient to justify the expenditure of a reasonable amount of capital in proving the district. The surface showing is sufficiently good to warrant this conclusion. The time is now ripe for capital to take hold and to determine the permanence or fickleness of the find.

The leasing system, similar to that in vogue in Nevada, has been inaugurated, and a number of leases have been given. The size of a lease is 250 ft. along the vein and extending the full width of the claim. Only white miners are employed, no yellow or colored people being allowed to remain in the district. Miners get \$3.50 and muckers and top men \$3 per day. The region is well watered and has good grass, but wood is very scarce. The climate is excellent and railway transportation facilities are convenient.

Only four carloads of gold ore have thus far been shipped from the district;



lurium to a less degree in certain quartzose dikes, having a strike about north 25 deg. west, on which is the Clemmie location toward the south end of the district. In this latter dike it was noted that where it was shattered most the larger proportion of the gold seemed to be confined to the crevices in the rock; as the compactness of the dike increased, the gold apparently decreased. This would seem to indicate that the gold came from some other source than from the dike itself. On the other hand the metal may have come from the depth below through zones of fracture in the dike.

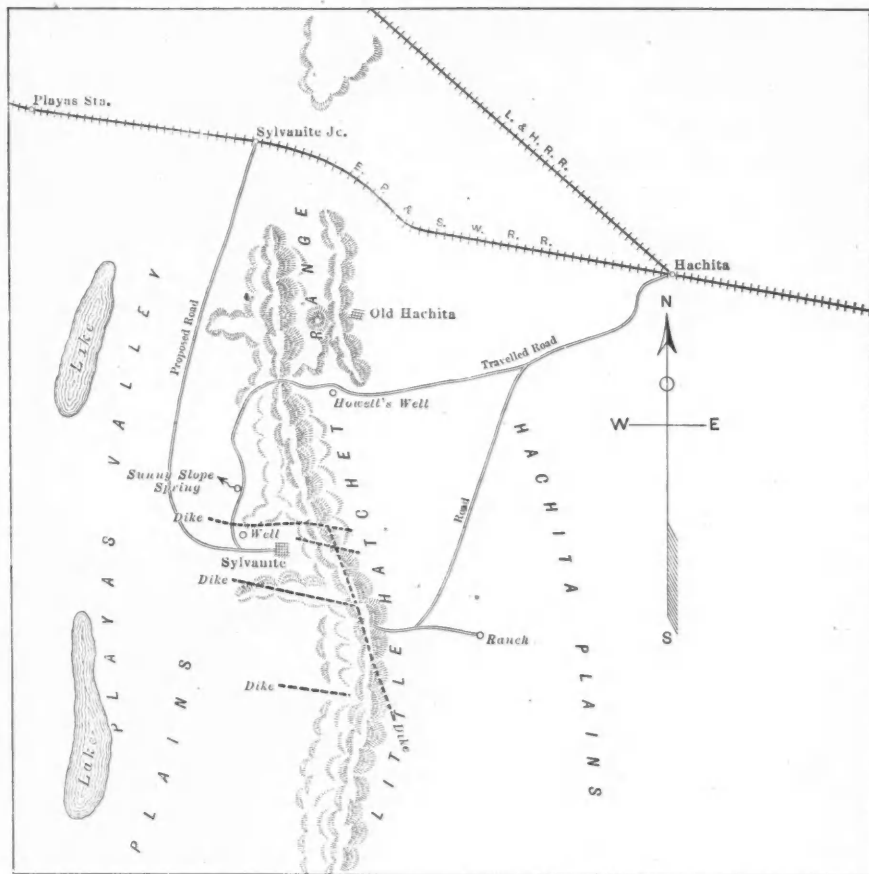
But few veins in the district are well defined, and many of them appear to be composed chiefly of small seams and stringers, or of an aggregation of stringers. Development alone must be the medium through which a correct knowledge of the district can be obtained.

Evidently the source of the placer gold is the gold-bearing zones. The gradual disintegration of the mineral-bearing rocks freed the gold and it accumulated below its source in the usual manner. The placer gold is rough, rusty and generally flaky, indicating that it has not been transported from a distance; it is usually fairly pure; it is said to average about 930 fine.

The accompanying generalized diagrammatic section running north 25 deg. east approximately through the center of the range, gives some idea of the rock system.

NATURE OF THE ORE

Much speculation and considerable controversy has arisen as to the exact name and classification of the gold-bearing mineral. All seem to agree that the mineral contains tellurium; some report bismuth, while others do not. Some of the mining fraternity have classed the ore as calaverite; others call it sylvanite, and still others pronounce it tetradymite. From preliminary tests of some selected samples, I am inclined to class the mineral as tetradymite. The gold appears to be free and



SKETCH MAP, SHOWING THE SITUATION OF SYLVANITE, N. M.

gold, while other tests from apparently similar material give astonishingly low results. However, the general run of assays are fairly good and are encouraging for the district.

GENERAL INFORMATION

Since but little development has been done, it would be premature for anyone to attempt to predict the future of the district. That gold is found and that the ores in various localities of the mountain range give splendid assays, would alone

this ore was mined during the summer before the excitement; it is claimed to have averaged about \$40 per ton.

For melting brass the most satisfactory fuel is anthracite, with which the temperature of the melting pots can be controlled better than with bituminous coal or petroleum.

Most of the lead ore mined in the United Kingdom comes from rocks of the Carboniferous age.

Coal Cutting in Northern Coalfield, England

Mining Machines Have Increased the Earning Power of the Men and Made Their Work Less Arduous. Comparison of Mining Costs

BY GEORGE R. DIXON

In my last article, published in the JOURNAL, Nov. 14, I described the labor details of a longwall face. An estimate of the cost of working was also included, and I ended with the query, "would the introduction of coal-cutting machines pay?" The face was stepped, each gateway leading by a few yards the following one. This necessarily entails the production of small coal, as previously pointed out. Moreover, under the conditions of working detailed, a large quantity of explosives must be used.

If a disk coal-cutting machine is introduced, the face must be straight. A second free face would be formed by the machine undercutting, say, 4 ft. 3 in. Probably the cut could be made in the stone. If the seam comes down easily from the top stone, a bar machine would have to be used, so that the sprags could be placed close together. If the conditions would permit, I would prefer using a disk machine. With a framey roof such as we have in this case, there would not be any difficulties introduced by adopting a straight instead of a stepped face.

DRIVE GATEWAYS IN ADVANCE OF THE CUTTER FACE

The length of face taken in my previous article, I would divide, as shown in Fig. 1. I would drive the gateway on the extreme right, also the gateway on the extreme left, and the central mothergate in advance of the cutter face. The 400 yd. of face would thus be divided into two separate faces.

The places X and L on Fig. 1 would be driven 18 ft. wide, and the place B 30 ft. wide. The machines would not cut always one way, being flitted after each cut, but would cut backward and forward. On faces of this description, it is a mistake to try to be too clever. The fillers should not follow directly on the heels of the machinemen. Moreover, the cuttermen will be in the mine at the same time as the stonemen engaged at the face canches, and as the latter workmen will fire a great many shots, the safety of the men is, of course, a prime consideration.

My experience would suggest employing three shifts of cuttermen every day, to cut the two faces. It would take them three days to do this. The quantity of coal filled off the face each day would be one-third of the product of the 400 yd. of coal. The output from 400 yd., 2 ft. 10 in. high, and undercut 4 ft. 3 in. at 10 cwt. per cu.yd., would be,

$$\frac{400 \times 94 \times 1.42 \times 19}{20} = 512 \text{ tons.}$$

Of the 400 yd., a total breadth of 22 yd. would be attacked by hand. This would produce, taking 4 ft. 3 in. of advance,

$$\frac{22 \times 94 \times 1.42 \times 19}{20} = 27.89$$

tons. This is 5.6 per cent. of the output from the 400 yd. of face, showing, therefore, that this quantity would be hand-hewed. Furthermore, there will be filled each day a total of

$$\frac{512}{3} = 170$$

tons, and of this,

$$\frac{27}{5} = 9$$

tons would be obtained by hand hewing, and 161 tons by machines.

The length of the face to be cut, there-

fore, is $400 - 22 = 378$ yd., so on each of the two faces, 189 yd. must be undercut. My estimate of the time required to cut over the two faces (three days) may seem excessive. I am guided in this, however, by my experience.

I do not want the fillers to turn up some morning to find that there are only a few hours filling for them, and the cutting machine in the hands of the fitters. Again, I do not want the fillers to delay the machine getting started on its return cut. I therefore suggest that if it is arranged for the 378 yd. to be cut, and the coal cleaned off in three days, much trouble will be avoided.

HOW MANY FILLERS WILL BE REQUIRED?

The rate of pay per ton may be taken at one-half of the rate for hewing and filling. In this case it would be 31c. per ton. Assuming as before a wage of \$1.92 per shift, a filler would have to lift

$$\frac{96}{15\frac{1}{2}} = 6.2$$

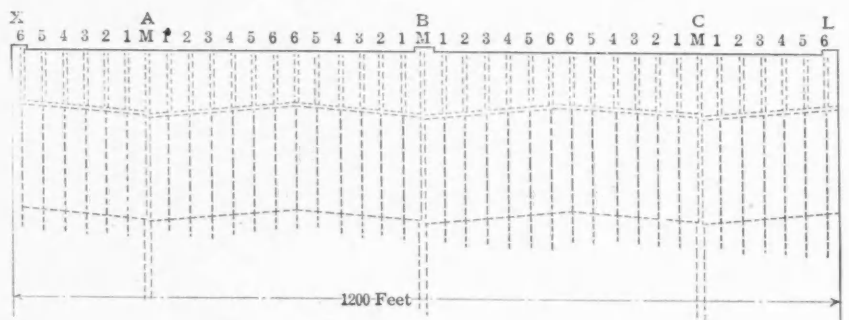


FIG. 1. GENERAL LOCATION OF GATEWAYS AND METHOD OF DIVIDING THE COAL FACE

fore, is $400 - 22 = 378$ yd., so on each of the two faces, 189 yd. must be undercut. My estimate of the time required to cut over the two faces (three days) may seem excessive. I am guided in this, however, by my experience.

RATE OF CUTTING

Three shifts per day for three days is equal to nine shifts cutting. The rate of cutting allowed for is

$$\frac{378}{9} = 42$$

yd. per shift. The shifts are of eight hours each, a total of 72 hours. The rate of cutting allowed per hour is

$$\frac{378}{72} = 5.25$$

yd. Two men per shift, a timberman and a machineman, will be required. That is, six men will be employed three days cutting the 378 yd., and they will put in 18 shifts to do so. There will probably be

tons of coal per shift. The number of fillers to produce 161 tons of coal would be $\frac{161}{6.2}$, or say, 27. Three hewers would be required for the nine tons secured in the leading places. Two deputies would be required, one in the foreshift, and one in the backshift.

If we allow 60 cars per putter as before, then the number of putters equals

$$\frac{170 \times 20}{9 \times 60}$$

or, say, six putters. The stone canches will be thicker, as the rate of advance of the face is only half what it was with hand hewing. If the gateways were only made 5 ft. 6 in. high, the cross-headings would have to be put in nearer than 50 yd. apart, as the gateways would get so low. Every night 13 gateways must be followed. The width of canch in each gateway being 6 ft., there will be a total width of $13 \times 6 = 78$ ft. The advance

is to be 4 ft. 3 in., or 4.25 ft., and the thickness of canch 3.16 ft. The cubic contents of the stone shot down in the 13 gateways equals $78 \times 4.25 \times 3.16 = 1047$ cubic feet.

THE LENGTH OF CROSS-HEADING

The length of cross-heading to cut off the gateways every 50 yd. would be 1200 ft. for the 39 gateways, minus 234 ft. (the total width of stone shot down in the gateway), or 966 ft.; adding 24 ft. to make allowance for the angling of the cross-headings, we have the length of cross-heading as equal to 990 ft. The cubic feet of stone to be shot down is, $990 \times 6 \times 3.16$, or equal to 18,770 cu.ft. This rock is prepared during the time the face takes to travel 150 ft., or $\frac{150}{1.42}$ equals, say, 106 working days.

The amount to charge, therefore, to each working day is $\frac{18,770}{106}$ equals 177 cu.ft. The total cubic feet of stone to shoot and stow each night is $1047 + 177$ or 1224 cu.ft. Allowing 75 cu.ft. per shift worked, the men required will be $\frac{1224}{75}$, or, say 16 men. Of these, 8 will be first-class stonemen, and 8 will be second-class stonemen.

To keep the face roads in repair, a changeman, and a third-class stoneman, will have to be employed in each of the three districts each night. Four first-class stonemen will follow the three mothergate back canches.

OFFICIAL SUPERVISION AND COST OF PRODUCTION

Suppose the total output to be 1000 tons costing \$9.60, then the 170 tons will cost

$$\frac{9.60 \times 170}{1000} = \$1.63.$$

I will now make out an approximate cost per ton on one day's work.

27 hewers getting 161 tons @ \$0.31.....	\$ 49.91
3 hewers getting 9 tons @ 0.56.....	5.04
Official supervision.....	1.62
2 deputies @ \$1.68.....	3.36
6 putters @ \$1.38.....	8.28
3 changeman @ \$1.44.....	4.32
3 third-class stonemen @ \$1.08.....	3.24
8 first-class stonemen @ \$1.92.....	15.36
8 second-class stonemen @ \$1.32.....	10.56
4 first-class stonemen @ \$1.92.....	7.68
2 stone putters @ \$1.20.....	2.40
Cutting and Cleaning:	
6 men @ \$1.92.....	11.52
5 men @ 1.32.....	6.60
77 shifts.....	\$129.89

The total cost per ton = $\frac{\$129.89}{170} = \0.760

The cost per ton for cutting and cleaning..... } = $\frac{\$18.12}{170} = \0.106

The cost of hewing and filling = $\frac{\$55.92}{170} = \0.33

The tons per shift in the face = $\frac{170}{77} = 2.21$

In my previous article, I found the face cost for hand hewing to be 92c. per ton. Comparing that with the cost for coal cutting just found, or 76c., there is on first sight a saving on the labor bill of 16c. per ton. There are several items in labor cost which have not yet been considered.

There is the cost of sharpening picks for the cutting machines, and of cutter repairs, also the cost of pipe laying if compressed air is the motive power, and of cable laying if electric current is used. Other additions we must make are, cost of power, interest and depreciation of the machines and feeding mains, and cost of material and stones both in the pit and in the repair shops. The total of all these items was placed by the committee upon mechanical cutting of the North of England Institute of Mining and Mechanical Engineers at 8 to 12c. per ton, and I would be inclined to accept the larger figure.

Since estimating a saving on labor at the face of 16c. per ton, I have already lost 12c. per ton and have only 4c. per ton left. Now the face roads in the case of coal cutting stand very much longer than with hand hewing. For that reason the gateways have to be made higher. The props in the gateways will also be longer. The amount of broken timber will undoubtedly be greater.

Again from this 400 yd. of face, only 170 tons are produced per shift with coal cutting, against 350 tons with hand hewing. The amount of capital tied up in tramway plates will be the same in the two cases.

The pit area for a given output, say 1000 tons per day, must be much greater in the case of coal cutting. Hence the cost of upkeep of main rolleyways, and the cost of haulage will be greater for the coal-cutting conditions. It is practically impossible to put the above considerations into so much per ton, but I ask, if one could do so, how much would then be left of the 4c. per ton.

It is usually stated that the rate of advance when using coal-cutting machines is greater than when hand hewing. I can only say that the figures given, practically embody my experience. If one could arrange to cut a certain length of face and load the coal off it every day, the rate of advance would be quicker. It could easily be arranged on paper, but this kind of theoretical work and pit work have a way of disagreeing. I will now present the other side. Suppose the selling price for large coal is \$3.36 per ton and for small coal \$1.68 per ton.

With hand hewing, suppose the yield of large coal to be 60 per cent. The average selling price will be 6/10 of \$3.36 + 4/10 of \$1.68 equals \$2.69 per ton.

If with coal cutting we increase the percentage of large coal to 70 per cent., the average selling price will be 7/10 of \$3.36 + 3/10 of \$1.68 or equal to \$2.85. There is thus a gain of 16c. per ton when the latter method of mining is used. It is this consideration, and this only that makes coal cutting by machinery as I know it, worth while from the colliery owner's point of view, and, of course, is worth striving after. In the case of a colliery producing coke, when the small coal

is as valuable as the large coal, I cannot see what advantage can accrue.

There is certainly an increased output per miner at the face, but this consideration alone is seldom pressing enough to be a deciding factor. It is also true that the workmen benefit most decidedly by the introduction of cutting machinery.

In most cases, the colliery owners have been anxious to allay any suspicion that the introduction of coal cutters would lower the earning power of the men, and as a result, in practically all cases, the men get more money, although the most arduous part of their work has been taken away. In a later article, I will discuss coal getting by cutting machines and face conveyers.

The Largest Coalfield in the United States

According to the press bulletin of the United States Geological Survey, the largest coalfield in this country is that which extends from Casper and Douglas, Wyo., northward to the Canadian boundary. The townships included in this great coalfield were withdrawn from entry three years ago, and the secretary of the Interior instructed the Geological Survey to classify and value the land. All of the coal in this field lies nearly flat, and in what are commonly known as "blanket seams."

The classification and valuation of coal land depends on three factors—the distance from the railroad, the character of the coal, and the depth at which it occurs below the surface or distance from outcrops. The two general classes of coal land, according to the law, are, (1) coal land within 15 miles of a railroad in actual operation or under construction; (2) coal land more than 15 miles from a railroad. Also by the terms of a scheme of classification and valuation approved by the Secretary of the Interior, April 15, 1908, the coal is divided into four groups, according to its character, ranging from anthracite and coking coals in the first group to lignite and low-grade sub-bituminous coal in the fourth group. All of the coal in the Powder river field seems to be low-grade sub-bituminous, and the land is, therefore, given the minimum value, \$20 per acre if within 15 miles of a railroad and \$10 per acre beyond that limit. The scheme further specifies that this classification of coal land applies only to land underlaid by coal beds from their outcrops or points of accessibility to a depth of 1000 feet.

The classification of these Powder river lands as coal lands is made simply in accordance with the Federal land laws, and relief from hardships that may seem to be imposed upon those who wish to gain title to land for agricultural uses, can be obtained only by revision of these laws in such a manner as to provide for separation of surface and coal rights.

Electricity in Modern Coal Mining

BY HARVEY J. NELMS*

In some of the recent laws passed by the different States in regard to electricity in connection with mining coal, it seems as if the chief mine inspector has not even consulted an electrical engineer to see whether his new law is practical, or only technical in its proposed good effects. Following is one of the laws recently put into effect Aug. 9, 1908, which to a certainty is anything but beneficial in its effects:

"In no case shall trolley wires be extended into rooms or working places, or track rails be bonded in these places for the use of gathering locomotives, or for any other purpose." This law to be effective should read: In no case shall trolley wires be extended into rooms or working places, nor shall track rails in rooms be used for an electrical return of any kind; also, said track shall not be connected in any metallic circuit which would connect it with any track that is bonded and used as an electrical return for locomotives and mining machines.

Even as revised, I do not believe the above law is justified; however, where the use of electricity is permitted by the mining department of a State, the use of bonds should be compulsory.

RAILS SHOULD BE BONDED

Where a mine uses electric motors for gathering purposes, the locomotives generally run in the rooms over iron rails to get the loaded cars, the trolley line in this case is used for both a trolley circuit for locomotives and also as a feeder for the mining machines. The rails certainly should be thoroughly bonded if the locomotive runs over them, for if the joints are only fish-plated here and there, the resulting fireworks produced at these joints when the locomotive starts out with the car is enough to often cause an electric arc from $\frac{1}{2}$ to $\frac{3}{4}$ in. long across every joint where the rails are not connected together.

Where mining machines and locomotives get their current off the same wire, and where locomotives run in rooms, only one wire should be used on the machine cable which carries the positive electromotive force to the machine, the return from the machine being a short cable which is connected onto the rail; again, the rails should be carefully bonded. The danger of using insulated wire with two cables, one being for the positive and the other for the return, lies in the fact that when both a machine and a locomotive are equipped with this double wire, the danger of short-circuit is increased 100 per cent. It is also true that the machine will often run over its own

cable causing a bad short-circuit; furthermore, if the double wire is overlooked even for a short period, it will burn through the insulation between the wires and cause a short-circuit. This cannot happen when only one cable is used, as it will simply burn off at its connection, hardly ever causing anything but a small arc.

LIABILITY TO SHOCK IS GREATER WHEN A DOUBLE CABLE IS USED

When reeling up a double cable, a short-circuit may occur while the cable is passing through the hands of the operator; not only does the mechanic receive a shock, but he will be painfully and severely burned, which is tenfold more harmful than the shock which would be received from handling only one wire under the same circumstances. Therefore, after considering all sides of the question, I believe single cables and bonded tracks in rooms should be used where the machine and locomotive feed off the same circuit.

Again, if you have iron track in rooms, and this track is connected with fish-plates to a bonded track on the entry, then if some of the fish-plates are left off the track in the room, a bad ground on a locomotive and machine, or a short-circuit on either, ahead of the room, will cause arcs across the points that are not bonded; consequently, why not fish-plate every joint, and then the return current will simply run to the end of a track in a room and go out again making no arc at all.

A DIRECT WIRE FROM THE GENERATOR TO THE FAN

Another law states that "all fans operated by electricity shall have a direct wire from the generator." To comply with this law, an operator would simply have to run his fan line from the main busbars, when in reality he should connect his fan line on the inside of his main switch; also, two switches and two circuit breakers should be installed so that nothing but a complete shutdown of his plant would stop his fan; otherwise his ventilator would stop every time his main circuit breaker went down. Where generators are operated in parallel there should be separate busbars and an equalizing bus to connect the fan to, so if the one machine stopped, the fan would still run.

Another law is to the effect that "where gathering locomotives are used on entries, the trolley wire must be placed on the opposite side from the room neck." In this case a motorman must use two trolley poles; the swinging around from one trolley pole to another increases his danger of being severely shocked. Also it makes the machine man carry his cable across both entries; when wire is strung for only one trolley pole, on one entry, he would be able to connect to the trolley wire inside of his room.

MACHINE WIRES ARE DANGEROUS WHEN TAKEN ACROSS THE ENTRY

Where machine wires are taken across the entry to cut a room the cable is usually put on the bottom and then run up along the rib and connected onto the trolley wire. You can't keep the men from walking on this cable where it crosses the track, and even if you put a board on it, they will take this latter off and use it to make caps for props. If you take the cable overhead it is liable to lag down and catch the motorman, or man passing under it; so it seems to me if danger of shock is to be avoided, it is the safest plan to have but one trolley pole.

Overcasts in Coal Mines

Among the many varieties of overcasts used in the anthracite field, Figs. 1 and 2, show a style that is a comparative improvement over some of the common

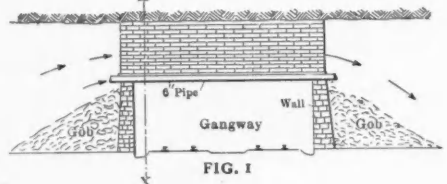


FIG. 1

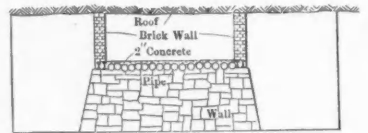


FIG. 2
Section through X-X

GENERAL DESIGN FOR OVERCAST IN A COAL MINE

types of air bridges. The construction is simple and relatively inexpensive as it may be built by unskilled labor. The foundation walls are the same as those used for any air bridge, but instead of arching, as in the case of concrete overcasts, old 6-in. pipes are used, this material being abundant as a result of flushing operations. These pipes are placed parallel on the walls, as shown in Fig. 2; on top of them is placed 2 in. of concrete of the usual proportions to fill up the space between the pipes if there is any, while both ends of the pipes are open so that the air travels through, as well as over them.

Brick walls are built on both sides of these pipes, as shown in the illustration. The pipes upon which these walls are built are often reinforced by heavy rails and the walls are sometimes built of concrete instead of brick. This style of overcast has the following advantages over concrete air bridges: 1. It is at least 20 per cent. cheaper than concrete overcasts. 2. There is no arching, therefore the sectional area over the bridge is greater and offers less resistance to the air current. 3. Foremen claim that it can be repaired more easily than any other style of construction.

*Mining engineer, Bentleyville, Penn.

Dust As a Factor in Mine Explosions

Watering Our Mines Is Said to Be Dangerous. It Is Recommended That We Split Our Air Currents and Use Auxiliary Fans

BY WILLIAM N. PAGE*

After a careful study of the excellent paper of Mr. Haas, read before our Charleston meeting of October 7, the report of Messrs. Desborough, Meisner and Watt-eyne, to the Secretary of the Interior, an article in the *Colliery Guardian*, by James Ashworth, of Edgcroft, England, and many other similar reports and experimentations, two facts seem to be fairly well established, to which I wish to direct the attention of our West Virginia mine owners and operators as of vital importance in connection with dust explosions:

1. Dust, as dust, is not explosive.

2. It is a physical impossibility to moisten dust to the point of safety, in high velocity currents.

In reference to the first, dust being simply a mechanical division of coal, a chemical alteration must be essential to an explosion, but the division may be so fine as to render the chemical reactions practically instantaneous; I am satisfied that a mine entry filled with a whirling mass of dust in suspension is a dangerous element, which will augment, or produce an explosion, when in contact with the requisite temperature and flame areas. The explosion is due to the gases generated by the rapid flaming of the dust, it follows that the danger lies with this dust in suspension over large areas, and that the dust is harmless when at rest.

In reference to the second point, Mr. Ashworth, quoting freely from Mr. Stokes, H. M. inspector of mines for Great Britain, and referring to particular disasters, shows from hygrometric observations, that neither complete saturation of the air currents, nor wet walls, roof and floor, nor all combined will remedy the danger. Mr. Ashworth says: "A practical demonstration of the correctness of these experiments was afforded by the Universal colliery explosion, where the flame of the explosion traversed the whole of the east side districts, although this side of the colliery was naturally wet and the air saturated with moisture; and this proved that the saturation of the roof, floor and sides will not reduce or prevent the extension of an explosion in a mine, as Messrs. Scholz and Stokes appear to have concluded. It has, however, been proved by German experiments that if water is used for the purpose of restricting or preventing explosions, it must be so considerable in quantity that it may be squeezed

out of the dust with the clenched hand, etc." I think we must all admit that it is a practical impossibility to keep mine dust in such a state.

SLOW CURRENTS ARE THE SAFEST

In olden times, when we had to depend on gravity and slow currents for ventilation, no one ever heard of dust as an element in explosions, and even now, I know of no disaster remotely attributable to dust, where high-pressure fans were not employed. Until comparatively recent times, all explosions were attributed to firedamp, and to guard against this danger, we have created a new danger in the enormous volumes of air traveling at high velocities through restricted channels; these currents of air pick up every particle of dust within reach and keep it in suspension. Just as the remedy for firedamp has developed the more serious problem of dust, so will the remedy now universally proposed for dust result in a greater danger from water, because water will not only affect the health of the miner, but it is the indirect cause of every death from roof falls.

According to the U. S. Geological reports, 66 per cent. of all underground fatalities is attributable to the fall of roof and coal, and only 34 per cent. to all other causes; I presume it would be fair to assume that not more than 5 per cent. of deaths can be traced to dust explosions. It would seem, therefore, that the remedy of water proposed in the effort to save five lives is now the death portion of sixty-six, and any increase of water in the mine must necessarily add to roof fatalities.

SPRAYING WITH WATER CAUSES ROOF FALLS

Slate or fire-clay probably constitute over 90 per cent. of the mine roofs in West Virginia, and every practical miner knows that these slates and clays disintegrate rapidly when exposed to atmospheric air and weather on the dumps or spoil banks, and when we force two or three hundred thousand cubic feet of air per minute through the mine at high velocities, we are simply introducing outside conditions underground; consequently, the roof constantly disintegrates, crumbles and falls as it would do if the same material was exposed outside. The more water introduced either by sprinkling or saturation of the air, the more deadly will be the consequences. We had a single-phase danger with firedamp a two-phase danger with dust, and we will have a three-phase

danger with water, more deadly than the other phases combined.

SLOWING DOWN THE VENTILATION IS MORE EFFECTIVE THAN WATER

In my opinion, the proper remedy for dust is not the application of water in any form, as it is not only of doubtful value in relation to the dust, but is unquestionably far more dangerous to life and the mine than all other elements combined. The only effective remedy is the slowing down of the ventilating currents to a velocity at which they will not carry dust in dangerous quantity, and this I believe can be done, and still supply the mine with all the air necessary for the dilution of the gases, respiration and combustion. A greater quantity than is necessary for these purposes must be a positive evil through both roof and dust. The tendency heretofore has been to regulate by statutes the specified volumes of air per minute for each man, animal, and light, without any limit beyond the statutory specifications; the mine inspectors have all considered high velocities as the most desirable attainment, the higher the better, with an eye single to firedamp and pure air for the miner. It seems to me however, that the time has come when the law makers and mine experts should study consequences, as too much of any good thing must always be harmful.

SPLIT THE CURRENT AND USE AUXILIARY FANS

Instead of forcing 200,000 cu.ft. of air per minute through restricted airways and passages by a single fan, under sufficient pressure to permeate every part of a tortuous mine, necessitating high velocities in many passages, I would suggest that the current be split as often as possible, and a number of auxiliary fans be substituted for one powerful single unit. Five fans delivering 40,000 cu.ft. will be preferable to one delivering 200,000 cu.ft., not only because of the slower velocities, but from an actual saving of power through less friction. Such small units placed within the mine will operate as force and suction at the same time, and since electricity is now almost universally employed underground, there is no mechanical or other difficulty in the way of installation. The cost of the small units combined will be little, if any greater than a single unit of equal capacity.

Where there is more than one intake and outcast, there is no problem involved,

NOTE—An open letter to the mine operators of West Virginia.

*President, West Virginia Mining Association, Charleston, West Virginia.

and in shaft mines with limited entrance, the difficulties would be neither great nor costly, as the necessary intake and outcast where the velocities might be high, could be easily isolated from all danger. In other words, the currents could be passed through auxiliary fans and slowed down, just as an electric force can be stepped up or down through a rotary converter. With such arrangement a uniform volume of air, under slow velocity, could be more satisfactorily distributed across all working faces, as a small motor-driven fan could be moved from place to place, with little loss of time or money.

I make these suggestions simply to direct the attention of our mine managers to the subject, being fully convinced that water is not an effective remedy for the prevention or restriction of explosions attributable to dust; granting, however, for the sake of argument, that it is a preventive, and that dust can be settled by a spray or humidity, its application is too expensive, uncertain, and dangerous, for practical purposes. Death from roof falls is like the falling of leaves one by one, making no disturbance, but an explosion, which kills in groups, though only one-thirteenth as deadly, is like a conflagration which fires the imagination of the public.

In our efforts to protect life and property, we must look to the falling leaves as well as to the burning bush, and the men who die one by one under roof falls are as much entitled to protection, as are those who lose their lives in a spectacular disaster.

Colliery Notes

During the 10 years preceding 1905 there were 183 fatal firedamp and coal-dust explosions at the mines in England; in these disasters the sacrifice of life totaled to 720. Of the various explosions, 131 were due to unprotected light; defective or opened safety lamps were responsible for 17 disasters, while 29 of the explosions were attributed to shot firing. The influence of coal dust in extending the explosions was marked in 21 instances, and included the more serious explosions with a correspondingly high death roll, amounting to a total of 476 out of the 720 deaths.

The difficult problem of determining when wire hoisting rope has depreciated beyond the limits of safety has recently occupied the attention of many engineers. It is certainly true that many ropes have been discarded while still in good condition. A novel method of testing such ropes is accomplished by the use of electric induction. The ropes are passed through a coil of copper wire, traversed by an alternating electric current, and the variations of induced current—which exactly correspond to changes in the thickness of the ropes—are recorded on a suitable instrument. Dangerous wear or

broken strands cause the indicator to give warning.

The question of installing gas engines as against steam depends principally upon the amount of power required and the quantity of gas given off. If the former is small, so that there is a quantity of gas to spare, then the steam plant is preferable, on account of its well tried and proved qualities and greater simplicity. For gas engines, the consumption may be taken as 40 to 50 cu.ft. of gas per horsepower-hour, though, of course, this will depend upon its calorific value. From 10 to 15 per cent. of gas will be given off per ton of coal coked in the ovens, which, taking the gas as weighing 0.03 lb. per cu.ft., will be equivalent to about 7500 to 11,000 cu.ft., and of this quantity, 30 to 50 per cent. will be available for driving gas engines.

There is still much mystery in connection with spontaneous fires underground and on board ships. We are still in need of information as to what is the nature of the physical or chemical property of a particular coal which renders it liable to spontaneous combustion. The rapid rise of temperature which takes place where radiation is prevented can be simply shown by covering an electric light with material such as fine coal, when it will be found that in the course of an hour or so, the heat is so great that the glass of the lamp melts and collapses. It was shown by Henry Hall, inspector of mines for Liverpool district, England, that timber will ignite in an atmosphere at a lower temperature than coal or cannel; that partially decayed timber, such as old pit props ignites most readily of all. It is possible that fires underground would not be so frequent if care were taken to clear out all old or used timber from seams where heating takes place.

It is not the normal voltage of the electrical system that has caused so many of the serious accidents from shocks, but rather the very high pressures which are set up on suddenly breaking the circuit; this is especially true in the field coils of a motor. One instance is cited of a man who took hold of the terminals of a motor at a colliery, thinking the current was off; the field circuit, however, was connected up. The victim could not get away and a miner who was with him switched off the current, with the result that the induced discharge passed through him, and he was killed. Had the rescuer known, a better plan would have been to seize the arm of the victim and try to pull it off the terminals. Dry clothing is a good insulator, and a man in contact with live metals may safely be seized thereby; it is, however, dangerous to take him by a bare part, or under the armpits where the clothing is likely to be damp. When current is being switched off a machine, it is a good plan to keep clear of the frame, as that is a time when an in-

ipient fault may develop and an existing fault becomes most dangerous.

When the recent fire at the Hamstead colliery had been raging from six to seven hours, the inspector decided to descend into the mine upon an exploratory trip. It was suggested that a small bird or a mouse be taken along to act as a guide to the safe condition of the air. The grounds for this practice are based on the fact that the circulatory system of the bird and the mouse is so small that their blood becomes saturated with CO in a shorter time than would be required for that of a man. The descent was made and the men took with them a linnnet. The party was underground more than an hour, and on reaching the surface, two of the inspectors had to be assisted from the cage; a third did not recover from the effects of CO for over a week, yet the bird, when brought out of the pit, was quite cheerful and was used by a subsequent party. During this later descent, the bird was alleged to have fallen from its perch, so the party stopped and returned to the surface, but the bird survived even this and was alive after the exploration of the mine was concluded. It should be remembered, however, that when explorers take a bird with them, the bird is at rest while the explorers may be working hard, and for this reason the effects on bird and man are somewhat equalized.

The dangers of the carbonic-acid gas (CO₂) when present in mine air are not realized by the general run of underground workers. This gas is present in air to the extent of 0.04 per cent. under normal conditions; however, CO₂ forms from 13 to 15 per cent. of a blackdamp mixture. No very noticeable effect on the breathing is produced until the quantity of CO₂ in the air reaches 3 per cent., when, if a blackdamp mixture exists, the miner's light will be extinguished. The great danger from this gas, however, results from the constant presence of small quantities of CO₂ in the atmosphere, thus causing a general deterioration in health and physique. The general opinion of the best authorities is that mine air should not contain more than ¼ per cent. of CO₂. One of the simplest tests to determine whether more or less than this latter quantity of CO₂ is present in mine air is as follows: Measure ½ oz. of clear limewater and pour it into a 5-oz. bottle, fill the bottle with distilled water, giving a solution of 10 per cent. strength. Add a drop or two of a phenol-phthalien solution, and the limewater assumes a pink color. Now fill an 8-oz. bottle with mine air from a sample flask which has been obtained from the mine, add ½ oz. of the colored solution, and shake. If the pink color disappears quickly, the air contains more than ¼ per cent. of CO₂. If the color fades only after repeated re-shaking, the quantity of CO₂ in the air is approximately ¼ per cent.

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The Marianna Explosion

After a feeling of security and relief that has been fostered by the absence of mine disasters for several months, we are again aroused by the catastrophe that has just occurred at the Marianna mine near Pittsburg, in which about 130 men have been lost. The serious and startling fact concerning this latest disaster is that the Marianna mine was planned by our most competent engineers and has been considered a model operation of its kind. No expense was spared in constructing the surface plant or in laying out and carrying forward the underground develop-

ment. This is the first serious accident the Pittsburg-Buffalo company has experienced, and it was believed by the officials of the company that so many precautions had been taken that the chances of such a disaster in one of its mines, and especially in its best mine, were as few as modern practice would permit. The mine had been examined by the district mine inspector only a few minutes before the explosion occurred, and the origin of the explosion is a mystery. It will be several weeks before sufficient investigation will have been made to justify the officials in making a statement as to the cause.

If we were to make a list of the mines in which disasters of this sort occurred during the last two or three years, it would appear that those which have suffered such accidents have not been the mines where coal is won in an unsystematic manner, nor those whereof the ventilation was deficient. The worst disasters have occurred in mines which we have been accustomed to regard as the most nearly ideal. The Monongah mines were probably the best planned operations controlled by the Fairmont Coal Company, just as the Marianna mine is one of the model plants in western Pennsylvania. In the latter the miners themselves were of the more intelligent class, so that the danger from disobedience and neglect of orders was minimized. Can anything be more discouraging to mine managers and engineers than the recurrence of such terrible accidents?

At a recent meeting of the West Virginia operators in Washington, Samuel Dixon, one of the most experienced, called attention to the fact that in the earlier days of mining when the workings were ventilated by furnaces and such

crude devices, explosions were less frequent and not so disastrous. In the letter of Mr. Page, another of West Virginia's oldest operators, the same point is brought out, and it is further asserted that we are passing too much air through our mines, and that watering our entries and rooms to lay the dust does greater harm than good. This is a radical and highly important criticism of modern coal-mining practice.

High-pressure fans driving immense volumes of air through our mines, especially during the winter months, do indeed remove much moisture from the mines and also tend to keep large quantities of dust suspended in the air; however, to say that before large currents of air were used in ventilation no explosions were remotely attributable to dust is a broad statement that will be opposed by many practical engineers. For our own part we do not believe there was ever an explosion of great magnitude at any time, in any mine, in which coal dust was not a factor. The ignition of any large quantity of gas in a coal mine is certain to produce a terrific explosion; but it would probably be confined to a restricted area were there no dust upon which the flame could feed, thus generating more gas and causing additional explosions on the advance.

Mr. Page's argument, however, is not intended to belittle the problem of coal dust as a factor in mine explosions, but rather to show that in curing this evil we are introducing a danger even more serious in its result. There is no question as to the accuracy of Mr. Page's figures, which show that 66 per cent. of all underground fatalities is attributable to falls of roof, while perhaps only 5 or 10 per cent. can be traced to explosions where dust has been a factor. However, it is not stated what proportions of the deaths due to falls of roof and side are caused by the additional water introduced into the mine, and we do not believe that a large proportion of these accidents is caused by the water that is introduced to moisten dust. The system of spraying our mines and introducing steam into the intakes to furnish moisture in the air are practices approved only in recent years; in looking back over past records we find that the greatest number of fatalities even then resulted from roof falls before this plan of watering was an accepted practice. No other problem of mining is accom-

panied by a greater diversity of opinion than the question of mine explosions. We sincerely hope that every engineer interested in coal mining will carefully read the letter written by Mr. Page, and we urge mining men to present their views and experiences so that all available evidence will be contributed to the solution of the problem. Every mining man in America who has been engaged in the production of coal for even a short period of time has undoubtedly had experiences that have caused him to form definite opinions respecting coal-mine accidents. We have recently received letters asking as to whether we desire a critical discussion of the various articles we publish, and we can say only that by such discussions, more than in any other way, will the greatest knowledge be gained. Mr. Haas, Mr. Ashworth, Mr. Page and many other experienced coal men have presented their ideas in a forcible manner; every other engineer who is interested in the safety of his brother miner and in the solution of this important question should add his individual effort to the discussion of this important subject.

Copper Statistics

In revising the tariff, there is one matter which certainly should be attended to. This is the classification of the imports and exports of copper and copper-bearing materials, which are now entered in such a way that it is impossible to determine precisely the amount of copper exported from the United States. In the case of the imports, it is possible to arrive at the whole amount of copper brought in, but not the proportion thereof that is refined metal.

Inasmuch as unmanufactured copper is free of duty, the classification has no bearing upon the tariff question. Consequently there is no reason why a more scientific classification should not be made. The U. S. Geological Survey, which in its statistical work upon this subject has experienced the same difficulty that we have, is now urging before the Ways and Means Committee that a classification be made according to the principal copper-bearing materials, namely, ore, concentrates, matte, blister copper, refined copper, old copper and alloys. In the case of all which are not essentially 100 per cent. copper, the gross weight and copper content are to be recorded. This is a logical classification,

although for "blister copper" it might be well to substitute "pig copper" and ore and concentrates might well enough be grouped together. Cement copper (precipitate) which is occasionally imported also should be specified. It is to be hoped that the Ways and Means Committee will adopt this suggestion in drafting the new tariff bill.

Coal Cutting vs. Pick Mining

In this issue of the JOURNAL, Mr. Dixon ably discusses the subject of coal-cutting machines as compared with hand hewing. This question is not only one that appeals to every colliery operator, but also is one as to which there is both a diversity of opinion and a lack of precise information. The article in question deals principally with mining in England, but it is also applicable to conditions in our own country.

When mining machines were first introduced in our coal mines, the majority of the miners opposed them on the ground that they would not only reduce wages, but also would do away with many of the men previously employed. That such machines have not lessened the demand for miners is well known to all who are familiar with labor conditions. As to a decrease in the earning power of the men, Mr. Dixon in concluding his article states that the miners not only earn more money, but also that the machines have done away with the most arduous part of their work. As to the economy of cutting machines, it is shown that the cost of production per ton is about the same with each class of mining; however, the advantage of coal cutting results from the increase in the percentage of large coal, which commands a higher price in the markets.

Alleged Oil Prospects in Nevada

During the early part of November, 1908, a brief examination of the oil prospects in Nevada was made by Robert Anderson, a geologist of the U. S. Geological Survey. On Nov. 29 we received for publication a preliminary statement of the results of his investigation. So far as we can recollect, this is the quickest action of the Geological Survey in the publication of its work. Mr. Anderson reports that the chances for finding petroleum in the region investigated are slight. The matter is of so little importance that it does not deserve much consideration. Our

real text is the great service that the Geological Survey can do for the mining industry by sending its scientists to new mining districts and promptly communicating their reports. It is just as important to know where not to spend money as where chances may reasonably be taken. Mr. Anderson spent only a few days in his examination of the oil prospects in Nevada, but these appear to have been sufficient to disclose the fundamental facts as to the geology of the region. It is to be hoped that the Geological Survey will further pursue this policy, and when a Tonopah, Goldfield, or Sylvanite is first heralded to the world will promptly send its scientists to the scene and make a quick report as to the general conditions. It is not to be expected that from such reconnaissances they will be able to say the last word about the subject, but their trained observation is vastly superior to the untrained which usually communicates the first information about such new districts.

Foreign Trade in Iron and Steel

At different times in the past we have heard a great deal of the possibilities of foreign trade in iron and steel products. This trade was to act as a balance wheel, maintaining production at an even level when the home demand was slack. Much was said of organizations promoted by the larger steel companies for the purpose of handling and extending sales abroad. In the present period of depression, however, these agencies have not worked, apparently. During the nine months ended Sept. 30 of the present year, which certainly covers a period of depression and light home demand, the exports of iron and steel products did not increase; on the contrary, they showed a decrease of 21 per cent. as compared with the corresponding period of 1907, when trade activity here was at its height.

The fact is that, in all the talk about foreign trade, no account was taken of the fact that under modern conditions a trade depression is not confined to one important country. It extends to others in greater or less degree, even spreading through the entire commercial world. When we have a large surplus to sell abroad, the demand there has fallen off, almost on parallel lines to our own. Other countries may be willing to buy our products at a low rate, but the purchasing and consuming capacity has been reduced.

Views, Suggestions and Experiences of Readers

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

CORRESPONDENCE AND DISCUSSION

Alumina in Copper Blast Furnace Slags

In an article in the JOURNAL of Aug. 8, on alumina in copper blast-furnace slags, analyses of four slags from the Champion Copper Mining Company are given. The most striking feature of these is the high alumina content, i.e., 27.8, 26.4, 22.9, and 31.2 per cent. This last particularly attracted my attention as being practically an impossibility for copper smelting. If it has actually been run it is a fact of much importance to copper metallurgists, but from the following facts I am afraid it is misleading and inaccurate, and its circulation may cause young metallurgists infinite trouble.

Since the Champion Copper Mining Company went into liquidation the Maori-land Copper Company started working the same mines and smelting on the same site formerly operated by Mr. Heinrich. Six ore sacks of the clean slag from his dump was taken and crushed to pass a 1/2-in. mesh screen for use in the new furnace construction. I got an accurate sample of these, and on analysis they returned the following results:

	Per Cent.
Silica.....	33.6
Iron oxide.....	32.2
Lime.....	10.6
Magnesia.....	14.3
Alumina.....	3.6
Sulphur.....	2.0

The copper was unusually high. A hand-picked sample of the whole dump (about 100 tons), rejecting anything that contained shot matte was then taken, and this gave a very similar result, with slightly higher iron and lower copper and sulphur.

With the permission of the present general manager, I give five analyses of the slags at present being run, on charges made up partly from Mr. Heinrich's old ore-charge heaps and kilns, and partly from the same mine workings.

PERCENTAGE COMPOSITION OF FIVE SLAGS.

	1.	2.	3.	4.	5.
Silica.....	40.5	37.5	34.5	30.6	34.3
Iron oxide.....	32.1	39.8	42.9	42.6	37.5
Lime.....	12.4	5.6	4.7	2.5	6.1
Alumina.....	6.0	6.7	6.3	7.6	6.8
Magnesia.....	8.8	9.7	10.5	10.2	8.8
Copper.....	0.15	0.85	0.6	0.7	0.75
Magnetic iron oxide				5.8	3.9

It will be noticed that the alumina is very constant, although the ore mixture has been changed about completely.

The ore consists of a massive pyrrhotite occurring in serpentine and carrying copper pyrites, native copper and copper

glance. The alumina in several analyses was as follows: 2.04, 3.1, 1.5, and 0.9 per cent.

In Mr. Heinrich's analyses practically no lime is given, 1.5 being the highest, whereas in both cases I found his dump to contain over 10 per cent. That he added limestone was almost certain, for his old charge heaps contain about 20 per cent. by volume of spalled limestone flux.

I should like to express my appreciation of Mr. Shelby's able and instructive article and to ask him if he has ever run a 31-per cent. alumina slag and what in his opinion is the highest alumina content allowable for economic working under favorable conditions?

The magnetic oxide of iron has given us a great deal of trouble in the reverberatory smelting, settling on top of the charge as a thick, infusible scum, and greatly retarding the working of the furnace. I attribute its formation to the oxidation of the pyrrhotite (Fe₁₁S₁₂) during pot sintering, since the ore carries practically none, and the sintered furnace charges up to 15 per cent. On roasting the ore by other methods I find the magnetic oxide still forms to practically the same extent. I should be very grateful for any suggestion in regard to the removal of this trouble.

HARLEY E. HOOPER.

Nelson, New Zealand, Oct. 5, 1908.

Loading Blast Holes

In regard to the discussion on the proper position of the primer in loading holes, by Mr. Hay in the JOURNAL of Nov. 14, 1908, I wish to give my view on the other side of the subject, i.e., the advisability of placing the primer at, or as near as possible to the bottom of the hole.

In cutting the fuse for a round of from 8 to 16 holes, 6-ft. fuse being used, it is rarely possible to give each hole a lead over the next hole to be fired of more than from 2 to 4 in. on the fuse, since sufficient fuse has to be left in the first hole to allow time enough for the men to reach a protected place in safety. This being the case, by the time the first hole "goes" the other lengths of fuse have all burned pretty well down in the hole, if the primer is placed in the bottom, and consequently the danger of a fuse being cut off or pulled out is greatly lessened as the process of burning so weakens the fuse that it will, in most cases, break be-

fore pulling out the primer in a properly loaded hole.

On the contrary, if the primer is put on top of the charge, the primer and perhaps part of the "powder" might be cut off and exploded in the muck pile, leaving part of the dynamite still in the hole. Then there is the added danger of flying rock cutting or pulling out the unburned fuse exposed at or near the collar of the hole. It is not an unusual occurrence for holes to be cut off and to fall more than 50 ft. into the chute, the fuse and cap breaking away from all powder and not exploding until the fuse has burned down to the detonator. Is it well to place so much confidence in the sensitiveness of a cap?

I do not agree with Mr. Hay's statement that, "if the round is drilled properly there is little likelihood of the cutting off of a hole." In volcanic rocks, especially in shattered zones, there are often seams and "slips," of which the drill operator has no knowledge and which very often cut off holes in a manner which could be foreseen by no man.

The formation of air spaces in the charge can easily be remedied by splitting the paper cartridge lengthwise of the stick of dynamite and tamping into the hole lightly with a wooden stick. Any dynamite which is "soft" enough to explode readily will fill all open spaces if this rule is followed.

In conclusion I wish to say that if a person wants to know how many holes miss fire from loading the primer on top of the charge, he should follow, in either shaft or drift, a man who follows this system.

E. A. COLBURN, JR.

Cripple Creek, Colo., Nov. 19, 1908.

Sampling by Machines

John A. Church's comment in the JOURNAL of Nov. 21 on my criticism of his paper on machine sampling makes it necessary for me to clear up some misunderstandings he seems to have of my statements.

In the first place he entirely misquotes me concerning the use of "perforated shaking aprons put in the Cripple Creek mill under Mr. Argall's management several years ago." Mr. Argall did not as I remember operate a mill in Cripple Creek, and I did not state nor do I now remember whether or not he used any such device in his mill at Cyanide, Colo. I did

distinctly say, however, that all Taylor & Brunton sampling mills had been partially or completely equipped with shaking tray feeds, and emphasized this condition by stating that this plan was adopted in order to give uniform feed and even wear on the rolls, while it incidentally prevented danger from synchronism of motion between any two consecutive samplers. The mills so equipped were one in Aspen, Colo., one in Salt Lake City, Utah, two in the Cripple Creek district, Colo., one in Butte, Mont., and will include one now being built in the Tintic district of Utah. Whether these can be called "modern mills" I will leave to the general mining and smelting fraternity to decide.

Again, there is nothing in my statement which can be twisted into a slur on the management of sampling works connected with smelters or mills. There is this difference, however, between reduction works samplers and public samplers, more particularly purchasing samplers, which seems to me too plain to call for more than a mere statement. Ore sampled by the reduction works is for the most part immediately bedded, and, except by special arrangement, only from $\frac{1}{8}$ to $\frac{1}{125}$ or even less of each lot is held intact for possible later readjustment. In such cases checks of sampling made by the reduction works are for the most part but resamples of this small portion held, and as this is usually coned and quartered or riffled and is not rehandled through the mechanical part of the mill, such a resample furnished no check on the mechanical system.

CAUSES OF VARIATION

The real check the reduction works has on its sampling is the balancing of the metals bought during any certain period of a month or a year, with the metals recovered plus the slag, dust, etc., and plus an estimated amount held in the furnace bottoms, tanks, etc. That is to say, the reduction works check is on the average of the sampling for a certain period rather than on the sampling of individual lots. On the other hand the public sampling works, with some exceptions, have a separate and independent check on the sampling of every lot or mixture of lots handled and forwarded by them to perhaps a dozen reduction works which may use nearly as many variations of sampling methods. In a well regulated sampling works the study of these check samplings, and the hunting down of causes of variations, form the most important and intensely interesting part of the business and, in my opinion, have been the principal cause of the gradual improvement in sampling methods. Therefore I reiterate that such public sampling works are in the better position to keep informed of differences in sampling and sampling methods and to hunt down causes for variations which may occur.

Mr. Church seems astounded that I have

known of differences of 30 per cent. occurring in duplicate samplings of small amounts of ore, though I venture to say that most managers of mines, reduction works and samplers have had the same experience. I did *not* say, however, that these differences occurred in the *mechanical* part of the sampling. On the contrary such differences are mostly due to the use of faulty coning and quartering methods succeeding the mechanical process, and to insufficient crushing at this stage of the work. Naturally it is not always feasible to give the details of such differences in sampling owing to the difficulty of obtaining the consent of all interested parties to their publication. I mentioned this matter merely as an argument against blaming the mechanical part of the sampling mill for careless work occurring at later stages of the process, and to emphasize that any comparison of theory and practice in mechanical sampling mills was useless unless the system in use at these later stages and in the bucking room had been perfected.

My main criticism was and is that Mr. Church has not proved his principal claims: first, that retardation of coarse or fines precludes the correctness of the mechanical sampling; and second, that the accuracy of mechanical sampling is greatly influenced because the 9.9 lb. of ore taken by the sample spout does not accurately represent in value the 60.6 lb. of ore presented to the machine during a single revolution.

T. R. WOODBRIDGE.

Salt Lake City, Utah, Nov. 24, 1908.

An Electric Coal Puncher

In an article which appeared in the *JOURNAL* of Sept. 12, 1908, entitled, "The Operation of Coal Mining Machinery," by George E. Lynch, the author states, in referring to the kind of power used in connection with the operation of the puncher type of machine: "The motive power is always compressed air, for there is as yet, no practical electrically driven puncher on the market." I desire to take issue with the author and to correct his statement, although I believe it was not made with the intention of misleading those who may have read the article.

Evidently Mr. Lynch was not aware of the existence of the Pneumelectric coal puncher, or if he was, he did not make an investigation of it before writing his article. This is an electrically driven machine, although the blow is struck by compressed air. As its construction has been described in the columns of your paper, it is probably well understood and the only relevant point to be considered at this time is as to whether or not the results obtained from its operation are of such a nature as to make Mr. Lynch's statement misleading.

In view of the fact that this electrically driven machine is in operation, and has been for a period of at least two years,

in nearly every bituminous coalfield in the United States, it would appear from that, if for no other reason, that it is practical. Another point which bears directly on the practicability of the machine, is the amount of work which it can do, and in this a comparison can be made between the work of the compressed-air-driven machine and the Pneumelectric, by using the figures given by Mr. Lynch. In this connection he makes the following statement: "Each puncher in the hands of an efficient runner will average 60 to 70 ft. of face undercut per 10-hr. shift. The power consumption is from 100 to 150 cu.ft. free air, compressed to 80 lb. gage per minute." According to this the average cutting would be 65 ft. face in 10 hours, and the air consumption 125 cu.ft. at 80 lb. gage pressure, the latter being equivalent practically to $23\frac{1}{2}$ horsepower.

Comparing this with well substantiated results which are being daily obtained from the Pneumelectric machine, it is found that the usual cutting of the Pneumelectric is from 80 to 100 lineal feet face in 10 hours, or an average of 90 ft., an excess in cutting capacity of practically $33\frac{1}{3}$ per cent. This amount of work is done with a power consumption of but $7\frac{1}{2}$ h.p., which is less than one-third of that required by the air machine of less cutting capacity.

In the light of this information it can be truthfully stated that there is a practical electrically driven puncher on the market.

JOHN L. WAGNER, vice-president,
Pneumelectric Machine Company.
Syracuse, N. Y., Nov. 21, 1908.

Monthly Advance in Mine Drifting

In the editorial in the *JOURNAL* of Oct. 17, it is stated: "We believe that this is the best on record for drifts or crosscuts of this size." The reference is to an advance of 263 ft. in a month in the Hot Time Lateral from the Newhouse tunnel under the management of S. H. Knowles. This is certainly excellent work. I think, however, that it is by no means the best on record, for I note, in a late number of the *Mining and Scientific Press*, that a drift on the 3100-ft. level of the Chollar Potosi, in Virginia City, was "abandoned in the black dike on the footwall for week after week at the rate of 80 ft. per week." This would give a monthly advance of 340 ft. Even in Europe, which we are apt to look upon as a very slow country, they make holes in the ground rather rapidly. I had occasion to study this question in 1905 and found that the firm of R. Meyer, a German contractor of Mülheim, claimed a progress of 294 ft. monthly for several months in limestone, and a record of 465 ft. for a single month in trachyte; both of these were ordinary mine tunnels. In the *JOURNAL* of June 20 I see that a drift on the Simmer reef, on

the Rand, made 294 ft. in 61 eight-hour shifts. Here, in Tonopah, a progress of 150 ft. in a month is thought good.

I think I have reported the record slow progress in my article on the Bogoslovsk Estate (*Trans.*, A. I. M. E., 1908). This was at the Frolovsky mine in the Urals, where two machine drills with six men in the face, for two eight-hour shifts made an average of 25 ft. monthly in pure, crystalline, white limestone.

WM. H. SHOCKLEY.

Tonopah, Nov. 21, 1908.

Railroad Grants on Mineral Lands

The following excerpt is made from the *JOURNAL* of Nov. 7, 1908, page 923: "Investigations made by the United States Government have disclosed the fact that about 300,000 acres of land valued at \$100,000,000 have been wrongfully acquired and now held by Harriman for the Southern Pacific system. * * * The railroad company's agent filed a non-mineral affidavit in taking up the land. Some of the richest mineral territory in the State (Nevada) is involved." I think the *JOURNAL*'s correspondent labors under a misapprehension regarding the law applicable to the above facts, as indeed mining men generally do.

During the years 1862 to 1866, Congress granted¹ to certain private corporations, to aid in the construction of railroads, approximately 150,000,000 acres of public lands, and of this amount about two-thirds were within the limits of the precious-metal-bearing States and Territories.² These acts granted to the corporations, commonly referred to as the "Pacific Railroad Companies," rights of way over the public domain 200 ft. in width on each side of the track, together with all necessary ground for stations, buildings, workshops, machine shops, depots, turntables, switches, side tracks, and water stations. So far as the right of way is concerned, these grants have been held to be present, absolute, and subject to no conditions except that the road be constructed and used for the purposes designated; the reservations of "mineral lands" found in these acts has no application to the right of way.³ There was also granted every alternate section of public land not sold, reserved, or otherwise disposed of, designated by odd numbered sections, to the amount of 10 alternate sections per mile on each side of the respective roads, on the line thereof, and within the limits of 20 miles on each side of said roads, "provided, that all mineral lands shall be excepted from the operation of this act."⁴

These acts, then, apply in terms only to

¹"Statutes at Large," Vol. XII, p. 492; 13 *id.* p. 358.

²"Public Domain," pp. 273-287.

³Montana Central Railroad Company, 25 L. D., 250; St. Joseph & Denver City Railroad Company vs. Baldwin, 103 U. S., 426.

lands other than mineral; and as if to cut off every possible contention that mineral lands might be reached under the legislation giving vast tracts of public lands to private corporations, under the pretense of aiding public improvements, a joint resolution was passed by Congress on Jan. 30, 1865, declaring that these acts shall not be so construed as to embrace mineral lands, "which in all cases are reserved exclusively to the United States."⁵

No part of the contemplated railroad from the Missouri river to the Pacific had been constructed at the date this joint resolution of Congress was approved, and "its provisions are to be deemed an amendment of the original acts, and as operative as if incorporated therein."⁶

Ever since the organization of the mineral division of the Land Department in 1867, it has been "the uniform practice to allow and maintain mineral locations within the geographical limits of railroad grants, based upon discoveries made at any time before patent."⁷ The practice has been accepted for so long a time that no departure from it will probably ever be sanctioned, and it has, in effect, become a rule of property. And it would seem to be the policy of the Government to allow and maintain mineral locations within "the geographical limits of railroad grants," after patent, because the patents issued under or in pursuance of these grants uniformly contain the reservation, "yet excluding and excepting from the transfer by these presents 'all mineral lands,' should any such be found to exist in the tracts described in the foregoing." The Supreme Court of California has held in several cases that such a patent could be attacked and its effect as a conveyance defeated, in an action at law, by showing that the lands in controversy are mineral in character.⁸

The late Judge Sawyer held this provision of a patent void,⁹ and in subsequent cases the California court has followed the ruling of the Federal judge. Nevertheless, the Land Department has continued to insert that provision in all patents issued to the railroad companies, and until the Supreme Court of the United States decides otherwise the validity of the reservation clause should be assumed. And the effect of such clause would seem to be that lands embraced within the geographical limits of railroad grants are free and open to exploration and location under the laws of the United States pertaining to mineral lands.

⁴"Statutes at Large," Vol. XII, p. 494, sec. 3.

⁵"Statutes at Large," Vol. XIII, p. 567.

⁶Barden vs. Northern Pacific Railroad Company, 154 U. S., 288, 329; book 38, lawyer's edition, 992.

⁷Central Pacific Railroad Company vs. Valentine, 11 U. S. land decisions, 238-246.

⁸McLaughling vs. Powell, 50 California, 64; Chicago Quartz Mining Company vs. Oliver, 75 *id.* 194; Hunt vs. Steese, 75 California, 720.

⁹Cowell vs. Lammers, 21 Federal Reporter, 200.

The purpose of Congress in making these vast concessions to private corporations should also be borne in mind when the grants are the subject of interpretation. Millions of acres of the public domain were given to the Central Pacific railroad companies. Why? The acts themselves answer in language too clear and forceful to be misunderstood: *To aid in the construction of the road!* And to prevent the companies from permanently holding the lands granted for speculative and selfish purposes, a clause was inserted in the granting clause of the act providing that: "All such lands, so granted by this section, which shall not be sold or disposed of by said company within three years after the entire road shall have been completed, shall be subject to settlement and preëmption, like other lands, at a price not exceeding \$1.25 per acre, to be paid to said company."¹⁰

It would seem that this provision is mandatory. But be that as it may, so far as other States are concerned, mine owners and operators in the State of Nevada are not without a remedy. Our State legislature has declared that, "the production and reduction of ores are of vital necessity to the people of this State; are pursuits in which all are interested, and from which all derive a benefit; so the mining, milling, smelting, or other reduction of ores are hereby declared to be for the public use, and the right of eminent domain may be exercised therefor."¹¹ The constitutionality of the act has been affirmed.¹²

In a later act it has been provided that "lands held in private ownership, excepting property already occupied for mining purposes, may be prospected for gold, silver, and other valuable minerals, and upon discovering a ledge or deposit of gold, silver, or other valuable mineral, the same may be located "in accordance with the laws of the United States and of this State."¹³

The statute makes full provision for the condemnation of such property and defines the manner in which compensation shall be determined. The trend of recent decisions leaves no room for doubt that the constitutionality of this statute will also be sustained.¹⁴

It seems clear, therefore, that the Southern Pacific system cannot hold these mineral lands, if the miners and mine operators of Nevada assert their legal rights.

THOMAS E. KEPNER.

Reno, Nev., Nov. 20, 1908.

¹⁰Section 3, Act of July 1, 1862, 12 "Statutes at Large," p. 494.

¹¹Compiled laws of Nevada, p. 283.

¹²Dayton Gold and Silver Mining Company vs. Seawell, 11 Nevada, 394; Overman Silver Mining Company vs. Corcoran, 15 Nevada, 147.

¹³Statutes of Nevada, 1907, pp. 140-141.

¹⁴Clark vs. Nash, 198 U. S., p. 361, p. 370; Strickley vs. Highland Boy Gold Mining Company, 200 U. S., p. 527, p. 532; Tanner vs. Treasury Tunnel, etc., Company, p. 83 Pacific, p. 464; s. c. 15 L. R. A. (N. S.), p. 616 and note.

Questions and Answers

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

MARKET FOR MARBLE DUST OR FLOUR

Marble flour is quoted at \$8.50 to \$10 per 2000 lb. Is this the price delivered at New York? What is the demand for this substance, and what are the uses?

C. D. W. C.

The demand for marble dust is small. Business is not done by jobbers on a carload scale. Five barrels is considered a good order. The chief consumers are manufacturers of carbon dioxide, most of whom have their own source of supply and do not buy in the open market. Marble dust is used also as a filler for cheap cements and as a substitute for siliceous filler. Ship chandlers buy a small quantity. The quoted price is for delivery at New York, and represents what dealers ask of consumers; not what producers can realize in selling their output, which would doubtless be a matter of private contract. It is to be understood, of course, that in the case of substances like this in which the market is small and limited, there is apt to be a wide difference between buyers' price and sellers' price.

DETERMINING DEPTH OF A SHAFT

I once read of a method of determining approximately the depth of a shaft by dropping a stone and timing its fall. I should like to have further information respecting this method.

T. A. D.

We recollect no such description, but, of course, with the aid of a stop-watch the depth of a shaft could be so determined approximately, computing it by the ordinary formula for a falling body, $S = \frac{1}{2} g t^2$; where S is the depth in feet of the shaft, g is accelerating force of gravity or 32.2 ft. per second, and t is the time in seconds of falling. This formula will give a rough estimate for shafts of moderate depth. But, owing to air currents in the shaft and the difficulty of not giving any lateral impetus to the object when dropping it, the falling object would probably strike the sides of the shaft before reaching the bottom, if the shaft was more than a few hundred feet deep. To be entirely accurate, the time taken by the sound in traveling from the bottom to the top should be introduced into the formula. This is at the rate of approximately 1100 ft. per second.

MINERAL LAND IN NEW YORK

Can I take mineral in a town or village if it be on land owned by the town or

county without making a regular claim on the property, even though blasting may have to be done?

B. R. A.

The above inquiry is indefinite. If it refers to blasting by the owner of the property, he may have to obtain permission from the local authorities, just as he might have to secure a license before erecting a building on his land. If the inquiry refers to the discovery and location of mineral, the latter in New York belongs to the owner of the land, with certain exceptions. Thus, it is declared by statute that all mines of gold and silver in any land, and all mines of any metal in lands belonging to all persons not citizens of the United States, "are the property of the people of the State in their right of sovereignty." Also all mines of other metals in land owned by citizens of the United States, the ore of which, on an average, shall contain less than two equal third parts in value of copper, tin, iron, lead, or any of these metals. The statute contains provision for obtaining the right to prospect and work precious metals, etc., in private lands, when the owner thereof refuses his consent. Inasmuch as there are no economic gold or silver deposits in New York, this statute is of theoretical rather than practical importance, although applications have been made for the right to prospect for supposed gold and silver deposits.

TREATMENT FOR ELECTRICAL SHOCK

Is there any definite minimum voltage above which electric shock will prove fatal? What is considered the best practice in treating a person who has been exposed to contact with an electrical conductor?

W. O. K.

There is no definite voltage above which the electric shock may be considered as always fatal. The effect depends not only on the strength of the current passing through the body, but the time for which it is maintained. The results also depend largely on the physical condition of the subject. As a general rule, a high potential shock is more dangerous than a low potential shock, but other conditions, such as the moisture of the skin and clothing, may enter into the results and make a low-potential shock produce a greater flow of current, and, therefore, become more dangerous. A person who has received a severe shock may exhibit the following systems: (1) Unconsciousness. (2) Cessation of breathing. (3) Cessation of the heart's action. (4) Turning blue and green in the face. Although life may appear extinct, remedial measures should never be given up until a doctor has pronounced the victim dead. There is no doubt that many people have been given up for dead after an electric shock, when proper measures would have restored them. In treating the victim, artificial respiration should be applied. The

lower limbs and trunk of the body should be elevated. It is also well to apply rhythmic action on the tongue; some doctors also advise a smart tap over the region of the heart, repeated a few times in the course of the first half minute. The elevation of the body and legs is to send the blood to the brain as a remedy for syncope; a blow over the heart may start that organ again if it has stopped beating, and the drawing in and out of the tongue is a form of artificial respiration. Hypodermic injections of ether and alcohol are also advocated as a means of distending the arteries and so helping the heart's action.

CHINESE MINERS IN THE TRANSVAAL

I have been much interested in the possibility of employing Chinese laborers and miners in an enterprise in which I am interested—not in the United States. Can you tell me why the employment of Chinese in the Transvaal mines has been practically given up? I see that the laborers of that nation are being sent back to their own country at a rapid rate.

P. W. F.

The testimony of mine managers and others concerned in the Transvaal is generally to the effect that the Chinese employed there made good mine laborers, learning their duties readily and doing the work well. There was a certain tendency among them to shirk and to limit the amount of work done, but this did not exist to a greater degree than would probably be found among an equal number of laborers of the same class from any other nation. The mines employing them were fairly well satisfied with the result. The reasons for the deportation of the Chinese were social and political rather than economic. There was always a strong prejudice against them among the white people of the country; and when the Transvaal became a self-governing colony after the Boer war settlements were completed, this found free expression. Moreover, some of the ablest of the ruling party considered that the country had a sufficiently difficult problem to deal with in its large negro population, without complicating it by the introduction of a considerable Asiatic element.

It is also inevitable that among 60,000 laborers picked up in the Chinese ports there should be some bad men. A number of these escaped from the mine compound, and sought to lead a predatory and nomadic life. This much increased popular prejudice against the race. What became of these men is not altogether clear; it is altogether probable that many of them were summarily dealt with, after the Boer fashion. This was only a side issue to the main question, however. On the main point of the efficiency of the Chinaman as a mine laborer the opinion seems to be favorable. The introduction of a Chinese element into a foreign community, however, is a matter which requires very careful consideration.

New Publications

- AUDEL'S GAS-ENGINE MANUAL.** Pp. 469, illustrated, $5\frac{1}{2} \times 8\frac{1}{2}$ in.; cloth, \$2. New York, 1908: Theo. Audel & Co.
- WATER POWER ENGINEERING.** By Daniel W. Mead. Pp. 787, illustrated. $6 \times 9\frac{1}{4}$ in.; cloth, \$6. New York, 1908: McGraw Publishing Company.
- BRIDGE ENGINEERING ROOF TRUSSES.** By Frank O. Dufour. Pp. 96, illustrated. $6\frac{1}{2} \times 9\frac{3}{4}$ in.; half leather, \$3. Chicago, 1909: American School of Correspondence.
- OPTICAL MINERALOGY A GUIDE TO MICROSCOPIC PETROGRAPHY.** Advance Pages. By N. H. Winchell and Alex N. Winchell. Pp. 134, illustrated. 6×9 in.; paper. October, 1908.
- ILLINOIS STATE GEOLOGICAL SURVEY, BULLETIN No. 8.** Year-book for 1907. H. Foster Bain, Director. Pp. 391, illustrated. 6×9 in.; cloth. Urbana, 1907: University of Illinois.
- THE MINERS' POCKETBOOK.** Fifth Edition, Revised. By C. G. Warnford-Lock. Pp. 624, illustrated. $4 \times 6\frac{1}{2}$ in.; leather, \$4. New York, 1908: Spon & Chamberlain; London, E. & F. N. Spon, Ltd.
- REPORT OF THE CHIEF INSPECTOR OF MINES IN INDIA FOR THE YEAR ENDING DECEMBER 31, 1907.** By J. R. R. Wilson. Pp. 122, illustrated. $8\frac{1}{2} \times 13$ in.; board covers Calcutta, India, 1908: Department of Mines.
- THE DESIGN OF HIGHWAY BRIDGES.** By Milo S. Ketchum. Pp. 544, illustrated. 6×9 in.; cloth, \$4. New York, 1908: The Engineering News Publishing Company; London, Archibald Constable & Co., Ltd.
- LE MARCHE CHARBONNIER BELGE.** By Georges de Leener. Commission D'Enquete sur la Durée du Travail dans les Mines de Houille. Pp. 294, illustrated. $8\frac{1}{2} \times 11$ in.; paper. Bruxelles, 1908: Goemære.
- ECONOMIC GEOLOGY OF THE KENOVA QUADRANGLE, KENTUCKY, OHIO AND WEST VIRGINIA.** By William C. Phalen. U. S. Geological Survey, Bull. No. 349. Pp. 158, illustrated. 6×9 in.; paper. Washington, 1908: Government Printing Office.
- SMOLEY'S PARALLEL TABLES OF LOGARITHMS AND SQUARES.** Fifth edition, Revised. By Contantine Smoley. Pp. 448, $4\frac{3}{4} \times 7$ in.; leather, \$3.50. New York, 1908: The Engineering News Publishing Company; London, Archibald Constable & Co., Ltd.
- THE GEOLOGY OF THE CROMWELL SUBDIVISION, WESTERN OTAGO DIVISION.** By James Park. New Zealand Geological Survey, Bulletin No. 5 (New Series). Pp. 92, illustrated. 9×11 in.; paper. Wellington, 1908: Geological Survey of New Zealand.
- COMMISSION D'ENQUETE SUR LA DUREE DU TRAVAIL DANS LES MINES DE HOUILLE PAYS ETRANGERS DONNEES STATISTIQUES ET MESURES LEGISLATIVES.** By A. Delmer. Pp. 119; illustrated. $8\frac{1}{4} \times 11$ in.; paper. Bruxelles, 1908: Goemaere, Imprimeur du Roi.
- GEOLOGY AND MINERAL RESOURCES OF THE WESTERN COALFIELD, WITH MAPS AND SECTIONS.** By J. E. Carne. Memoirs of the Geological Survey of New South Wales. Geology No. 6. Pp. 264; illustrated. $9\frac{1}{2} \times 12$ in.; board covers, 15s. Sydney, 1908: Departments of Mines and Agriculture.
- INVESTIGATIONS OF THE COAL FIELDS OF NORTH DAKOTA AND MONTANA BY THE UNITED STATES GEOLOGICAL SURVEY.** By A. G. Leonard, C. D. Smith, A. J. Collier, L. H. Woolsey, R. W. Stone, E. G. Woodruff and W. R. Calvert. U. S. Geological Survey, Bull. No. 341-A. Pp. 120, illustrated. 6×9 in.; paper. Washington, 1908: Government Printing Office.
- THE WATER POWER OF WISCONSIN.** By Leonard S. Smith. Pp. 354, illustrated, 7×10 in.; cloth. Madison, Wis., 1908: Wisconsin Geological and Natural History Survey.
- This report is the result of surveys undertaken under a special act of the State legislature. It is preliminary, the work being still unfinished. Its topography and generally large rainfall, with numerous rivers and streams have resulted in supplying Wisconsin with a large number of water powers. Already those utilized are furnishing a total of 130,000 h.p., and the number can be largely increased. The report gives valuable data as to the rivers of the State, their flow, fall and other conditions. It is illustrated by maps and many reproductions of photographs.
- THE CHEMICAL ANALYSIS OF IRON.** Seventh Edition. By Andrew A. Blair. Pp. 334, illustrated. $6\frac{1}{2} \times 9$ in.; half leather, \$4. Philadelphia and London, 1908: J. B. Lippincott Company.
- The former editions of this work and the standing of the author as an analyst are too well known to require any comment. The seventh edition of this valuable contribution to the analysis of iron, steel and blast-furnace materials differs from previous editions by the addition of methods for the separation of vanadium, molybdenum, chromium and nickel in steel; an account of the volumetric method for nickel, and some changes in the methods for gas analysis. The table of factors has been recalculated from the values for 1908, as given by the International Committee and the corrected factors have been substituted throughout the text.
- COMPETITIVE DESIGNS FOR CONCRETE HOUSES OF MODERATE COST.** Pp. 56; $15 \times 22\frac{1}{2}$ in. Illustrated. Price, \$1. Philadelphia; the Association of American Cement Manufacturers.
- The Association of American Cement Manufacturers last year offered a number of prizes for designs and plans for concrete houses which could be built at moderate cost, ranging from \$2000 to \$4500. The object, of course, was to aid in extending the use of cement or concrete in the construction of dwelling houses. In response to this offer over 200 designs were received, and submitted to a jury of architects and experts in concrete construction. In all 26 were selected either as the recipients of prizes or for honorable mention. These designs and plans are published in the present volume—or rather album—with the accompanying specifications. The publication is in a complete and handsome form. The designs cover a wide range, and should suit almost all situations and tastes. They show what can be done with concrete construction for small dwelling houses of many different classes. They are attractive, and should be studied carefully as they show the advantages which concrete possesses over the usual frame or brick construction. The use of concrete is extending rapidly, and the circulation of these designs will certainly help its growth in small constructions.
- MANUAL OF UNDERGROUND SURVEYING.** By Loyal W. Trumbull. Pp. 251, illustrated; $6\frac{1}{4} \times 9\frac{1}{4}$ in.; cloth, \$3. New York and London, 1908: Hill Publishing Company.
- Contents: Instruments. Meridian. Underground practice. Carrying the meridian underground. Survey of secondary openings. Record of the survey. Uses of the mine maps. Making the map. Map filling. Bore-hole surveys. Methods of various engineers. United States deputy mineral surveyor's examination.
- This is a good book. The author evidently lacks experience in literary work, which deprives his book of the scholarly effect that such a treatise ought to have. His long quotations from other writers, however pertinent and satisfactory in their instruction as to the subject, are apt to be somewhat irritating to the reader. But these are trifling criticisms. The essential thing is that we have here a complete, intelligent and practical treatise on mine surveying, especially as practiced in America, that is in all respects up-to-date. It comprises many novel features that will be warmly appreciated, some of which are mentioned in the table of contents, summarized above. The author is an engineer who has done personally the things that he writes about. His book smells of the field, of the mine and of the drafting room. But in this branch of engineering grime, mud and candle-grease do not conceal or belittle theory and mathematics, and as it ought to be, the present book is strong in the purely scientific direction. It is a contribution to technical literature that will be welcomed by the surveyors

The Business of the Standard Oil Company

The following is from the testimony, Nov. 25, of John D. Archbold, vice-president of the Standard Oil Company, of New Jersey, before the referee in the case of the U. S. Government against the company.

"A great many more wells are usually drilled than are necessary. There is generally an unnecessary expense because of this. I have made it a practice in dealing with intelligent producers to ask them not to drill within so many hundred feet of each other. In Oklahoma the Government has a regulation in this regard.

"Sometimes a man drills as near the stipulated boundary as he can and the result of this is that the other man's territory is drained.

"Through the early years of the business there was an anxiety as to the continuation of the resources of the fields. In the late '60s this was especially noticeable, and it continued to the '80s. It affected investors to a large extent. And I say, to my own criticism, that in the earlier years of the business I could not avoid feeling this same apprehension.

"There is no way by which the possible production from a given well can be measured. The geologists have been of little help to us. They can tell us where oil is not, but they can't tell us where it is. You cannot send experts to examine an oil well as you can to examine a silver mine.

"In 1882 the Standard Oil Company's consumption of crude petroleum was 16,000,000 bbl. This had increased to 64,958,301 in 1906 and to more than 72,000,000 in 1907. In 1882, the refineries that consumed the 16,000,000 bbl. of oil were those of the Atlantic Refining Company, three in number; the Standard Oil Company, of New Jersey, four in all, and the refineries of the Standard Oil Company, of New York, with three separate plants, as well as the plants of the Standard Oil Company of Ohio and the Acme Oil Company. These refineries were all improved or rebuilt in the years that followed. By 1906 a number of additional plants, including those of the Standard Oil Companies of Indiana and Kansas and California, had been put up. The valuation of the properties of the companies that went into the Oil Trust in 1882 was \$17,000,000. By 1906 it had become \$57,000,000 due to the construction of new refineries and improvements. Since 1882, the Atlas of Buffalo has been the only refinery purchased by the Standard Oil Company. That was purchased in 1882, and cost \$84,000."

Answering further questions, Mr. Archbold told about the reasons for establishing refineries at certain points. It was the custom, he explained, to pick a situation convenient to a large center of population, surrounded by good transportation facilities. The Standard Oil built in Kansas, for instance, in order to get a chance at

the trade of the Southwest. A refinery near Kansas City had all the railroads which enter that place at its disposal. "We had no other thought" said Mr. Archbold, "than to pick our situation with a view to cheapening the price as much as possible.

"At present the Bayonne refinery has a capacity of more than 13,000,000 bbl. The seaboard refineries have increased much in importance. This has been especially true of recent years. The automobile business and the manufacture of gas have had much to do with this. Practically all the oil brought to the seaboard refineries is conveyed by means of pipe lines.

"At first the manufacture of by-products did not figure large. Of late they have come to be an extremely important branch of the business. Among the articles we make are naphtha, gas oil, fuel oil, paraffin oil, compounded oil, filtered cylinder oils, unfiltered cylinder oils, waxes, candles, greases, coke, pitch, road oils, asphalt and paving residuums, roofers' wax, soap stock, cordage oils, acid oil, turpentine and substitutes, engine, petrolatum, and vaseline. These articles have come to be more important than the illuminating oil itself.

"The work of developing these articles has been one of the most important branches of the Standard Oil business. We have spared no efforts to discover new uses to which to put our crude supply. Scientists and experts have been procured, not only from home, but from abroad. In the early days I can remember seeing the naphtha distilled from the oil run into the nearby creek or burned. The uses of naphtha and gasolene were not appreciated then. Now the lighter grades of gasolene bring three or four times the price of the oil. Some of our discoveries have been patented. But we haven't relied much on patents in our business."

Chronology of Mining, November

Nov. 5—Very large sales of copper at advancing prices. Nevada Consolidated, at annual meeting announced that production Jan. 1, 1909, will be at rate of 35,000,000 lb. copper, and by April from 50,000,000 to 55,000,000.

Nov. 6—Great activity in stocks and sharp rise in prices followed reassuring statements of President-elect Taft.

Nov. 7—Excitement in copper market with violent advance. Estimated sales, 10,000,000 to 12,000,000 pounds.

Nov. 10—Tariff hearings began before Ways and Means Committee. Property of Consolidated Arizona Smelting Company bought by Hooley, Learned & Co. at trustees' sale in Arizona, as preliminary to reorganizing the company by the stockholders and creditors. Rand output in October announced as 617,000 oz., the best on record. Western Pacific railway open for passenger traffic from Salt Lake City to Ely, Nevada.

Nov. 11—Violent break in stocks. Homestake declared regular monthly dividend of 50c. per share and extra of 25 cents.

Nov. 12—Firedamp explosion at Radbod colliery, Hamm, Westphalia, Germany, killed 300 men and wrecked mine. Rumor that U. S. Steel Corporation would reduce prices on finished products, rails excepted. Extraordinary buying of U. S. Steel common at highest prices in history. January Mining Company sued Bunker Hill & Sullivan for \$7,300,000 for ore taken from disputed vein.

Nov. 13—U. S. Steel Corporation announced the intention to spend several millions on plant for production of steel car wheels.

Nov. 14—El Oro, Mexico, partially destroyed by fire.

Nov. 15—Collapse of attempts to reorganize the four pig-iron syndicates of Germany, and demoralization in the German pig-iron market.

Nov. 16—Four plants of the Illinois Steel Company resumed operations. Announced that three blast furnaces at Gary, Ind., will be blown in Dec. 15, and that steel making will begin Jan. 1. Fire of incendiary origin in No. 3 mine of Tennessee Coal, Iron and Railroad Company, at Ensley, Ala., killed 13 convict miners.

Nov. 17—Reported that Mexican Petroleum Company has merged with Waters-Pierce Oil Company, to fight S. Pearson & Sons. Stockholders of Virginia-Carolina Chemical Company approved issue of \$15,000,000 15-year 5 per cent. bonds, of which \$12,000,000 have been sold.

Nov. 18—John D. Rockefeller testifies in case of the U. S. Government vs. Standard Oil Company. James Gayley, first vice-president, U. S. Steel Corporation, resigned.

Nov. 19—Utah Consolidated announces contract with a new smelting company and abandonment of its own plan to build works.

Nov. 20—Organization of Independent Fertilizer Company, capital \$50,000,000, which makes a long-time contract for the sulphuric acid of the Tennessee Copper Company.

Nov. 23—Andrew Carnegie declares that American steel works can produce more cheaply than all competitors and require no tariff protection.

Nov. 28—Explosion in Marianna mine of Pittsburg-Buffalo Coal Company killed 130 men.

Correction

In the table in the third column of the article, "Notes on Air Agitation," by Mark R. Lamb, in the JOURNAL, Nov. 7, 1908, p. 901, the horsepower required to compress 38 cu.ft. of free air to a pressure of 35 lb. per sq.in., should be 4 h.p. instead of .6 h.p., as printed.

The Tariff Hearings

SPECIAL CORRESPONDENCE

Hearings on the metal schedules in connection with the proposed revision of the tariff were undertaken by the Ways and Means Committee on Nov. 25 and continued during Nov. 27. The principal part of the discussion related to steel and its manufacture.

Willis L. King, vice-president of the Jones & Laughlin Steel Company, of Pittsburgh, suggested that the duty on steel bars be advanced from 0.3c., on a minimum of 1c. value, to 0.4c. per pound. He further urged that there is no valid reason for a difference between steel and iron bars, the latter being assigned (paragraph 123 of the present tariff) a duty of 0.6c. per lb. J. H. Nutt, of Youngstown, Ohio, on behalf of the Western Bar Iron Association, recommended the maintenance of the differential between steel and iron bars established in the present tariff act. James Lloyd, president of the American Iron and Steel Manufacturing Company, Lebanon, Penn., in behalf of the iron-bar interests both East and West, recommended the reduction of duty on iron bars to 0.5c. per lb. On iron and steel rivets he suggested a reduction to 2c. per lb. In behalf of George Nash & Co., J. Wilckes & Co., and Hermann Boker & Co., importers, J. B. Wilkinson requested that paragraph 135 be left as already modified by judicial decisions; an average rate, except on the cheaper grades, of 25 to 30 per cent. instead of the 45 per cent. rate which the Treasury some years ago sought to impose on certain of the steel covered by this paragraph. The importers, however, want grades valued at less than 4c. assessed on a plane with grades valued at more than 4c. As to paragraph 141 the importers asked that no additional duty be imposed upon steel strips, plates, or sheets that have been blued, brightened, or polished. In paragraph 132 they request a reduction of the 45 per cent. duty on iron or steel sheets or wire plated with copper or nickel to 20 per cent., and in lieu of paragraph 185 a duty of 6c. per lb. on nickel, nickel oxide, alloy of any kind in which nickel is a component material of chief value, in pigs, ingots, bars, rods, plates, sheets, and strips, all other forms to take a duty of 30 per cent. ad valorem.

Frank S. Witherbee, Port Henry, N. Y., for the iron-ore producers, urged that any reduction on ore be limited to not more than 15 per cent. of the present 40c. a ton duty. William G. Mather, Cleveland, Ohio, for the Lake Superior iron-ore producers, favored a maximum reduction of 20 per cent., amounting to 8c., in the 40c. duty.

Joseph G. Butler, in behalf of the merchant blast furnaces of the United States,

requested that ferro-manganese be placed on the free list and that the remainder of the pig-iron schedule be left as it stands. Everit Brown, of New York, in behalf of the Electro-Metallurgical Company and other manufacturers, requested that ferro-silicon, ferro-molybdenum, ferro-titanium, ferro-vanadium, ferro-chromium and ferro-tungsten, not now mentioned in the tariff, be given a new classification with 20 per cent. duty, the same as now imposed through executive order of the Treasury Department pending judicial determination. Mr. Brown added that the manufacturers would prefer 30 per cent. John L. Cox, of the Midvale Steel Company, of Philadelphia, recommended that the ferro-alloys (silicon, chromium, etc.) be made dutiable at \$4 per ton, the rate originally fixed by the Board of Appraisers, or removed entirely.

John A. Topping, Pittsburg, for the Republic Iron and Steel Company, offered to accept reductions on steel where possible to do so "without abandoning the protective system." E. C. Felton, Harrisburg, for the Pennsylvania Steel Company and the steel-rail producers of the United States, asked that the present duty on steel rails be retained. William U. Follansbee, of Follansbee Brothers, Pittsburg, for twelve independent tinplate manufacturers, said that a reduction of 20 per cent. on tinplate, cutting it from \$1.50 to \$1.20 per box would be accepted by the producers. J. A. Shimer of the Dunbar Furnace Company, Philadelphia, urged a reduction of \$4 a ton in the duty on pig iron and the retention of the tariff on iron ore. J. A. Campbell for the Youngstown, O., Sheet and Tube Company suggested on behalf of the wrought-iron and wrought-steel pipe interests the reduction of duties on those articles to less than half their present rate (\$40 per ton) or \$20 as a maximum (paragraph 152). On round iron or steel wire (paragraph 137) Mr. Campbell suggested a reduction from 1.25c. per pound (not more than 13 wire gage) to about 1c. a pound, with other grades of wire similarly reduced. H. J. Bailey, of the Broderick & Bascom Wire Rope Company, St. Louis, asked revision of schedule C, paragraph 137, making the duty on round iron or steel wire not smaller than No. 13 0.6c. per pound, with grades below No. 13 and not smaller than No. 16 0.8c., smaller than No. 16 being 1c. per pound, provided that all such wire valued at over 6c. shall pay 30 per cent. ad valorem. Other changes in the duty on wire and its manufactures of like character were recommended. William G. Park, chairman of the Crucible Steel Company, Pittsburg, recommended a reduction of 10 per cent. from the present duty on iron and steel ingots, clogged ingots, blooms, and slabs (paragraph 135).

F. P. Cullen, Oswego, for the Fitzgibbons Boiler Company, recommended that welded cylindrical furnaces be cut to 80 per cent. on the labor cost of production

or about 1c. per pound, present duties being estimated at 100 per cent. Joseph L. Gitterman, a manufacturer of bottle caps, recommended in addition to the present 45 per cent. on such caps, 10 per cent. extra for each color enameled thereon plus the duty charged on pig lead, the latter to be imposed upon the caps by weight.

George H. Large, Flemington, N. J., representing the Taylor Iron and Steel Company, suggested 30 per cent. ad valorem on railway bars, girder rails, frogs, switches, castings, etc., containing at least 7 per cent. of manganese. F. W. Collier, Worcester, Mass., a manufacturer of wire goods, speaking for the National Manufacturing Company, the H. & R. Parker Wire Goods Company, of Worcester, and the Woods Strainer Company, of Lowell, recommended 60 per cent. ad valorem plus 20c. per pound in lieu of the present duty of 40 per cent. ad valorem plus 1.25c. per pound plus 0.2c. per pound. Thomas Prosser, Prosser & Son, New York, importers, recommended reductions on forgings of iron or steel to 20 per cent. (instead of 35), steel forgings machined to 35 per cent. (instead of 45), locomotive and car tires and wheels to 0.75c. per pound (instead of 1.5c.), boiler and other tubes to 20 per cent. ad valorem (instead of 35), bar steel to rates varying from 0.8c. to 4c. per pound according to value, a cut of from 0.1c. in the first three classes of the present act upward according to value.

Jesse F. Orton, of New York, in behalf of the tariff reform committee, of the New York Reform Club, recommended the entire wiping out of the steel schedule and the elimination of some other schedules. John Williams, of Pittsburg, in behalf of the Amalgamated Association of Iron, Steel and Tin Workers, recommended the abolition of the drawback privilege on imported tinplate and the maintenance of other duties on tinplate at their present level. John W. Walton, Cleveland, O., a dealer in wire rope, recommended the reduction of the duty on wire rope to a more reasonable figure. Nelson Lyon, Tarrytown, N. Y., recommended the abolition of the duty on pig iron. Samuel S. Eveland, of Philadelphia, a manufacturer of steel balls and ball-bearings, requested the retention of present duties on steel. Dwight Divine, of Ellenville, N. Y., a manufacturer of cutlery, recommended the maintenance of present rates of duty on such articles. H. F. Mattern, of Lebanon, Penn., representing the Lebanon Chain Works, requested the reclassification of the chain schedule, a reduction on the large sizes and an advance on the small sizes, retaining the present tariff from sizes under 2 in. down to $\frac{7}{8}$ in., inclusive. Thomas T. Woodhouse, of Trenton, N. J., representing the Woodhouse Chain Works supported Mr. Mattern.

Charles H. Sherrill, representing importers of automobiles recommended a re-

duction in the tariff from the present rate of 45 per cent. to 30 per cent.

T. D. Bradstreet for the clockmakers, chiefly in Connecticut and New York, asked for a moderate increase in the present tariff and this view was supported by Walter Camp.

Albert H. Washburn, of New York City, asked a duty of 30 instead of 40 per cent. on bronze powder, adding to the classificatory words the words "and flitters."

C. W. Jefferson, for the Mica Insulator Company, Schenectady, N. Y., asked a duty of 20 per cent. ad valorem on mica, cutting off the additional duty of 6c. per lb. now levied (paragraph 184, Schedule C). F. W. Webster, of Boston, for the American Mica Company, asked that the duty be made entirely specific, estimated at 65c. per lb. on the most expensive grades. H. H. Ward, Cleveland, Ohio., for the Great Southern Mica Company, operating in Alabama and North Carolina, asked a clearer classification of mica and an increase of the ad valorem rate to 40 per cent., the present specific duty to remain the same. W. V. Brown, Asheville, N. C., representing the Asheville Mica Company, asked that the proposed 40 per cent. duty be made specific on a basis of 6c. per lb., with an additional duty of 2c. per lb. for every square inch of area surface. B. C. Grindstaff, of Buchanan & Grindstaff, of North Carolina, indorsed this suggestion. L. W. Kingsley, of Eugene Munsell & Co., of New York, asked that amber mica be made free and small sizes reduced, the duty being raised on larger sizes to a countervailing sum.

Arthur B. Davis, Pittsburg, for the Aluminum Company of America, asked the retention of the present duty on aluminum.

Charles W. Lefler asked that pyrites be allowed to remain on the free list. Samuel O. Barbour, representing the International Silver Company, requested the retention of present rates on silver hollow ware. C. E. Allen, of Salt Lake City, in behalf of the Commercial Club of that place, requested the maintenance of present rates on lead. Melton L. Lissberger, of Long Island City, N. Y., for 51 manufacturers of lead goods, asked a reduction on pig lead to a maximum of 1c. per lb. (instead of 2½c. as now), with corresponding reductions on lead manufactures.

At the zinc hearings on Nov. 25, S. Duffield Mitchell, Carthage, Mo., in behalf of Missouri zinc producers, asked that calamine be taken from the free list (paragraph 514) and made dutiable in the same section with lead (paragraph 181) at 1½c. per lb. on its metallic contents. Axel O. Ihseng, Joplin, Mo., made the same request.

At the pottery hearings on Nov. 23, W. C. Neilson, representing the Bauxite Mining and Manufacturing Company, of Philadelphia, asked that the duty on bauxite be made \$2 per ton instead of \$1 as at present. John Richardson, for John

Richardson & Co., Boston, and S. T. Warren & Co., paper manufacturers, asked that china clay or kaolin be placed on the free list. Harry A. Auer, Cleveland, for the Standard Reduction Company, of Alabama, asked that the present duty on fuller's earth be continued (\$1.50 to \$3 per ton). H. L. Shepherd, of Rockport, Me., representing the lime manufacturers of Maine, asked that the present duty on lime (5c. per 100 lb.) be retained. Orin F. Perry, New York, took the same view. Edward Cary and Hugo Reisinger, New York City, requested that the present rate of 90c. per 100 lb. on carbons for electric

\$1. Clarence W. De Knight, Washington, D. C., for the Association of Portland Cement Manufacturers, asked that the present duty of 7 to 8c. per 100 lb. be retained.

November Dividends

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

NOVEMBER DIVIDENDS.

U. S. MINING COMPANIES.				
	Location.	Date Paid.	Amount per Share.	Amount Paid.
Amalgamated	Mont.	Nov. 30	\$0.50	\$769,439
Benton M. & D., pfd.	Wis.	Nov. 20	0.01½	2,949
Bost. & Mont.	Mont.	Nov. 30	3.00	450,000
Bunker Hill & Sull	Ida.	Nov. 4	0.25	75,000
Camp Bird	Colo.	Nov. 7	0.24	196,800
Colorado	Utah	Nov. 25	0.03	30,000
Elkton, Con.	Colo.	Nov.	0.01½	37,500
Florence	Nev.	Nov. 2	0.10	105,000
Homestake	S. Dak.	Nov. 25	0.75	163,800
Intern'l. Nickel, pfd.	N. Y.	Nov. 1	1.50	133,689
Sioux, Con.	Utah	Nov. 20	0.06	45,000
Snowstorm	Ida.	Nov. 20	0.03	45,000
Uncle Sam	Utah	Nov. 20	0.03	15,000
Utah (Fish Sp'gs)	Utah	Nov. 7	0.03	3,000
Total				\$2,072,177
U. S. INDUSTRIALS.				
	Location.	Date Paid.	Amount per Share.	Amount Paid.
Lehigh Coal & Nav.	Pa.	Nov. 27	\$2.00	\$764,520
National Carbon, pfd.	U. S.	Nov. 14	1.75	78,500
New River Coal, pfd.	W. Va.	Nov.	1.50	188,085
Penn. Steel, pfd.	Pa.	Nov. 1	3.50	577,500
U. S. Steel, pfd.	U. S.	Nov. 30	1.75	6,304,919
Warwick I. & S.	U. S.	Nov.	0.30	44,601
Total				\$7,958,125
FOREIGN MINING COMPANIES.				
	Location.	Date Paid.	Amount per Share.	Amount Paid.
Dolores	Mex.	Nov. 25	\$0.15	\$60,000
Mines Co. of Am.	Mex.	Nov. 27	0.02	40,000
N. Y. & Hond. Ros.	C. A.	Nov. 21	0.10	15,000
Total				\$115,000

lights be changed to 25 per cent. J. S. Crider, Cleveland, Ohio., asked for the National Carbon Company that the present rate on carbons be made 90c. per 100 ft. instead of 90c. per 100 carbons. Fillmore Condit, of California, for the local producers, asked a rate of \$3 per ton on all asphalt containing less than 60 per cent. bitumen and \$5 on all containing over 60 per cent. (in lieu of \$1.50 and \$3, respectively), both crude and refined. Frank C. Partridge, of Proctor, Vt., in behalf of the general marble industry, asked that the present duties on marble be retained and that the classification of breccia and decorative limestone be rectified. Montague Lessler, New York City, at the hearings before the committee on Nov. 26, asked in behalf of nine users of gypsum that that product be placed on the free list. George E. Roberts, of Chicago, and a committee representing domestic gypsum interests, asked that the present tariff of 50c. per ton be raised to

Prayers for Zinc Ore

Prayers that Congress will be moved in the proposed revision of the tariff to increase the duty on zinc ore were offered on Thanksgiving day, in Joplin, Mo., by ministers of all the churches in the 25 towns in Jasper county and throughout the Kansas-Missouri mining district.

This prompted a poet in the New York *Evening Post* to express himself as follows:

O Lord, we humbly ask Thine aid
To tariff raise on Zinc,
Because our infant trade now stands
Close on to ruin's brink.
We do not ask Thee "mountains move
And cast into the sea,"
That deaf may hear, and dumb may speak,
Or that the blind may see.
For things like these we have no use;
We need substantial "chink."
We must have help and have it now,
Good Lord, remember Zinc.
We know 'twill raise the price of paint,
Of mat, and tub, and sink,
But other people pay the bill;
Good Lord, protect our Zinc.

Personal

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

George W. Wilkins sailed from New York, Nov. 23, for British Guiana.

J. Morgan Clements, of New York, has gone to Canada on professional business.

David W. Brunton, of Denver, Colo., has been a visitor in New York this week.

S. S. Lang, formerly at San Luis Potosi, Mexico, is doing some geological work in the State of Chihuahua.

F. W. Linck is visiting London, after spending some time in the Ural district, Russia, for the Platinum Corporation.

S. F. Shaw, of Pasadena, Cal., has returned from Bodie, Cal., and is now examining copper claims in Sonora, Mexico.

Joseph Irving, general manager of the Mono-Baltic company at Ironton, Colo., is at present in the East, on business for the company.

F. Burns, formerly at the Alaska Treadwell mine, has gone to Ecuador for the South American Mines Development Company.

Spencer W. Clawson, formerly superintendent of the Copper Queen mine of Arizona, is a visitor in the Lake Superior district.

Edwin Shapley, of Guanajuato, Mexico, is examining the San Rafael and other mines in the State of Jalisco for a Philadelphia syndicate.

J. B. Tyrrell recently returned to Toronto from Sturgeon Lake in northern Ontario, where he examined several gold-mining claims.

Harold Boericke, of the Primos Chemical Company, Primos, Penn., has been in Boulder, Colo., looking after the tungsten interests of his company.

E. P. Mathewson is at Salt Lake City inaugurating preliminary work in connection with the new smeltery, for which he is the consulting engineer.

James Humas, recently at Butte, Mont., has been appointed general superintendent of the Austin-Manhattan Consolidated Company, at Austin, Nevada.

B. H. Bennetts, who has been smelter superintendent for the Alaska Mines Securities Company, at Hadley, Ketchikan, Alaska, is now at Seattle, Washington.

J. W. H. Hamilton, of Hamilton & Hansell was in San Francisco last week, and on his way back to New York will visit Goldfield, Nevada, on professional business.

H. Hasegawa, of Japan, a mining engineer in the employ of the Furukawa Copper Company is a visitor in the Lake Superior copper district, studying the mining methods.

Edward Blake Wyman, representing a British syndicate, is in Ottawa, Canada,

negotiating for the purchase of the Right-of-Way and Cobalt Station Grounds mining companies.

Hon. Wm. Templeman, Canadian Minister of Mines, having failed to carry his constituency at the recent Dominion elections, must either find a seat elsewhere or resign his portfolio.

Norman W. Haire, general manager of the Bigelow group of mines, and Wm. Uren, general superintendent, are at Milwaukee looking into milling machinery for the new Ahmeek stamp mill.

C. H. Fergie, at one time connected with the Dominion Coal Company, is examining coal lands in southern Cape Breton, in the interest of the Canadian Pacific Railway Company, which is anxious to secure its own coal deposits in eastern Canada.

Godfrey D. Doveton is now associated with the firm of Spurr & Cox, Inc., as metallurgical engineer. He will, as formerly, devote special attention to economic process devising and the design, erection and supervision of reduction works for the treatment of difficult and low-grade gold and silver ores.

Obituary

Alexander Dron was suffocated, Oct. 11, by a rush of foul air in the Frost shaft of the Austin-Manhattan Consolidated Company, at Austin, Nev. He was born in Scotland, 67 years ago, and had passed many years in Nevada, where he was well known as a mining captain.

Colonel William H. Zimmerman, of Brazil, Ind., died suddenly Nov. 22, while on his return from a trip to Florida. He was born in Ohio in 1836; after serving in the army during the Civil War he removed to Indiana, where he engaged in coal mining. He was one of the first operators in the block coalfields. For some time past he had been president of the Block-coal Operators' Association.

J. Smith Talley died at Terre Haute, Ind., Nov. 23, aged 68 years. He was born in Delaware, but went to Illinois about 1865, engaging in coal mining near Litchfield. He removed to Indiana 10 years later and organized the Coal Bluff Mining Company, of Terre Haute, which he had managed ever since. He was president of the Indiana Operators' Association for 15 years and was largely instrumental in bringing about the annual wage conferences between miners and their employers.

Herbert Percy Seale, assistant general manager of the Mount Morgan Gold Mining Company, died at Rockhampton, Queensland, Sept. 21, aged 36 years. He was born at Maitland, N. S. W., and graduated from the University of Sydney. After doing some railroad work he went to Mount Morgan in 1896, where he was placed in charge of construction of the

West works. In 1901 he was made mine manager and in 1906 assistant general manager. In 1903 he visited the United States on a trip of inspection, accompanying the general manager, A. C. Richards.

Eli Morcom died at Tower, Minn., Nov. 26, aged 74 years. Captain Morcom was one of the pioneer miners of the Lake Superior region. He was a resident of the Menominee range for a number of years. He was superintendent of the old Quinnesec mine, operated by the Menominee Mining Company, and was also associated with Capt. John Wicks in the discovery of the Chapin mine. Some 25 years ago he was made superintendent of the Minnesota Iron Company. He was in charge of the work of developing the first iron mine in Minnesota—the Minnesota at Tower on the Vermillion range. Captain Morcom also developed mines for the company at Ely and on the Mesabi range. He took a prominent part in local affairs and had held several important local offices.

Societies and Technical Schools

Coal Mining Institute of America—The winter meeting was held at Pittsburg, Dec. 1. The program was arranged for one day, in order to give the members opportunity to attend the meeting of the American Mining Congress.

Thomas S. Clarkson Memorial School of Technology—The 12th anniversary of this school at Potsdam, N. Y., was held Dec. 1. The Founders' Day address was delivered by S. W. Stratton, director of the Bureau of Standards at Washington.

American Institute of Chemical Engineers—The first annual meeting of this institute is to be held in Pittsburg, Dec. 28 and 29, in the buildings of the Carnegie technical schools. Papers of general chemical engineering interest are to be presented. Among these will be the first technical statement by the inventor, James Gayley, regarding the process for dehydrating air to be used in blast furnaces, and other metallurgical apparatus. Other papers on the use of fuels and power production are to be presented. The measurement of high temperatures, dryer calculations and dryer design are the subjects of two other important papers. One interesting feature of the Pittsburg meeting will be the exhibition by manufacturers of novel plants and machinery, partly by drawing and partly by the actual installation for tests in the presence of the institute. These exhibitions and tests are in no way official in that the institute does not undertake to pass official judgment upon any of the exhibits. All communications from those desiring to attend the Pittsburg meeting, or from manufacturers who desire to exhibit, should be addressed to the secretary, Dr. J. C. Olsen, Polytechnic Institute, Brooklyn, New York.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Denver, Butte, Goldfield, Wallace and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 26—The new railroad of the Stone Cañon Coal Company, of Monterey county, has been put in operation. It extends from Bradley, on the Southern Pacific coast line, to the Stone Cañon coal mines, 22 miles. The mines have been developed to such an extent in the past few years that a large daily supply of coal can now be shipped to San Francisco and other California cities. This coal is the best thus far found in this State, and the quantity available is large. It is bituminous, and can be used either for domestic or steam purposes. Before the completion of the railroad only small shipments had been made.

W. P. Hammon, of San Francisco, the "dredge king" of California, has acquired what is supposed to be a controlling interest in the Truckee River General Electric Company, which has two large power plants on the Truckee river and a large distributing system, carrying electric power into Reno, Carson, Virginia City, the copper mines at Yerington, and other mining districts of Nevada.

Two new quicksilver mines are being opened on this coast. One is the Florence Mack mine in the hills west of Coalinga, in Fresno county, where a new vein has recently been struck. The other is near Ione, Humboldt county, Nev., where a reduction plant is now being installed.

The Four Metals Mining Company has started its smelter at Keeler, Inyo county, and has its aerial tramway almost ready for operation. The old dumps of the once-famous Cerro Gordo mines are being utilized. Electric- and water-power plants are being installed on Lone Pine creek. In days past the Cerro Gordo mines were great producers, but they have been idle for many years.

Wallace, Idaho

Nov. 23—With positive assurance that the Idaho Northern railroad will be in operation to the terminal point at the town of Paragon by the beginning of the year, and in view of the statement of Senator Donlan, of Missoula to the effect that the big power project at Thompson Falls will be carried into execution, the big operators of the north side have taken the preliminary steps toward putting the Murray tunnel scheme into operation. This tunnel will be more than $1\frac{1}{4}$ miles in length and will aid in the development of some of the best mines of the district. The consideration will probably resolve itself

ultimately into a vast merger including the Jewell group, Chicago-London, Black Horse, Paragon and Bear Top mines, operating 61 mineral claims, all extensively developed and all ready to ship as soon as the railroad is in operation.

Close estimates show that such a tunnel would have to be driven from its entrance on the Jewell group a distance of 1000 ft. to the Chicago-London, on which property it would give a depth of 500 ft.; a distance of 3500 ft. to the Black Horse mine on which it would give a depth of 1250 ft.; a distance of 5000 ft. to the Paragon giving a depth of 1800 ft.; and then of 7000 ft. to the Bear Top, giving a depth of 2800 feet.

It is figured that the cost of the tunnel will be in the neighborhood of \$100,000 and it is believed that this expense would be more than covered by the discovery of blind leads.

Goldfield, Nevada

Nov. 26—There is considerable oil excitement in Nevada. A party of Goldfield men, among whom are Frank Oliver, F. A. Farnum and C. C. Stanley, has acquired a large tract of land near Indian Springs, in Lincoln county. Mr. Oliver has just returned from San Francisco, where he closed a tentative option with de Bertodano and Sartorius, both prominent in the California oilfields. On this Indian Springs property, oil indications are said to be exceptionally good. The odor of gas can be detected at surface, and in sinking such a quantity of gas is met with that it is impossible to sink a shaft or well to a depth of more than 18 or 20 ft. Drilling and prospecting outfits will be put to work as soon as possible.

The oil well which is being sunk near Blair, 23 miles west of Goldfield, has reached a depth of 225 ft. It is believed the stratum of quicksand which caused so much trouble has been passed. The drill was making progress at the rate of 30 ft. per day when the engine broke down. Drilling has stopped, awaiting the arrival of new parts from Los Angeles. A member of the United States Geological Survey, who has had experience in oil-producing districts, is expected in Nevada during the present month to make a thorough investigation of the Indian Springs and Blair fields, as well as the Mono, Cal., field, which extends into Esmeralda county, and possibly reaches Blair.

During the week, two cases against high-graders were argued in the State Supreme Court on appeals from the dis-

trict court. The two defendants are now serving terms of $3\frac{1}{2}$ and 5 years, respectively, in the penitentiary. They were arrested in a Goldfield mine at night, but at the moment of arrest they had no high-grade ore about them, so they are fighting for their freedom on the ground of insufficiency of evidence. F. J. Haugs, counsel for the defendants, is also counsel for the Miners' Union.

The Mohawk Mining Company has been awarded a decision in the Federal court at Denver by which it recovers \$20,000, the value of ore stolen from its mine and later hauled to Bullfrog, whence it was shipped by express to Pueblo, Colo., where the ore was identified by the mining company's detective, who was trailing it. The Wells Fargo Express Company was the defendant in the suit.

George Wingfield, vice-president of the Goldfield Consolidated Company and one of the controlling factors in Goldfield's largest bank, has been sued for \$75,000 damages by F. A. Attinger, a local stock broker. Attinger alleges in his complaint that in the presence of a large number of the members of the local stock exchange, of which he also is a member, Wingfield accused him of high-grading. Attinger sues for \$50,000 on account of injury to his reputation and business and for \$25,000 as exemplary damages, making a total of \$75,000. F. J. Haugs is attorney for Attinger.

Squatters who occupy portions of the surface ground of the Gold Coin Mining Company are beginning to move their effects. The Gold Coin corporation is believed to be the only one in the camp which charges ground rent for squatters on its surface. The squatters having no desire to pay rent when they can get quarters elsewhere for nothing, are beginning to move.

Butte

Nov. 26—Joseph O. Morris, who has been in Butte several weeks in the interests of the North Butte Extension Copper Company, left for New York last week to complete the arrangements for the company's reorganization. Before leaving, Mr. Morris stated that a number of the company's creditors had been paid, and that arrangements would be made for the payment of the balance within 10 days. According to Mr. Morris the company now owns the Overman claim, adjoining the Black Crow claim and deeds to the Occidental and Free Trade claims have

been deposited in escrow. He is confident that operations will be resumed by the middle of December. The hearing of the petition for the appointment of a receiver has been continued until Nov. 30, and may possibly be dismissed by agreement before that time.

Last week in the State District Court, John O. Evans secured a judgment against the Butte Central & Boston Copper Corporation for \$1217. The action was begun before the bankruptcy proceedings were instituted against the company and was, therefore, not affected by the company's insolvency.

The Hodgens brothers, of this city, have recently secured a 90-day option on a controlling interest in the stock of the Butte & Ely Copper Company at \$1.90 per share. The stock is to be placed in the Daly Bank and Trust Company, in Butte.

Denver

Nov. 28—The Carbon Lake mine, of the San Antonio Company, operating in the Red Mountain district of the San Juan region, is attracting a great deal of attention owing to the size of the orebody, and the results of its shipments, and is doing much to encourage the renewal on a large scale of mine operations in that district, once celebrated as the location of the Yankee Girl, Guston, Congress, National Belle, Silver Bell and other rich mines. Since July 10 last, there have been shipped from workings not over 200 ft. deep 122 cars of 25 tons each, which netted \$35,181 at the smelter—an average of about \$300 per car. I saw returns from one carload which gave \$2 in gold, 12 oz. silver, 27 per cent. copper and 7 per cent. arsenic. The ore is a very peculiar one (enargite), and has the appearance of sulphide of antimony, showing no sign of copper; it is associated with iron pyrite and galena in small quantities, in a lime-spar matrix. A tunnel is being driven which, at a distance of 2300 ft. from the portal, it is estimated will intersect the lode 500 ft. from the surface, and 300 ft. below the present workings. The country rock through which it is passing is the hardest kind of syenite-porphry; the tunnel is 5½x8 ft. in the clear, and two shifts with Rand machine drills are making 6 ft. a day. The mine is located on the Silverton railway half way between Silverton and Ouray. Electric power and light is supplied by the Animas Power Company.

Calumet, Michigan

Nov. 28—The E. I. Du Pont de Nemours Powder Company, of Wilmington, Del., has secured a site, consisting of 2500 acres, on Portage lake and will erect a large dynamite factory at a cost of about \$1,000,000. It is expected that this plant will be completed next spring. There is only one competing plant in this district. The Hancock Chemical Company, of Dollar Bay, is a subsidiary of the Tamarack

Mining Company, and has supplied explosives to that company for many years.

London

Nov. 12—The prospectus of the new Russian mining company, called the Kyshtim Corporation, Ltd., has been advertised. The company will acquire from the Perm Corporation, Ltd., the entire share capital of the Kyshtim Mining Works, a company registered in Russia, in 1900, with limited liability.

The property consists of estates in the southern district of the Ural mountains, containing iron, copper and gold mines. There are also extensive forests and a large revenue is expected from the sale of its timber.

The copper and gold mines in the Soimonovsk valley, about 29 miles from the town of Kyshtim, have been reported on by Messrs. Knox and Allen, mining and metallurgical engineers of New York. H. H. Knox estimates the cost of producing electrolytic copper at £32 per ton, and that for an expenditure of £103,000 the output should be 4500 tons per annum, with the prospect of returning ultimately a net profit of £976,100, an estimate which is subject to increase as the work advances.

The electrolytic copper refinery is now under construction and should be at work before the end of the year. The purchase consideration is £924,000, payable as to £174,000 in cash and £750,000 in fully paid shares, out of a capital of £1,000,000 shares of £1 each. The capital now offered for subscription is £250,000 ordinary shares and £250,000 in 6-per cent. debentures. After making provision for new capital expenditures, as recommended by the copper and iron experts, and after meeting the cash purchase consideration, the company will have approximately £125,000 working capital.

The *South African Mining Journal*, published in Johannesburg, has now arranged for the issue of a London edition, with Kendall Robinson as editor. The paper will be posted to subscribers as soon as possible after the arrival of the South African mail boat, which is due on Saturday mornings. The London edition will contain the latest cables.

The Victoria Falls Power Company, Ltd., to which reference was made in the *JOURNAL* of Oct. 31, is bringing an action against the Rand Mines, Ltd., with regard to preferential rights for supplying power in bulk at rates equal to those quoted by any competitor.

The action brought by the Ore Concentration Company (1905), owning the Elmore patents, against certain persons connected with a company called the Minerals Separation, Ltd., to recover damages for an alleged breach of agreement, has been settled out of court. The defendants had obtained from the Ore Concentration Company an option to pur-

chase the patent rights for Australasia of a process for separating minerals by the use of oil, and in one clause of the agreement it was provided that any improvements made should be communicated to and become the property of the Ore Concentration Syndicate, the parent company of the Ore Concentration Company. The plaintiffs claimed that certain discoveries had been made and had not been communicated. The terms on which the dispute was settled have not been disclosed.

A meeting of the South African Option Syndicate was held on Nov. 3, in London, under the presidency of Sir John Willoughby. The syndicate owns diamondiferous alluvial deposits in Rhodesia at Somabula and Bembsi. From the Somabula wash some 6636 carats of diamonds and some 100,000 carats of miscellaneous stones have been recovered. The value of the diamonds sold together with the value of those still on hand is £22,482. A large amount of work has been carried on in the attempt to discover the source of the diamonds, but without success. The gravel washing has not proved profitable and the ground is now being offered to tributors. The company is now occupied with the development of a newly discovered diamond mine at Bembsi, some 38 miles northeast of Buluwayo. This discovery is called the Colossus mine, owing to the large area over which diamondiferous ground is supposed to occur. The estimated area of the pipe puts the Premier and De Beers mines in the background. But this is not all. There is another mine some five miles off, from which a small test washing of mere surface soil gave diamonds at the rate of 30 carats per 100 loads, while a third pipe has also been located, and there is, according to the chairman, a considerable probability of a fourth mine being located farther on. If all these mines turn out to be the real thing, diamonds will soon be a drug on the market. The shareholders are now asked to provide the funds necessary to develop these promising properties, and it would be surprising if, in spite of their disappointment at Somabula, they did not respond to their enthusiastic chairman.

The Bembsi deposits are reported on by W. Nichol, a former employee of the De Beers company, who expresses the highest opinion of the prospects of the properties.

The report of the Consolidated Goldfields of South Africa, Ltd., for the year ending June 30, 1908, has been issued. The realized net profit allows the directors to recommend the payment of a dividend of 20 per cent. on the £2,000,000 ordinary shares, leaving £68,260 to be carried to the credit of the current year's profit and loss account. The report is, as usual, full of interesting statistics as regards the mines. Schedules of the company's principal share holdings and of unfloated properties are attached.

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

RANDOLPH COUNTY

Gold Ridge—The old mine at Gold Ridge, which has been worked in a desultory way for gold and copper for many years, is to be systematically developed by W. L. Ernest & Son, who now control it. Preparations are being made to install machinery, and to work on a large scale.

WALKER COUNTY

Gamble—The lease of this coal mine to the Tennessee Coal, Iron and Railroad Company has expired, and the mine has been turned over to the Pratt Consolidated Coal Company, the owner. The Pratt company has its office in Birmingham, the officers being G. B. McCormack, president; Erskine Ramsey, vice-president; H. E. McCormack, general manager; E. A. Rosamond, general superintendent.

Arizona

COCHISE COUNTY

Gold Treasure—In this mine, near Bisbee, gold ore has been found in sufficient quantity to induce a new company to push development work.

Warren—This mine, Bisbee, has shut down. The company refuses to give any explanation for so doing.

GRAHAM COUNTY

Morenci Water Company—This company which furnishes water for the Detroit Copper Mining Company and the Arizona Copper Company, both of Morenci, is installing a new pumping plant on Eagle creek about six miles southwest of Morenci.

MOHAVE COUNTY

Gold Road Mining and Exploration Company—This company, of Kingman, has installed a new mill with a capacity of 300 tons daily. Since the shutdown of the mill one year ago good orebodies heretofore unknown have been opened up. The ores are of a higher grade than that formerly produced.

California

AMADOR COUNTY

Potazuba—This company has levied a small assessment and it is supposed will start up again, after several years idleness. The mine is in the town of Sutter Creek and was originally opened by E. C. Voorheis of that place.

BUTTE COUNTY

Francisco—In this mine, where three ledges have been opened up, a gasolene motor has been installed and an option taken on a 30-stamp mill. The ledges were struck after a 600-ft. tunnel had been run.

CALAVERAS COUNTY

Hamby—At this mine near San Andreas a new and valuable shoot of ore has been found, and 15 of the 20 stamps of the mill are being kept busy. Another level will shortly be opened.

Kenross—The storage reservoir has been finished on this San Andreas mine and men are now repairing the ditch, after which the débris dam will be built, so that hydraulicking can begin when water is available.

EL DORADO COUNTY

Geo. M. Mitchell and James W. Ward have bonded for \$75,000 the Murderer's Bar, Texas Bar and Brown's Bar mines, including the Little Kennebec claim, with machinery tools, etc.

Prevolcanic Channel Gold Mining Company—At this property at Pacific, T. G. Patton, of Placerville, manager, the new mill has started and is expected to handle 50 tons of cemented gravel daily. The gravel channel is about 600 ft. wide as far as known.

INYO COUNTY

Crooked Cañon—A small ledge of gold-bearing ore found at this place has started a new camp without a name as yet. A number of locations have been made. Such ledges as have been found are small. The cañon is on the east side of the White mountains north of Laws station and is reached by the toll road which crosses the range near there.

St. Ives—The Unthank & Shive lease on this property in Chicago district has some ore that will run as high as \$80 per ton, while the rest of it is of \$15 per ton milling grade. Some sulphuret ore is being sacked for shipment.

MADERA COUNTY

Hildreth—This old and long abandoned camp is becoming active again. The Volcano No. 2 has 14 men at work and a small mill with concentrator is being installed. The old Hanover mine is being worked by Williams Brothers. The Norton is a new claim being opened; and another is that owned by Frank Haneck who has some rich rock at 60 ft. depth.

MARIPOSA COUNTY

Virginia—The power is virtually cut off by the lowness of water at the Nameless dam from which this mine near Coulterville gets its current. Other properties in that section which rely on electric power are about in the same condition.

NEVADA COUNTY

Colling—The Colling ranch, in Rough and Ready district, has been purchased by Mr. Rogers, of Goldfield, who will develop the ledges known to exist there.

Dana—In this mine, at Grass Valley, adjoining the old Idaho, Superintendent Burgess has uncovered a ledge about 8 ft. wide, showing some free gold; a new hoist has been ordered, and shaft sinking will shortly commence.

PLACER COUNTY

Paragon—At this mine both the upper and lower leads are being worked. The Breece & Wheeler ditch has been cleaned out and water turned in at the head.

PLUMAS COUNTY

Bullion—This old mine, at Clio, has been reopened by Daniel Edwards, of Reno, Nev., and some high-grade ore has already been found, carrying both gold and copper.

RIVERSIDE COUNTY

German-American—New machinery will shortly be installed on this mine, at Pleasant Valley, and a new road is being built to it.

SHASTA COUNTY

Simona—A deal has been closed with San Francisco men for the purchase of this mine in Lower Springs district in the western part of the county.

SIERRA COUNTY

Sierra Buttes—It is expected that this old mine at Sierra City will shortly commence operations again. Labor troubles last summer brought things to a standstill, and there was much feeling displayed. The mining company even cut off the water supply for power in the town, though letting it be used for domestic purposes. Now a new superintendent, Jay C. Folsom, has taken charge and has arranged with the citizens so that they have electric lights again. Machinery and provisions are being hauled in for the winter, so that affairs in that locality should soon become active again.

SISKIYOU COUNTY

Hardscrabble—The new mill for this mine, on French creek, has been started up.

TRINITY COUNTY

Golden Jubilee—This mine, at Coffee creek, has 60 men at work. A stamp mill is being installed.

Bonanza King—At this mine, Trinity Center, Joseph Porter, superintendent, it is intended to keep 20 stamps at work all winter. A tunnel is being run to tap the ledge at lower depth.

TUOLUMNE COUNTY

Kline Ranch—On this ranch, near Stent, a rich strike has been made. The ledge is small, but of high-grade ore. F. J. Young and others have leased the property and are developing it.

Nonpareil and Longfellow—These mines have been sold at sheriff sale to satisfy judgment and costs in the case of H. M. Street against the Nonpareil Gold Syndicate and Longfellow Mining Company.

YUBA COUNTY

A pit is being dug at Marigold, near Marysville, for launching the largest gold dredger yet built in the Yuba field.

Colorado

BOULDER COUNTY

Celura—This company is resuming work on its holdings at Sunshine, and it is reported that a mill will be built.

CLEAR CREEK COUNTY

Banner Consolidated—Plans are being prepared for this company by the Newbury Machine Company, of Denver, for the erection of a mill at the portal of the Rockford tunnel, the first unit to have a capacity of 250 tons per day. Fred H. Nye, Idaho Springs, Colo., is manager.

Mammoth—B. J. Martelon, of Silver Plume, Colo., has taken a lease and bond on this property on Brown mountain, and it is planned to have the aerial tramway reconstructed for the conveyance of ores and supplies.

GILPIN COUNTY

Eagle Mill—This rapid drop 35-stamp mill at Black Hawk has been purchased by the Great Bonanza Mining Company, Ltd., with G. H. Ellis Smith, Central City, Colo., as manager. The mill is to treat the ores of the Next President mine of this company.

Frank Augustus Mining Company—Centerville, Iowa, men are interested and have purchased the Tanner & Dunn and the Wilson & Ogilvie groups of tungsten claims, on North Beaver creek, on the Boulder-Gilpin county lines. Arrangements are being made for the electrical equipment of the property and for the

erection of a large concentrating mill on North Beaver creek next spring. Frank Augustus, Rollinsville, Colo., is manager.

Argo Leasing Company—A local pool has taken a five-year lease and bond on the Argo group in Russell district, has installed a 40-h.p. boiler and will do liberal development on a reported promising showing. Harry Willis, Central City, Colo., is superintendent.

Belcher—Malet & Co., have opened up pitchblende or uranite ores at a depth of 140 ft., the mine being located in the Nevada district. The streak of pitchblende is between 4 and 12 in. wide and the mineral runs from 40 to 60 per cent. The ores are being carefully cobbled and sorted for shipment to New York where representatives of the German buyers will bid on them.

Cashier—The third quarterly dividend has been paid by this company and it is figuring on the installation of an electric plant during the winter season. William Auger, Central City, Colo., is superintendent.

Carroll—This property in Eureka district has been sold to the Lusitania Mining Company with I. F. Dawson, Mercantile building, Denver, as manager. New machinery will be installed.

Jefferson Company—Pennsylvania capital is interested in a lease and bond on the Ralls County mine on Quartz hill and they have already opened up 4 ft. of milling ores in the 300-ft. workings, and will have the tramway tracks extended for cheaper hauling of ores and supplies. J. F. Shaw, Central City, Colo., is manager.

Parole—Toledo, Ohio, capital is interested with W. H. MacFarland, Central City, as general manager, and a contract has been let for new shaft-building, and machinery is to be installed. The company owns the Parole and Morning Star mines in Gregory district.

Pewabic Consolidated—The mill known as the New York mill has been remodeled, and a new set of boilers with furnace for burning western lignite attached has been installed. John C. Fleischhut, Central City, Colo., is manager.

LAKE COUNTY—LEADVILLE

A. Y. & Minnie—This property in California gulch, after being closed down for a year, has resumed operations. At present a force of men is employed in repairing the shaft and when this is completed the different drifts will be cleaned out. This work will take to about the middle of December when the breaking of ore will commence, and 75 tons will be shipped daily to the Western Chemical Company, Denver. By the first of the year the tonnage will likely be doubled, and in all probability the mill will resume operations and handle the low-grade product.

Big Six—From time to time rich ore has been found in this territory, Breece hill, but this week some of the richest ore, with the exception of the Little Jonnie, ever taken from the hill was found in a streak of talc embedded in a body of ore; the talc runs 300 oz. gold per ton; the body holds up to 2.35 oz. gold per ton. The ore was caught at the 750-ft. level and 210 ft. from the shaft; a small streak has been followed for several days and led to the rich streak that is about 3 in. wide. The talc is freely spattered with native gold; it is being sacked. The discovery was made in virgin territory.

Iron Silver—The work of cleaning up at the Moyers and Tucson is about completed, and shipments will start soon. No large force of men will be put on either of the properties until after the first of the year. The present tonnage from the two properties will be the neighborhood of 250 tons daily.

Jolly Shaft—A good grade of iron is being shipped from this property, East Fifth street, averaging 30 tons daily. Work is being carried on in new territory.

Matchless—A rich vein of silver ore has been opened in No. 7 shaft, Fryer hill, drifting for which has been in progress for some time. Work has been carried on from No. 5 shaft, in new territory, and it is expected that vein will turn into a large body. Iron is being sent out from both shafts.

Idaho

SHOSHONE COUNTY

Caledonia—Within the next 10 days the first shipment of about 40 tons of ore will be made. The management has decided to sink the shaft another 200 ft. and then to crosscut to the ore.

Hecla—This company has announced its regular dividend for the month of November at the rate of 2c. per share. The dividend involves the distribution of \$20,000, making a total paid for the year of \$160,000, and a grand total of \$1,680,000.

New York Group—This property has been bonded by a syndicate of New York capitalists, and a stamp mill will be erected next spring. The property was formerly owned by the Wake Up Jim Mining Company and consists of five claims.

IDAHO COUNTY

Buster Mine—Drifting and crosscutting at the 400-ft. level has resulted in the finding of the vein which was lost some weeks ago. Development will now be continued below this level.

Idlewilde Mining Company—Supplies have been purchased for immediate shipment to the mine at Elk City, and development work will start at once.

Crackerjack—Fifteen men are at work taking out ore and developing. The stamp mill has not been run for some

time and will remain shut down until several months' run is on the dump. Supplies are now being taken to the mine.

Espey—A four days' run of the five-stamp mill on this property has given a gross cleanup of \$5400, according to Alfred A. Adams, the present owner. Mr. Adams has purchased repairs and a small amount of additional machinery and the mill will be started in a short time.

United Placers Company—Surveys for an 8-mile flume were completed some time ago, and as soon as patents are issued for the land, applications for which have been made, the work of constructing the flume will begin. The company also is planning a power plant from which power will be sold to other companies. Manager W. H. Hill states that in one year from date he will be handling gravel. The property comprises 1100 acres of placer ground.

Ohadi Mining and Milling Company—Supplies and equipment for driving 500 ft. of tunnel have been ordered for the company's property in the Cave gulch district. Work will begin in December. This is brought about by the opening of the Upper Snake to navigation by small steamers.

KOOTENAI COUNTY

Green Monarch Mining and Milling Company—Frank C. Lavigne, manager, is engaged in transporting a new air compressor and other machinery to the mine at Hope. Five drills will be put in commission as soon as the plant is installed. The company has shipped two carloads of ore to the Panhandle smelter.

Illinois

MARION COUNTY

Marion County Coal Company—Arrangements have been made to push the work on this company's mine at Centralia, and to make it one of the largest mines in the State. F. Kohl, Jr., of Centralia, has been elected president.

Indiana

GIBSON COUNTY

David Ingle, an Oakland City coal operator has leased 600 acres of land east of Princeton, near Francisco, and will try to develop a new coalfield. Work has already begun with a core drill and there is every indication of profitable development.

GIBSON COUNTY

Peacock Coal and Mining Company—The new mine of this company, near Oakland City, is now in full operation. This mine is in an 8-ft. vein of coal, and will have a large output and a large complement of employees.

KNOX COUNTY

Big Muddy Coal and Coke Company—The property of this company, comprising 10 acres of ground near Bicknell, and a complete coal-mining plant, has been

sold to Fred. C. Hunold, of Chicago, and A. B. McLaren, of Marion, Ill. The deal involved over \$75,000 in all.

SULLIVAN COUNTY

J. W. Broddy, of Indianapolis, is at the head of a company to select a site near the Linton fourth-vein mines upon which to erect and equip a large central power plant. The purpose is to mine coal and generate electricity, and to transmit it to the manufacturing centers of central and eastern Indiana. Work is to begin on the sinking of a shaft and the construction of the plant next spring.

VIGO COUNTY

The judgment convicting John Hewitt of the offense of failing to provide a wash room with lockers for clothing at Lost Creek mine, near Terre Haute, where the coal miners could wash themselves and change clothing, has been reversed by the Indiana Supreme Court. Hewitt contended that the act passed by the last legislature requiring wash rooms was unconstitutional, and when the lower court held it to be valid and assessed a fine against him he appealed. The Supreme Court declined to pass on the constitutionality of the law and decided that the affidavit on which Hewitt was convicted was defective, because it did not state that he had charge of the mine, since the law holds only the person "in charge" subject to a fine for failing to provide a wash room.

Kansas

ZINC-LEAD DISTRICT

Ore has been found in croppings on Brush creek, 2½ miles north of Baxter.

Michigan

COPPER

Wyandot—This company has begun drifting on the amygdaloid formation that was recently encountered in the crosscut driven from the exploratory shaft. The formation at the point of intersection carried a small seam of copper-bearing rock and its extent and value is now to be fully determined.

Ojibway—Sinking has been resumed at No. 1 shaft of this property and the next level will be established at a depth of 650 ft. The crosscut from the 500-ft. station has passed through one of the beds of the Kearsarge series, which was 30 ft. wide and highly mineralized and is now entering another bed after passing through about 15 ft. of trap. The crosscut from this same level at No. 2 shaft has entered the formation and it is well charged with copper. The crosscut will be extended and the other beds encountered.

Copper Range—This company has begun diamond drilling on sections 7 and 8, which lie to the west of Atlantic's section 16 property. This land is owned by the St. Mary's Mineral Land Company, and

the Copper Range has secured an extended option on it and will fully explore it. This tract in all probability carries the southern extension of the main working lodes of the district.

Mass—This company is diamond drilling from two separate points underground at "A" shaft, but nothing authentic can be learned concerning the results being obtained.

Ahmeek—The two new shafts of this company have reached the bedrock after passing through about 70 ft. of overburden; sinking will proceed at the rate of about 100 ft. per month. The drift south from No. 2 shaft is entering exceedingly rich ground in proximity to the North Kearsarge boundary line.

Victoria—This company has curtailed the number of men employed, due to lack of water necessary to operate its hydraulic plant. Explorations continue by means of a crosscut from the shaft in the southern portion, and to the north two diamond-drill outfits are in operation.

Calumet & Hecla—This company has again taken up exploratory work on the Nonesuch property in Ontonagon county.

Superior—No. 1 shaft will soon be in condition to accommodate two skips. The intervening space has been widened out and the retimbering is practically completed. The crosscut at the 10th level has penetrated the lode and at this point it is 80 ft. wide and shows a uniform grade of stamp rock for nearly the entire distance. At No. 2 shaft the work of enlarging to two compartments is progressing satisfactorily. The additional surface equipment is rapidly rounding into shape and in a short time this company will be on a producing basis.

Seneca—A temporary shaft house is being erected at this property and will soon go into commission; everything at the property is in such condition that the progress of sinking the shaft will not be interfered with during the winter months. The shaft is equipped with hoisting and compressing facilities capable of meeting all requirements for more than a year. This shaft is going down in the footwall about 60 ft. behind the lode, and as the levels are established crosscuts will be driven to cut the lode. The Kearsarge lode upon which this property is being opened is supposed to be composed of several series of amygdaloid and trap alternating; one authority gives it at seven, four of which are known to carry copper in commercial quantities, and in driving the crosscut from the footwall side these various beds will be penetrated. Diamond drilling continues and a complete cross-section of the tract will be made from east to west.

Missouri

ZINC-LEAD DISTRICT

Kelly Land—Sheet ore has been struck

in drilling on this land, near the Frisco station at Webb City.

Microbe—This company, at Spring City, has reached the ore with its shaft and is planning the erection of a mill.

Midway—This camp, situated between Joplin and Webb City, has 12 companies at work, where a year ago there was not one. The Kalitan, Osyka, Florence and Snyder & Watkins are already large producers. The ore is free jack and lead, found in open ground, and strong water is encountered.

Plata—McAbee & Co., of Joplin, have got into the ore at 170 ft. with the shaft at Spring City. This mine adjoins the Delta and has the same blanket lead formation. This same orebody is being developed in the McKee mine and a shaft is soon to be sunk to strike it on the Aladin lease by the Don McRiver company. The Plata Mining Company will erect a mill on its strike.

United Zinc Company—The Highland mill of this company, at Prosperity, has been destroyed by fire. The loss was \$40,000 in all.

Montana

BUTTE DISTRICT

Anaconda—Operations in the Anaconda and Never Sweat mines of the Anaconda company have been almost at a standstill for several weeks owing to the trouble occasioned by the smoke and fumes from the fires in the mines.

Davis-Daly—About 40 men are now employed digging the foundations for the hoisting engine which is to be installed at the Colorado shaft. The engine to be used is one formerly at the Rarus mine, and is good for a depth of 2500 ft. The shaft is down 1500 ft. Although no development work has been done below the 100, a crosscut will be driven on the 1425-ft. level.

Butte-Montana—Operations have been resumed on the Alex Scott under the direction of C. J. Stone, a mining engineer, of Duluth, who arrived here a few days ago. On the 900-ft. level drifting westward is in progress.

JEFFERSON COUNTY

Columbia Butte Mining Company—This company's property is situated near Whitehall. H. T. Huyder, general superintendent, has brought an action to set aside the conveyance made by him to the company on the ground of failure of consideration. He alleges that the company has failed to make the payments agreed upon for the claims and that it is in debt and unable to make any further payments.

MISSOULA COUNTY

Iron Mountain Tunnel Company—The United States Government has instituted an action in the Federal Court at Helena against the company for \$707.85 for the

alleged conversion of timber on the Lo Lo National Forest Reserve.

FERGUS COUNTY

New Year Gold Mining Company—In the action of J. W. Lusk, of St. Paul, as trustee, against the company, Joseph Meredith has been appointed receiver. The action was instituted to foreclose a mortgage given to secure the payment of 366 bonds for \$500 each.

MADISON COUNTY

Prospect Mine—This mine is situated just west of Virginia City. An electrically driven air compressor is being used to operate several drills in sinking the shaft. J. H. Panky, of Virginia City, is in charge of the work.

CARBON COUNTY

Northwestern Improvement Company—Six men lost their lives in a fire last Friday in the company's East Side coal mine, near Red Lodge.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Florence Annex No. 2—The first shipment, consisting of 40 tons, valued at \$100 per ton, has been made. On the 350-ft. level, the face of the drift being driven under the hill and toward the Engineers lease, looks more promising. Two drifts are being driven to the south and west on the 150-ft. level and have passed through a fault.

Silver Pick—The only work being done at the Silver Pick is that of the Goldfield Golden Pick lease. The 250-ft. level driven by former lessees, has been cleaned out, the shaft has been sunk to a depth of 340 ft., and will be continued to the 350-ft. level where a station will be cut and extensive lateral work done.

Goldfield Mining and Reduction Company—Work has been resumed and a gasoline hoist is being installed. The two-compartment shaft, now 70 ft. deep, will be sunk to a depth of 500 feet.

Zinn-Florence—On the 185-ft. level, in following a well defined talc seam, a vein of low-grade ore 8 ft. wide and assaying from \$4 to \$12 per ton has been opened up. Two feet of the ore is oxidized; 10 in. of the ore carries gray copper. This vein has a north-south strike and dips to the west.

Portland Florence—This lease working the ground included in the old California Florence lease has made its initial shipment this week. It consisted of 20 tons of ore assaying \$50 per ton, and came from the 200-ft. and 300-ft. levels.

Ben Hur—At this property, 3½ miles west of town and near the Sassy Sal of unpleasant memory, the shaft is 127 ft. deep; the crosscut driven from the bottom is 127 ft. long.

Hazel Goldfield—This lease on the Last Chance claim of the Laguna group, one

of the Consolidated Goldfield properties, has encountered at a depth of 717 ft. what is supposed to be the Red Top vein. High assays are obtained from streaks and bunches of ore in a vein of solid quartz; indications show the approach to a body of ore. The shaft has now reached a depth of 734 feet; its total cost to this point is about \$55,000.

Combination Fraction—It is reported unofficially that no effort is being made toward a heavy production at this time, as the Fraction ores will be treated at the new Consolidated mill when it is completed. This gives color to the rumored acquisition of the Fraction by the Consolidated, which latter almost entirely surrounds the former; both are controlled by Nixon and Wingfield.

Black Butte Consolidated—Work has been resumed after a shutdown of 10 days, due to broken machinery; a carload of ore is ready for shipment.

Begole Syndicate—The dump of the Begole Syndicate lease, which contained 1200 tons, on the Mohawk Combination, and which was sold to the Nevada Goldfield Reduction Works to be run through their mill with high-grade rock, has averaged about 4 oz. gold per ton.

Precious Metals Company—This lease in the Atlanta has resumed sinking from the 350-ft. level. The shaft will be continued to a depth of 500 feet.

Florence—It is stated that the Florence mill will begin operations Dec. 15.

Railroad Florence Mining and Leasing Company—This new company has been formed by local officials of the Tonopah & Tidewater railroad to take over the Review lease on the Red King claim of the Florence upon which \$35,000 was formerly spent. The lease has a shaft 335 ft. deep and considerable lateral work.

February Premier Mining Company—This lease on a block of ground 400x600 ft. on the south end of the February claim of the Consolidated holdings has made a record for the camp by sinking and timbering the first 100 ft. of its shaft in 18 days.

Nevada Eagles—Shipping ore has been found in this property located three miles west of town. At a depth of 250 ft. stringers of good ore were cut, but these pinched out in the raises driven on them. The shaft will be sunk 150 ft. deeper and new hoisting machinery will be installed.

Consolidated Mill—The structural-steel work of the mill will be completed by Dec. 1; the placing of all the corrugated sheeting and roofing will be finished in another week. The cyanide plant is complete, except for the piping and laundry systems, both of which are under way. The crushing department is completed and has been given a trial run. Work on the plant for the sulphuric-acid treatment of the mill concentrates has been started, and some of the tanks are in place.

ESMERALDA COUNTY—MONTEZUMA

Buckeye Mining Company—Shaft sinking has been completed and drifting will be started either from the bottom or the 300-ft. level. Stringers of copper sulphide ore have been cut in the shaft; it is expected to cut the main vein in about 20 ft. if it has not changed its dip.

ESMERALDA COUNTY—CUPRITE

Ellsworth Oldt has just purchased a group of six claims adjoining the sulphur group now being exploited by Los Angeles men. Oldt will start an adit immediately.

NYE COUNTY—TONOPAH

Production for the week ending Nov. 14 amounted to 5393 tons, having a value of \$134,825. The Tonopah Mining Company mined 3300 tons; Belmont, 650; Montana-Tonopah, 708; Midway, 100; MacNamara, 300; West End, 85; Jim Butler, 250 tons.

Tonopah Mining Company—The sinking of the Mizpah shaft has been resumed, as the air hoist formerly on the 900-ft. level has been installed in the new 1200-ft. station. The shaft is 1253 ft. deep and will be sunk to a depth of 1500 ft. without any further lateral work. The drill hole from the 740-ft. level of the Silver Top shaft is now 87 ft. deep, and as yet shows no change in the rock formation.

Belmont—The winze on the 1000-ft. level to the north of the Mizpah fault is now down 95 ft., and shows a well defined vein containing 4 ft. of fairly good milling ore. On the 1100-ft. level the vein was crosscut and found to have a width of 38 ft., but it has since been discovered that the supposed hanging wall was not the true hanging, but a thin slab of country rock beyond which was quartz and vein matter. Consequently this crosscut is being driven farther.

Tonopah Extension—The 30,000 tons of ore in the company's dumps is to be treated in a local mill. A station has been cut in the shaft at the 35-ft level and drifts will be run out under the dumps; then raises will be driven to tap the dump.

MacNamara—All hand drilling is to be abolished at the mine, and the number of air drills is to be increased. For this purpose the air line from the Tonopah. Extension compressor plant is being enlarged.

NYE COUNTY—BERLIN

Goldfield Blue Bell—The old, Berlin mine, 10 miles south of Austin, recently purchased by the Goldfield Blue Bell company has made a good showing the last 30 days. The old mill has been closed for 25 years, but with little renovating it was started up by the new owners, and 1500 tons of dump rock and slimes were treated. A recovery of \$15,000 by amalgamation alone was obtained.

NYE COUNTY—ROUND MOUNTAIN

Sunnyside Extension—Gordon and Garrecht have acquired a lease on the Sunnyside Extension claim of the Blue Jacket group, and are now working it with dry washers. The top soil which carries little or no gold for about a foot in depth has been swept aside by means of plows and scrapers; under this is about 3 ft. of pay dirt.

NYE COUNTY—BELLEHELEN

Nevada Bellehelen Company—The Comforth mine of this company is being developed by an adit now 600 ft. long which has cut three veins. The third vein contains about 10 ft. of high-grade shipping ore. A mill will be built on this property during the winter.

NYE COUNTY—BULLFROG

Bullfrog Gold Bar—This property, by order of the court, will be sold at sheriff's auction on execution of a debt to the Nevada Exploitation Company, amounting to about \$40,000.

LINCOLN COUNTY—SEARCHLIGHT

Quartette—A high-duty pump is being installed at the 10th level of the mine in order to permit exploration at greater depth and to provide more water for the mill. From 30 to 35 stamps are running, and about 100 tons of ore are crushed in 24 hours.

NYE COUNTY—MANHATTAN

Panion-Faulkner Group—Hoisting machinery is being installed at the old shaft of this group now owned by the Manhattan Sunshine Mining Company. A road has been built to the property and the new company will thoroughly explore the northern porphyry and rhyolite belt of the camp.

Veith Mill—The five stamps recently added are running, and custom ore is being treated. A 100-ton lot from the Crescent is being milled. A 20-ton lot from the Toro Blanco is to be milled next and then a 100-ton lot from the Veith-Plamenez lease.

CHURCHILL COUNTY—WONDER

Nevada Wonder—The company intends to build a mill to treat its own ore. Contracts are being negotiated with the water company and several trial shipments of ore have been made to F. L. Bosqui, of San Francisco, to determine the proper treatment for the ore.

ESMERALDA COUNTY—HAWTHORNE

Lucky Boy—This group has been turned over to J. D. Hubbard, of Chicago, as the final payment of the total \$80,000 has been made. During the few days prior to this settlement, owing to a misunderstanding between the vendor, the vendee and the bank, the vendor has held possession of the mine with shotgun guards. The mine is on the old Bodie road eight miles from

Hawthorne, and is producing a good grade of silver-lead ore.

HUMBOLDT COUNTY—SEVEN TROUGHS

George and English Lease—This lease on the Fine Gold property has been extended and the leasers are erecting a 40-ton milling plant.

Mazuma Hills—A large pump has been installed and the mine will be explored at greater depth.

Oklahoma

OTTAWA COUNTY

Consolidated—This company at Miami has an 18-ft. face of ore in its shaft, and is erecting a 150-ton mill.

Oregon

COOS COUNTY

It is announced that the Libby coal mine, at Marshfield, on Coos bay, has been sold to parties interested in the Great Northern railroad. The output of the mine is to be increased.

Pennsylvania

BITUMINOUS COAL

Milford Coal Company—This new company has bought 3000 acres of coal land in Somerset county, near Casselman. There are several small mines on the tract, one or more of which will be enlarged. Albert C. Ritchie, of Baltimore, is president of the company.

South Dakota

CUSTER COUNTY

Saginaw—Development work on the new orebodies by Superintendent Herber, shows them to be the largest in the southern Hills. The mine force is to be increased.

LAWRENCE COUNTY

Branch Mint—Test runs of ores from various properties in the Galena district will be made under the direction of Superintendent Michael Hecht, of New York, and the district is to be generally sampled.

Clover Leaf—Affairs have been wound up, the company dissolved and the property turned over to the former president, Pierre Wibaux, of Paris. The property at Roubaix showed very rich specimen gold ores.

Gilt-Edge-Maid—N. E. Hiltner is the new mill superintendent of the plant at Turner, succeeding L. B. Eames. Mr. Hiltner came from the Wasp No. 2 mine.

Golden Reward—The Moore process for slimes will be installed and the slime-plant capacity increased to 250 tons daily by Superintendent Henry Schnitzel in the Deadwood mill. The Moore will be used in conjunction with the Chamberlain process.

Gold Mountain Mining and Developing

Company—This new company has just been organized to operate the Russell & Higbie ground in the Two Bit district. M. R. Russell, of Deadwood, with Chicago and Kansas City men, are behind the enterprise.

Ohio-Beaver Creek—Reorganization is to be effected and the receiver discharged. President T. C. Lentz, of Columbus, O., retires and is succeeded by Charles Hayden, of the same place. Work will be resumed on the ground near Tinton in the spring.

PENNINGTON COUNTY

Black Tom—Officers were elected at the annual meeting at Hill City as follows: President, W. A. Ford, Hill City; vice-president, C. A. King; secretary-treasurer, Walter Burden; superintendent and general manager, William Barnes, Hill City. Operations are to be commenced again next month and later the 10-stamp mill opened.

Continental Copper Company—Sinking in the shaft, now down 500 ft., will be continued at once by Superintendent Overpeck. At the 700-ft. level drifting will again be commenced. New pumps are being installed in the mine preparatory to deeper work.

Francis—A new find of wolframite ore has been made on Spring creek by Harry Francis, of Custer.

North Star—Coughran & Son are operating the small mill treating free gold ore from a small vein near Rochford.

Tennessee

POLK COUNTY

Tennessee Copper Company—The contract for the acid output with the Independent Fertilizer Company is said to be for 40 years at \$3 per ton. The copper company received \$250,000 in cash and on Dec. 4 will receive \$2,250,000 additional. This is based on an acid output of 100,000 tons per annum, the present capacity of the plant. The plant is to be increased to 300,000 tons annual capacity. With the addition of each pair of 25,000 ton units the mining company will receive \$625,000 cash, wherefore the total cash bonus for the contract will amount to \$5,000,000.

Utah

BEAVER COUNTY

Majestic Mining Company—The smelter of this company, comprising a copper furnace and a lead furnace, has been leased to the Miners' Smelting Company, a Heinze interest, for five years with privilege of extension or purchase. It is understood that this smelter is to be used to treat ores of the Silver King Coalition Company and the Ohio Copper Company.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Nov. 21, were as fol-

lows: Crown Reserve, 116,000 lb.; Cobalt Central, 40,860; La Rose, 217,990; McKinley-Darragh, 180,700; Nipissing, 299,680; Nancy Helen, 41,500; O'Brien, 127,600; Right of Way, 62,150; Silver Cliff, 60,000; Temiskaming, 60,000; Tretheway, 64,000; total, 1,270,480 pounds.

Chambers-Ferland—During the last five months more than 1000 ft. of underground development has been done and also 1814 ft. of surface trenching. Eight new veins have been discovered. Of the 124 acres of the property only about 30 so far have been prospected. A Taylor hydraulic air system is being installed.

Green-Meehan—A syndicate, headed by Robert T. Shillington and Mr. Ferland of the Chambers-Ferland mine, has secured a controlling interest in this company, and has assumed its management.

Great Northern Silver Mines, Ltd.—This company is an amalgamation between the Cleveland-Cobalt and Clear Lake Mining Companies, and the Cobalt Light, Heat and Power Company. The stock of the latter company is principally held by the Cleveland Cobalt company. The new concern is capitalized at \$1,500,000. The property will consist of approximately 500 acres of mining locations in the Coleman, South Lorraine and Montreal river districts.

Temiskaming—The main shaft is down 220 ft. and a station is being cut at this level. On the South property adjoining the Silver Queen a shaft is down 30 ft. on a vein of calcite and decomposed mineralized matter. The shaft will be sunk to 100 ft. and drifting and crosscutting will be done on an extensive scale.

Mexico

CHIHUAHUA

Gold Discovery—S. L. and C. E. Pearce, until recently of the Durazno Mines Company, report the discovery of a rich telluride-gold deposit in an almost inaccessible bluff on Tetamoa creek in the Arteaga mining district in the extreme western part of the State. Specimens giving remarkably high assays are reported to have been removed from a vein 8 ft. wide on a limestone-phonolite contact. Five claims were located. The district is reached from Alamos, Sonora.

SONORA

Nacozari Consolidated Copper Company—Ore is beginning to show in the rock in the face of the main working and drainage tunnel. No change had been anticipated for at least 200 ft. This property adjoins the ground of the Moctezuma Copper Company on the south.

La Caridad—Shipments from this property are being brought to the railroad at Nacozari at the rate of about a ton daily. The ore is a high-grade copper carrying some gold and silver, and is only what is being taken out in development work. The

main orebody opened up in the lower tunnel now shows a width of about 36 ft., a considerable portion of which is shipping ore.

El Refugio—This property has been taken under bond and lease by Mildon & Russell, of Nacozari and development work has been commenced by them and by leasers. The ground covers a vein of copper-silver ore and lies about half a mile southwest of the Pilares shaft.

Filadelfia—This mine, located on the line of the Southern Pacific branch about 12 miles below Nacozari, is reported under option to the Calumet & Arizona Mining Company and the engineers are expected to make the examination early in December. Only surface work has been done by the owners but this shows a considerable body of low-grade copper ore. The entire workings, consisting of 400 ft. of drifts and tunnels, all show some chalcocite, bornite and chalcopyrite; but the flow of water has thus far interfered with development work at depth.

Promontorio—This property which has lately been under option to the Southwestern Development Company of the Eppes Randolph interests and which has recently been examined by the company's engineer, W. N. Cummings, is reported to have been taken over. The mine lies about 40 miles southeast of Moctezuma to which it is connected by wagon road and mule tram. The price is not known but it will involve the payment of \$250,000 within the next 90 days.

Santa Rosalia—Development work in this mine has been greatly stimulated by recent strikes. The old machinery has been repaired and the pumps start this week. There are four boilers, a good hoist and a 10-stamp mill on the ground. High-grade ore is being hoisted from above the water level. At present the ore is being shipped but the company will in a short time treat the ore at the mine, first by amalgamation and then cyaniding. The property is 50 miles from Cananea in a very thinly inhabited district.

Cananea Consolidated—The smelter was recently visited by a number of prominent mining and metallurgical engineers including Dr. James Douglas, president of the Phelps-Dodge western interests, Walter Douglas, general manager of the Copper Queen Consolidated Mining company, Norman Carmichael, general manager of the Arizona Copper company, C. E. Mills, general manager, of the Detroit Copper Company of Arizona, Geo. B. Lee, superintendent of the Douglas Reduction Works, J. S. Douglas, general manager, of the Montezuma Copper Company, and the representing directorate of the Arizona Copper company, besides many others. Prominent metallurgical machinery manufacturing concerns have also had their engineers on the ground. President W. D. Thornton, of the Greene Consolidated, has just returned to New York.

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, Dec. 2—Coal trade in the West shows little change. Demand increases slowly and there has been no special incident during the week. There is still a tendency to ship freely to the larger consuming centers, which keeps prices down. Domestic trade continues light, on account of the weather. Steam coal is a little better, but the advance from week to week is small.

The Seaboard bituminous trade is quiet, recent activity having generally subsided. There is considerable irregularity about the demand.

Throughout Pennsylvania mines are still having a good deal of trouble on account of the drought and short water supply. If trade were more active, this would be a serious drawback. As it is, most mines are able to keep up with present demand, but at some increase in cost.

Anthracite trade is quiet, the mild weather keeping down sales. While no official announcement has been made, it is said that the anthracite companies are determined not to grant the demands recently formulated by the miners. This has given rise to some talk of a possible strike. It must be remembered, however, that it is four months before the present agreement will expire, and a good many things can happen in that time. The present strike talk is rather premature.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Nov. 21; in short tons:

	1907.	1908.	Changes.
Anthracite.....	5,049,291	4,605,743	D. 443,548
Bituminous.....	35,497,082	30,085,114	D. 5,411,968
Coke.....	12,402,440	6,292,746	D. 6,109,694
Total.....	52,948,813	40,983,603	D. 11,965,210

Total decrease this year to date was 22.6 per cent.

New York ANTHRACITE

Dec. 2—The demand for prepared and small steam sizes, with the exception of No. 2 or rice, is good and considerable coal is moving.

Schedule prices are \$4.75 for broken, and \$5 for egg, stove and chestnut. Small steam prices are: Pea, \$3.25@3.50; buckwheat No. 1, \$2.35@2.50; buckwheat No. 2 or rice, \$1.60@2; barley, \$1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

The soft-coal market has been subject to periods of activity and depression for some time past, and this week the dull period was in evidence. In all consuming territories there has been no activity and consumers seem to be waiting. In New York harbor conditions are extremely dull and prices remain unchanged at \$2.45@2.65 per ton. Transportation is fair and cars are in good supply. In the Far East and along the Sound little coal is being taken.

In the Coastwise vessel trade orders are scarce and boats seem to be in good supply. Freight rates remain unchanged. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, 70@80c.; Lynn, Newburyport and Bath, 80@85c.; Portsmouth, 80c.; Bangor, \$1@1.10; Providence, New Bedford and the Sound, 70@75c. per ton.

Birmingham

Nov. 30—An increased production of coal in Alabama is finding a ready demand and there is no accumulation. Some of the railroads are already finding some trouble in furnishing all the cars that are needed for the prompt handling of the product. The railroads continue to increase their orders. There has been no change in prices for coal lately, though much talk is to be heard in that direction. Preparations are being made for further development in the coalfields in Alabama and shortly after the new year starts in it is announced that miners will start on several new openings.

Coke is a desirable product. During the past week the Birmingham Coal and Iron Company gave instructions to fire up the Bradford ovens, recently leased, 106 in number. The Sayre Mining Company is also increasing its production of coke as much as possible. The larger companies, the Tennessee and the Sloss-Sheffield, not to overlook the Woodward and Republic companies, the Alabama Consolidated and Yolande, are working their ovens steadily. Good prices obtain for coke and the needs are going to be strong all through the coming year. Large piles of coke are being stacked by some of the larger concerns, in the belief that there will be need for it soon.

Chicago

Nov. 30—Comparative steadiness exists in the coal market for all grades of products, shipments being fairly well restricted to the consumptive capacity of the

Chicago district. There is still some enforced cutting of prices to escape demurrage charges on some consignments of Western lump and egg and on smokeless run-of-mine. Screenings also are depressed because of large supply and decreasing consumption.

Sales of domestic coals continue light in the absence of cold weather. Steam coals show a perceptible though slow increase. With increased shipments from the mines no kind of coal will continue stable as to prices and dealers fear any tendency to send in more of any kind until conditions of consumption improve.

Illinois and Indiana lump and egg being \$1.65@2.55; run-of-mine \$1.65@1.75; screenings, 95c.@\$1.55, car prices. Coals from east of Indiana are all in fair demand. Hocking sells for \$3@3.15; Youghogheny for \$3.15 for ¾-in. gas; and Pittsburg No. 8 for \$2.65@2.85. Smokeless run-of-mine is still somewhat shaded from the circular prices of \$2.85@3.30, with Pocahontas and New River comparatively firm around the higher quotation. Lump and egg smokeless at \$4.05@4.30 are firm. Anthracite is quiet though sales are steady and well distributed.

Indianapolis

Dec. 1—The strike at the Hudson mine in Vigo county has been settled at last. Thomas Haggerty and Harry Moore, arbitrators selected to decide the case, have rendered a decision in favor of the miners who went out on a strike because of the discharge of a driver. The arbitrators held that the driver was justified in refusing to haul coal because the evidence showed the entry, as he claimed, was in an unsafe condition. The arbitrators decided that the driver be reinstated, with pay for time lost, and that the miners who went out be supplied with places in the mine.

The case has attracted the attention of miners and operators all over the country. President Lewis, of the Mine Workers, attempted to make a decision and ordered the men back to work pending settlement. They refused, and he suspended their charter, and this matter will come up in the national convention in January.

Pittsburg

Dec. 1—Production at the railroad coal mines continues to decline and considerably less than 50 per cent. of the mines are running. The warm weather so far has lessened the demand and the mills are not

consuming as large a tonnage as formerly from railroad mines. The Jones & Laughlin Steel Company and other large manufacturing establishments obtain their supplies from the river mines. The pools and harbor are now filled with accumulated stocks. All the river mines are down owing to a lack of empty boats and barges. Late reports from the Marianna mine of the Pittsburg-Buffalo Company, where fully 135 miners lost their lives on Nov. 28, indicate that the damage to the mine was not as great as at first supposed, and that it is probable operations may be resumed in a few weeks. Prices remain unchanged and \$1.15 a ton for mine-run coal is still being quoted by the large producers. Slack is firm at around 65c. per ton.

Connellsville Coke—There is no material change in the coke situation. Operations in the Connellsville fields continue at about 50 per cent. of capacity. Some contracts have been made for delivery of furnace coke for the entire year at \$2 and more, but few of the large producers care to sell beyond the first half as they are confident that better prices will be obtained later on. For prompt shipment furnace coke has sold as low as \$1.85, but no business for the first half has been done at less than \$2. Foundry coke is firm at \$2.25@2.40 for any delivery. The *Courier* in its weekly report gives the production in both fields at 220,145 tons. The shipments were 8105 cars as follows: To Pittsburg district, 3188; to points west of Pittsburg, 4450; to points east of Connellsville, 467 cars.

Foreign Coal Trade

German Coal Production—Coal production of German Empire, nine months ended Sept. 30, metric tons:

	1907.	1908.	Changes.
Coal.....	106,596,371	111,391,925	I. 4,795,554
Brown coal.....	45,365,491	48,892,403	I. 3,526,912
Total mined.....	151,961,862	160,284,328	I. 8,322,466
Coke made.....	16,240,813	15,836,983	D. 403,830
Briquets made.....	12,121,710	13,631,513	I. 1,509,803

Of the briquets made this year 10,619,023 tons, or 77.9 per cent., were from brown coal, or lignite.

German Coal Trade—Imports and exports of fuel in Germany, nine months ended Sept. 30, metric tons:

	1907.	1908.	Changes.
Imports:			
Coal.....	10,005,328	8,774,420	D. 1,230,908
Brown coal.....	6,687,729	6,505,442	D. 182,287
Total coal.....	16,693,057	15,279,862	D. 1,413,195
Coke.....	420,331	418,015	D. 2,316
Briquets.....	134,106	137,903	I. 3,797
Exports:			
Coal.....	14,840,124	15,501,967	I. 661,843
Brown coal.....	15,164	20,459	I. 5,295
Total coal.....	14,855,288	15,522,426	I. 667,138
Coke.....	2,801,194	2,721,444	D. 79,750
Briquets.....	892,745	1,158,313	I. 265,568

Coke exports this year included 19,500 tons to the United States.

French Coal Trade—Imports and exports of fuel in France, nine months ended Sept. 30, metric tons:

	Imports.	Exports.	Excess.
Coal.....	10,976,620	818,810	Imp. 10,157,810
Coke.....	1,383,660	98,800	Imp. 1,284,860
Briquets.....	745,540	97,840	Imp. 647,700
Total.....	13,105,820	1,015,450	Imp. 12,090,370
Total, 1907.....	12,945,970	1,067,590	Imp. 11,878,380

Exports this year included 128,280 tons furnished to steamships in foreign trade.

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

	Imports.	Exports.	Excess.
Coal.....	3,971,203	3,470,382	Imp. 500,821
Coke.....	230,244	670,262	Exp. 440,218
Briquets.....	105,805	346,090	Exp. 240,285
Total.....	4,307,252	4,486,734	Exp. 179,482
Total, 1907.....	4,298,203	4,467,060	Exp. 168,857

The changes reported this year were unimportant.

Spanish Coal Imports—Imports of coal into Spain, nine months ended Sept. 30, were 1,426,857 metric tons, a decrease of 6729 tons; imports of coke, 216,795 tons, an increase of 22,761 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Nov. 21: Best Welsh steam, \$3.48; seconds, \$3.36; thirds, \$3.24; dry coals, \$3.60; best Monmouthshire, \$3.18; seconds, \$3.06; best small steam, \$1.80; seconds, \$1.44. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Dec. 2—There is a halt in the iron and steel trades which is attributed in some quarters to the discussion of tariff changes, though others believe that the recent buying movement has supplied consumers' needs for the present, and that activity is not to be expected before the new year.

Basic iron sales have been light, but some large contracts are said to be pending. Sales of foundry iron have also been small, but it is said that orders to deliver on contracts are larger.

In finished material there has been some activity. The retail demand for bars and plates is improving. Structural steel still shows a good deal of activity, a few large contracts and a number of small ones having been placed. There is said to be more firmness in this market, and fewer concessions are being made. The total volume of structural orders is considerable. Lake shipbuilding shows some activity and several railroad-equipment orders are reported. Rail business is still very much in the future; there are reports of large orders to be placed for 1909 delivery, but they do not appear to be on the books as yet.

On the whole, the volume of trade is growing, but advances are slow.

Baltimore

Dec. 1—Exports for the past week included 4376 tons steel rails to Mexico; 5,938,600 lb. steel billets to Liverpool; 671,707 lb. tin scrap to Rotterdam.

Birmingham

Nov. 30—Two of the larger pig-iron producing companies in the Southern territory have practically withdrawn from the market as far as iron for delivery during the first three months of the coming year goes. The companies which are still handling business are firm at \$13 per ton, No. 2 foundry, and reports are current that some sales have been made at 50c. advance, delivery on demand. The make in this territory has changed but little recently. Two furnaces, according to the calendar, are to go into operation during the present week, while two others are being gotten in readiness hastily and will be ready before the middle of the month. There has been but little business transacted for delivery during the second half of the coming year. The starting in of the last month of the year may bring about a better price and active selling for delivery during 1909. The furnace companies in the Southern territory are confident that every ton of iron that can be manufactured during the coming year can be disposed of. The throwing of some 37,000 tons of iron on the market immediately on the turn of the new year is not going to have much effect on the general market.

Chicago

Dec. 1—The iron market continues firm, with something of quietness, but an optimistic tone among sellers and buyers. Sales are for the first and second quarters of the next year; for the second half a few inquiries for good sized tonnage are out and occasionally a sale is made, but neither buyers nor sellers are considering second-half requirements at all generally as yet. Lots sold run up to 1000 tons with occasionally one for 1500 or 2000 tons and the greater number small. There is little demand for quick-shipment iron and substantially no difference in prices between iron for delivery within 30 days and that for the first quarter. On second-quarter deliveries 25c. premium over first quarter quotations obtains.

Southern iron holds to \$13@13.25 Birmingham for first-quarter sales, making Chicago prices \$17.35@17.60. Northern local output is apparently being steadily absorbed at \$17@17.25. Lake Superior charcoal is quiet at \$19.50@20.

Iron and steel products are quiet but firm, with prospects of continued quiet in many lines, but no relapse for the coming month. Coke is strong and shows increasing sales at \$5 for the best Connellsville, with lower grade cokes 25@35c. less.

Cleveland

Dec. 1—The activity which became notable in the local pig-iron market early in November has shown a marked falling off. There were pretty high expectations but inquiries have not kept up to early

promises during the last week and sales have somewhat diminished. It seems as though all the foundries had covered expected requirements for the first quarter of 1909. One of the Cleveland steel companies has purchased 2000 tons of basic within the last few days.

Bessemer is quoted at \$16.90@17.90; No. 1 foundry \$17.50@17.75; No. 2, \$17@17.25; No. 3, \$16.50@17; No. 2 Southern, \$16.85@17.35; gray forge, \$15@16; Lake Superior charcoal, \$19.50@20, Cleveland.

Philadelphia

Dec. 2—Sales of pig iron have fallen off, most of our foundrymen, apparently, having gotten under cover for the present. The recent buying has cleared out stocks pretty well, and furnace people are stiffer in their ideas about prices. Some basic is being asked for, and most of this business is going to Virginia furnaces. No. 2X foundry is about \$17.50; No. 2 plain, 50c. less; basic \$16.75@17; forge \$15.75 and rather scarce.

Steel Billets—There is some inquiry for large lots, but only small orders have been placed, at unchanged prices.

Bars—Bar iron is firmer, and an advance is expected. Refined iron is in more demand, but steel bars are quiet. Store trade is improving.

Plates—Small orders are increasing, but large contracts are held back. Prices unchanged.

Sheets—Current orders are small, but in greater number than recently, and the mills are not worrying.

Structural Material—Several large contracts are pending, but the negotiations seem to hang fire. Bridge work is looming up, and there is a fair volume of miscellaneous orders for building. Prices are firmer, less cutting being done.

Rails—Business on heavy sections is still mostly in the future. Light rails are in some demand. Talk of trolley orders is heard, but they are not coming as yet.

Scrap—Scrap dealers are feeling chipper, and are not inclined to take any but good offers. Buyers want scrap cheap, but are not getting much. For heavy steel \$16.50@17 is asked; \$20 is talked of for No. 1 railroad wrought, and \$16.25@16.75 for good cast scrap.

Pittsburg

Dec. 1—The iron and steel markets are quiet this week as to sales, but remarkably strong in quotations on prices. There is a bullish tone, but no transactions of any consequence are noted. In pig iron sales were in small lots only. In finished lines there is the general run of orders but no heavy tonnages have been booked recently. The Pressed Steel Car Company has taken an order from the United States Steel Corporation for 250 steel cars for the American Steel and Wire Company, for delivery at Cleveland. This will mean 2500 tons of plates which will be rolled by

the Carnegie Steel Company. The Car company expects to book several large orders shortly as negotiations are progressing satisfactorily.

There are still many reports as to what the railroads will do in the way of placing orders for steel rails. Estimates vary as to the probable requirements but it is believed that fully 3,000,000 tons will be placed after terms have been arranged and active buying begins. There is some hope that after the meeting of steel representatives in New York on Dec. 10 the question of steel-rail requirements for next year will be definitely arranged and buying likely will begin soon after the opening of the new year.

Operations of the large mills in the Pittsburgh and surrounding districts show but little change compared with a week ago.

Pig Iron—The market is decidedly quiet this week and sales of all grades will not exceed 2000 tons, chiefly for December delivery. In some instances prices paid were higher than were quoted a week ago. Standard bessemer is stronger, one sale being at \$17 and another at \$16.50, Valley furnaces. It is reported that less than \$16.50 cannot be done for any delivery. In some quarters predictions are made that prices will advance fully \$1 a ton and remain at that figure for the rest of the year and through 1909. Others believe, however, that the high point has been reached and that a decline is probable. The general impression among producers and dealers is that the iron market will continue strong. Malleable bessemer is quoted at \$15.75@16; basic at \$16@16.25; No. 2 foundry at \$16@16.50; gray forge at \$14.75@15.25, all f.o.b. Valley furnaces.

Steel—The only business in bessemer and open-hearth billets is on sliding scale contracts. The price remains at \$25, Pittsburgh. Sheet-bars and tinplate-bars are firm at \$27.50; plates at 1.60c. and merchant steel bars at 1.40c.

Sheets—Conditions in the sheet market are unchanged. Production is at the rate of about 60 per cent. Prices remain the same, black sheets being quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—There have been several sales at prices ranging from \$46.50 to \$47.50. It is reported that much higher prices are likely to prevail after Jan. 1. Some dealers have refused business for prompt shipment at \$47 per ton.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie canals, to and from Lake Superior, in October, was 7,351,082 tons, an increase of 169,652 tons over September. For the season to Nov. 1 the total freight passing was, in short tons:

	1907.	1908.	Changes.
East-bound.....	39,552,112	24,734,614	D. 14,817,498
West-bound.....	10,923,579	9,341,730	D. 1,581,849
Total.....	50,475,691	34,076,344	D. 16,399,347

The number of vessel passages this year was 12,909, showing an average cargo of 2640 tons. The mineral freights included were as follows, in short tons, except salt, which is in barrels:

	1907.	1908.	Changes.
Coal.....	9,844,344	8,434,745	D. 1,409,599
Iron ore.....	35,036,614	20,953,638	D. 14,082,976
Pig and manuf. iron.....	259,281	235,607	D. 23,674
Copper.....	63,767	75,708	I. 11,941
Building stone.....	898	1,019	I. 121
Salt, bbl.....	417,960	467,777	I. 49,817

Iron ore was 61.5 per cent. of the total freight this year, and coal 24.8; against 69.4 and 19.5 per cent., respectively, last year.

Foreign Iron Trade

German Iron Production—The German Iron and Steel Union reports pig-iron production in October at 941,582 metric tons, or 12,853 tons more than in October. For the 10 months ended Oct. 31 the production was, in metric tons:

	1907.	1908.	Changes.
Foundry iron....	1,873,127	1,859,395	D. 13,732
Forge iron.....	647,487	540,875	D. 106,612
Steel pig.....	849,150	764,615	D. 84,535
Bessemer pig....	395,770	318,439	D. 77,331
Thomas(basic) pig	7,061,626	6,382,923	D. 678,703
Total.....	10,827,160	9,866,247	D. 960,913

All classes of iron showed decreases, the smallest being in foundry pig. The total loss this year was 8.9 per cent.

Metal Markets

New York, Dec. 2—The metal markets have been generally quiet and with little incident. Silver has reached the lowest point in seven years.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1908..	\$ 1,952,574	\$ 3,782,705	Imp. \$ 1,830,131
" 1907..	3,716,258	4,512,466	" 796,208
Year 1908..	70,889,954	42,210,678	Exp. 28,679,276
" 1907..	53,596,071	35,374,686	" 18,221,385
Silver:			
Oct. 1908..	4,378,015	3,744,163	Exp. 633,852
" 1907..	5,053,997	3,599,695	" 1,454,302
Year 1908..	43,159,395	34,536,867	" 8,622,528
" 1907..	53,024,790	38,067,919	" 14,956,871

Exports of specie from New York week ended Nov. 29: Gold, \$23,900, to the West Indies; silver, \$592,431, chiefly to London. Imports: Gold, \$158,668, chiefly from Cuba; silver, \$55,641, from Central and South America.

Treasury Department estimate of money in the United States, Nov. 1:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury).....		
Treasury.....	\$ 188,480,313	\$ 610,060,562
Gold certificates.....	43,571,480	807,246,389
Silver dollars.....	21,567	74,740,245
Silver certificates.....	4,893,158	483,899,842
Subsidiary silver.....	19,272,269	131,663,701
Treasury notes of 1890..	13,775	4,691,225
U. S. notes.....	3,686,960	342,994,056
Nat. bank notes.....	22,642,191	643,202,001
Total.....	\$282,581,713	\$3,098,498,021

Population of the United States estimated at 87,971,000; circulation per capita, \$35.22. Total amount in circulation \$20,198,660 more than on Oct. 1; and \$222,129,325 more than on Nov. 1 last year.

Movement of gold and silver in Great Britain, 10 months ended Oct. 31:

	Imports.	Exports.	Excess.
Gold.....	£38,710,965	£39,885,521	Exp. £1,174,556
Gold, 1907...	37,980,302	30,789,070	Imp. 7,190,632
Silver.....	8,798,269	11,178,436	Exp. 2,380,167
Silver, 1907.	13,810,699	14,779,880	Exp. 969,181

Of the silver imported this year a total of £6,987,905 is credited to the United States.

Movement of gold and silver through the port of San Francisco, nine months ended Sept 30:

	Imports:	Coin.	Bullion.	Total.
Gold.....	\$1,675,069	\$1,996,659	\$3,671,728	
Silver.....	18,110	2,030,836	2,048,946	
Exports:				
Gold.....	17,240	1,903	19,143	
Silver.....	6,374	4,158,336	4,164,710	

The larger part of the gold exports came from Australia; of the silver from Mexico.

Gold—Bar gold is quoted in London at 76s. 11¼d. per ounce. American gold eagles are 76s. 6½d. Sterling exchange in New York is higher, offerings of bills being small. Today engagements of \$6,000,000 gold for Paris are reported, although none has yet been actually shipped.

Platinum—Dealers continue to quote \$24 per oz. for refined platinum, \$26.50 for hard and \$19 for scrap. Demand is good and the tendency is to higher prices. Some small lots of scrap sold this week at \$20@21 per ounce.

Reports from abroad are that crude platinum, assaying 83 per cent., has been selling at 17,300@18,000 rubles per pound—equivalent to \$16.75@17.60 per oz.—at the mines in Russia. This shows a strong upward tendency.

An employee of a New York dental company has been arrested on charges of stealing \$12,000 worth of platinum, the thefts running over nearly three years. The alleged thief was detected through an offer to sell a quantity of the metal at a figure below the market price.

Silver—Under pressure of bazar sales and speculative operations silver has been depressed to 22d. in London. The outlook for an advance of any importance in the metal is very discouraging for the present as the undigested blocks of silver held in the great eastern centers would indicate that the immediate demand is not likely to be large.

Silver

SILVER AND STERLING EXCHANGE.

Nov.	Sterling Exchange.	Silver.		Nov.-Dec.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York Cents.	London, Pence.
26	.....	.....	22½	30	4.8665	48¾	22½
27	4.8650	48½	22½	1	4.8675	47¾	22½
28	4.8665	48	23¼	2	4.8675	47¾	22

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

Shipments of silver from London to the East, year to Nov. 19, reported by Messrs. Pixley & Abell, London:

	1907.	1908.	Changes.
India.....	£10,173,904	£8,350,623	D. £1,823,281
China.....	217,350	516,400	I. 299,050
Straits.....	645,950	164,885	D. 481,065
Total.....	£11,037,204	£9,031,908	D. £2,005,296

Imports for the week, £3500 from Chile, £5000 from Mexico, £1000 from the West Indies, £156,500 from New York; a total of £166,000. Exports, £82,000 coin to the Straits, £100,000 bars to India; £182,000 in all.

Copper, Tin, Lead and Zinc

Nov.-Dec.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
26	.....	.....	63¾	.....	.....	.....	.....
27	14¾ @14¾	14¾ @14¾	63¾	30	4.25 @4.30	5.10 @5.15	4.95 @5.00
28	14¾ @14¾	14¾ @14¾	.....	29¾	4.25 @4.30	5.10 @5.15	4.95 @5.00
30	14¾ @14¾	14¾ @14¾	63¾	29¾	4.25 @4.30	5.10 @5.15	4.95 @5.00
1	14¾ @14¾	14¾ @14¾	63¾	29¾	4.25 @4.30	5.10 @5.15	4.95 @5.00
2	14¾ @14¾	14¾ @14¾	63	29¾	4.25 @4.30	5.10 @5.15	4.95 @5.00

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

Copper—The market during the week has been quiet, and there has been little change in prices. Transactions have been limited to a certain extent, and buying seems to have subsided for the time. Nevertheless there is a strong undertone apparent. From all attainable information there is little doubt that consumption is increasing steadily, and the indications are that it will continue to enlarge. This feeling has had its effect in supporting quotations; especially as it has been accompanied by the removal of some disturbing influences referred to heretofore. In short, the speculative lots which had a depressing influence on the market in the previous week were readily absorbed, and as a fairly steady, though by no means large, business was transacted from day to day, prices show a slight advance and the undertone considerable strength. At the close Lake copper is quoted at 14¼@14½c.; electrolytic in ingots, cakes and wire-bars 14¾@14¾c. The average of the week at which business in casting copper has been done is 13¾@14 cents.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15¾c. base, carload lots at mill.

In spite of the decrease in the statistics for the second half of November of 800 tons, the London Standard market was depressed throughout the week, owing to the realization of speculative accounts, and closes at the bottom, quotations being cabled as £63 for spot, £64 for three months.

Refined and manufactured sorts we quote: English tough, £66 10s.; best selected, £65 10s.@£66 10s.; strong sheets, £77 10s.@£78 10s.

Exports of copper from New York and Philadelphia for the week were 4390 long tons. Our special correspondent states the exports from Baltimore at 592 tons.

Tin—On account of the unfavorable statistical position of tin which it was expected would be revealed at the end of November, the market throughout the week has been rather soft. The expected happened and tin statistics for last month showed an increase of 1400 tons. The market in London closes somewhat better from the lowest, spot being quoted at £134, and three months at £135 10s. per ton.

The domestic market followed closely that of London, so far as quotations were concerned, but buyers remained shy. The market closes easy at about 29½ cents.

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

	In Store.	Afloat.	Total.
Great Britain.....	7,911	5,016	12,927
Holland.....	1,813	183	1,996
U. S., exc. Pacific ports....	2,193	2,837	5,030
Total.....	11,917	8,036	19,953

This shows an increase of 1427 tons over November.

Lead—On account of the continued absence of demand on the part of consumers, second-hand lots are being forced for sale, and in addition there has been a great deal of pressure to realize by Missouri producers. Prices receded farther, and the close is weak at 4.25@4.30c. New York.

The market abroad is also weak and closes at £13 2s. 6d. for Spanish lead, £13 5s. for English lead.

Spelter—Fair-sized orders are being placed daily both by galvanizers and brass manufacturers, and whatever offerings come on the market are being readily absorbed. Prices are again somewhat higher and the close is firm at 4.95@5c. St. Louis, 5.10@5.15c. New York.

The London market for spelter has fluctuated within narrow limits, but shows a very healthy undertone. The close is somewhat higher at £21 5s. for good ordinaries, £21 10s. for specials.

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

Other Metals

Aluminum—Prices are unchanged. The Aluminum Company of America continues

to quote 24c. base for No. 1 ingots; 33@34c. base for sheets. Foreign metal is offered at 22c., New York, for ingots. The range is, therefore, 22@24c. per lb. for ingots. Abroad the market is still in a demoralized condition, as low as 13½@14c. being quoted.

Antimony—The market is quiet, and very little business is being done. Quotations are 8.15@8.25c. for Cookson's, 8@8½c. for Hallett's, and 7¾@7½c. for ordinary brands.

Quicksilver—New York price is steady at \$46@47 per flask of 75 lb. San Francisco quotations are \$44@45 for domestic business and \$42@43 for export. London price is £8 10s. per flask, with £8 8s. 6d. quoted by jobbers.

Nickel—Large lots, 40c., New York.

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

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

Spanish Metal Exports

Exports of metals and ores from Spain, nine months ended Sept. 30, metric tons, as reported by *Revista Minera*:

Metals:	1907.	1908.	Changes.
Copper.....	6,592	10,245	I. 3,653
Copper precipitate.....	14,239	15,715	I. 1,476
Zinc.....	791	815	I. 24
Lead.....	140,515	140,145	D. 370
Quicksilver.....	1,492	1,499	I. 7
Minerals:			
Iron ore.....	6,870,953	5,758,935	D. 887,982
Copper ore.....	962,997	893,308	D. 69,689
Zinc ore.....	120,820	89,677	D. 31,143
Lead ore.....	4,438	2,493	D. 1,945
Manganese ore.....	57,717	16,593	D. 41,124
Pyrites.....	1,000,205	1,088,707	I. 88,502

Exports of salt, 381,565 tons in 1907, and 464,283 in 1908; increase, 82,718 tons.

Zinc and Lead Ore Markets

Joplin, Mo. Nov. 28—The highest price paid was \$45, the assay base price on the best grades of zinc sulphide concentrate ranged between \$40 and \$42, but this ore carrying an excess of 6 per cent. iron commanded a base price of \$44 and \$44.50 per ton. While a \$42 base was the highest settling price for the best grades, on this week's settlements, it is reasonably certain that offerings of \$42.50 and \$43 have been made for the following week's shipments. According to one buyer, who has been in the field for many years, buying under existing circumstances is the most strenuous it has ever been; competition is so strong that what might be thought an advance sure to get the ore priced is too low for the seller to take into consideration inside of 24 hours. The market has changed first in one and then in another camp every day during the week. Zinc silicate ore was advanced \$1 and \$2 per ton, the base being \$19 per ton of 40 per cent. zinc, with the highest reported price at \$25.50. The average price, all grades, is \$37.32 per ton. Lead concentrate declined

further during the week. The opening price was \$54 and the closing price \$52. The average, all grades, was \$53.08 per ton.

SHIPMENTS, WEEK ENDED NOV. 28

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,012,410	440,440	\$91,919
Joplin	2,280,720	251,270	52,270
Alba-Neck	674,610	.....	13,492
Galena	538,960	50,070	12,105
Spurgeon	514,100	168,070	11,071
Oronogo	535,260	3,900	10,435
Duenweg	387,250	43,110	8,887
Granby	400,000	146,000	8,400
Aurora	580,840	16,070	7,714
Prosperity	298,930	34,930	6,902
Miami	314,990	64,700	5,493
Carl Junction	193,490	1,440	4,294
Badger	188,850	5,830	4,119
Quapaw	230,440	14,350	4,066
Zincite	147,980	8,220	3,323
Cave Springs	150,670	.....	3,013
Carthage	65,830	.....	1,381
Sarcoux	66,240	.....	761
Wentworth	46,610	.....	535
Totals	11,628,180	1,248,400	\$250,180

48 weeks.....468,407,120 71,865,730 \$9,897,896
Zinc value, the week, \$217,043; 48 weeks, \$7,920,836
Lead value, the week, 33,137; 48 weeks, 1,977,060

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January.....	\$46.90	\$37.60	\$45.84	\$35.56	\$83.58	\$46.88
February.....	48.30	36.63	47.11	34.92	84.58	49.72
March.....	49.75	36.19	48.66	34.19	82.75	49.90
April.....	49.25	35.40	48.24	34.08	79.70	52.47
May.....	46.90	34.19	45.98	33.39	79.56	56.05
June.....	47.00	33.06	44.82	32.07	73.66	60.48
July.....	46.80	34.55	45.79	31.67	58.18	59.90
August.....	44.56	36.53	43.22	33.42	59.54	60.34
September.....	41.00	37.68	40.11	34.44	53.52	64.59
October.....	41.75	35.95	39.83	33.28	51.40	62.63
November.....	38.60	39.13	35.19	35.02	43.40	64.53
December.....	51.50	.....	30.87	.....	37.71	.....
Year.....	\$44.36	.....	\$43.68	.....	\$68.90	.....

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

Platteville, Wis., Nov. 28—One choice car of zinc ore brought \$42 per ton this week, the base price ranging from \$38 to \$40 per ton of 60 per cent. zinc. For 80 per cent. lead ore, \$54 was paid.

SHIPMENTS, WEEK ENDED NOV. 28

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	1,045,365	.....	240,000
Hazel Green.....	251,400	.....	.....
Galena.....	180,000	.....	.....
Benton.....	167,680	82,930	.....
Linden.....	96,700	66,100	.....
Days Siding.....	87,000	.....	.....
Livingston.....	80,000	56,000	.....
Mineral Point.....	26,000	.....	.....
Cuba City.....	.....	38,790	.....
Total.....	1,934,145	243,820	240,000
Year to Nov. 28.....	101,400,737	9,904,725	4,404,604

Shipment this week was curtailed by the bad condition of the roads; also by a breakdown at the plant of the Highland Mining Company. In addition to the above there was shipped to the Platteville Separating plant, 341,810 lb.; shipped to the Joplin Separator works, 496,400 lb. zinc concentrates.

There was shipped last week, not then reported, as follows: Highland, 255,100 lb. zinc and 50,000 lb. lead; Harker, 117,440 lb. zinc; Linden, 98,000 lb. zinc; Mineral

Point, 71,500 lb. zinc and 47,990 lb. lead; total, 542,040 lb. zinc and 97,990 lb. lead.

Chemicals

New York, Dec. 2—The general market is satisfactory, and spot business is gradually increasing. Futures have been contracted for to a considerable extent, but many consumers are still content to purchase for immediate requirements.

Copper Sulphate—The demand seems to be on a smaller scale with prices unchanged at \$4.75 per 100 lb. for carloads, and up to \$5 for smaller lots.

Nitrate of Soda—The market is quiet and not active. Quotations are unchanged at 2.15c. for spot and futures.

Phosphates—Exports of Florida phosphate rock through the port of Savannah in October are reported by J. M. Lang & Co. as follows: Germany, 9088; Sweden, 3298; total, 12,386 long tons.

Mining Stocks

New York, Dec. 2—A strong and active market early in the week was not carried through, and toward the close movements became rather confused and erratic. The whole course of the general market was evidently professional, and it looks as if prices were worked up to prepare for several large bond issues which are pending. There was no definite tendency apparent at the close, and many operators are inclined to think that the market generally has been worked up to a higher level than is warranted by existing conditions.

On the Curb copper stocks were active, but some of their earlier strength was lost. Sales continued large, but prices were variable, and the tendency was uncertain, as on the Stock Exchange. Ohio Copper was a leader, selling largely and advancing in price. Cumberland-Ely and Nevada Consolidated held their quotations well, but other stocks were weak. The Cobalt shares were generally weak, chiefly on account of the decline in silver. The Nevada gold stocks were irregular, and inclined to go off, with very few exceptions.

One sale of Homestake, of South Dakota, is reported, 100 shares changing hands at \$96.25 per share, an advance over the last quotation.

Boston, Dec. 1—Although there has been fair activity in copper-mining shares, prices, with some few exceptions, show slight net changes for the week. Operations have been of a more or less professional character, and profit taking has been freely indulged in, thus giving the market good tone. Money is easy, and it is the general belief that the demand for copper is bound to increase as business mends.

Amalgamated is about where it was a

week ago at just about \$85. It has sold both above and below this. The exploration of new territory and development now going on in some of the Lake Superior properties have incited considerable speculation in some of these favorites. Lake Copper has risen \$2.25 to \$20.75, and there has been more or less activity in Franklin, Isle Royale and La Salle. The latter rose to \$16.87½, but is back to \$14.75. Superior Copper touched \$36.50, but was off to \$33.50 tonight. Atlantic touched \$19.12½ during the week; Franklin, \$19.50; Massachusetts, \$7.37½; Michigan, \$15.25; Rhode Island, \$6.37½; Winona, \$7.75, and Wyandot, \$3.37½. * Adventure spurted \$2, and touched \$10.50 today.

Parrot rose \$2 to \$31, on reported favorable development. The Victoria mining management announced a \$1 assessment today, payable Jan. 11 next. The King Phillip Copper Company, another Michigan property, controlled by the St. Mary's Mineral Land Company, has also levied a \$1 assessment. Keweenaw, Superior & Boston and Batopilas are likely to be listed now on the Exchange within a short time.

Superior & Boston shot up over \$3 on the Curb, touching \$17.50. National Mining and Exploration, after shooting up from 71c. to \$1.25, fell back close to 60c. on the Curb. The failure to consummate a sale of bonds was responsible for the break. The Curb is again to move its quarters, but will likely go indoors, as large quarters have been leased in the financial district.

STOCK QUOTATIONS

NEW YORK Dec. 1		BOSTON Dec. 1	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	75	Adventure	10½
Amalgamated	85½	Allouez	139
Anacosta	50¾	Am. Zinc	25¾
Balakala	12½	Arcaadian	14½
British Col. Cop.	8	Arizona Com.	38¾
Buffalo Mines	3½	Atlantic	18½
Butte Coalition	27½	Bingham	130
Colonial Silver	9	Boston Con.	16½
Cum. Ely Mining	8¾	Calumet & Ariz.	121
Davis Daly	3½	Calumet & Hecla	685
Dominion Cop.	3½	Centennial	135
Douglas Copper	3½	Con. Mercur	42
El Rayo	4½	Copper Range	82¾
Florence	4¾	Daly-West	11
Foster Cobalt	47	Franklin	19
Furnace Creek	15	Greene-Can.	11½
Giroux	6¾	Isle Royal	24¾
Gold Hill	1½	La Salle	14¾
Goldfield Con.	7¾	Mass	7½
Granby	103	Michigan	14¾
Greene Gold	¾	Mohawk	70
Greene G. & S.	7	Nevada	19½
Greenw'r & D. Val.	75	North Butte	87¾
Guanajuato	2	Old Colony	65
Guggen. Exp.	185	Old Dominion*	58¾
Hanapah	15	Osceloa	127
McKinley Dar.	1.02	Parrot	30¾
Micmac	27½	Quincy*	95½
Mines Co. of Am.	17½	Rhode Island	6½
Mitchell Mining	3½	Santa Fe	2½
Mont. Sho. C.	1	Shannon	18
Nev. Utah M. & S.	3½	Superior	33¾
Newhouse M. & S.	6¾	Tamarack	185
Nipissing Mines	9¾	Trinity	117½
Old Hundred	18	United Cop., com.	114¾
Silver Queen	1.03	U. S. Oil	20
Stewart	¾	U. S. Smg. & Ref.	46
Tennessee Cop'r.	45	U. S. Sm. & Re., pd.	46
Tri-Bullion	1½	Utah Con.	47
Union Copper	¾	Victoria	4¾
Utah Apex	6¾	Winona	17½
Utah Copper	49	Wolverine	1150
Yukon Gold	41½	Wyandotte	3¾

*Ex. Div. †Ex. Rights.

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	34
Am. Smelt. & Ref.	93¾
Am. Sm. & Ref. pf.	106¾
Bethlehem Steel	24
Colo. Fuel & Iron	38¾
Federal M. & S. pf.	188½
Inter. Salt	15½
National Lead	83¾
National Lead, pf.	1106¾
Pittsburg Coal	113¾
Republic I. & S.	27¾
Republic I. & S. pf.	87
Sloss-Sheffield	79
Standard Oil	653
U. S. Red. & Ref.	113
U. S. Steel	55¾
U. S. Steel, pf.	112¾
Va. Car. Chem.	43¾

BOSTON CURB

Ahmeek	120
Black Mt.	5¾
East Butte	7¾
Hancock Con.	112
Keweenaw	5¾
Majestic	83
Raven	90
Shawmut	110
Superior & Pitts.	114
Troy Man.	98

NEVADA STOCKS. Dec. 2.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick.	.12
Belcher	.21	St. Ives	.20
Best & Belcher	.42	Triangle	.04
Caledonia	.15	BULLFROG STOCKS	
Chollar	.10	Bullfrog Mining	4.03
Comstock	.32	Bullfrog Nat. B.	4.04
Con. Cal. & Va.	.77	Gibraltar	.03
Crown Point	.40	Gold Bar	4.03
Exchequer	.30	Homestake King	.14
Gould & Curry	.10	Montgomery Mt.	4.05
Hale & Norcross	.42	Mont. Shoshone C.	.95
Mexican	.86	Original Bullfrog	4.01
Ophir	1.75	Tramp Cons.	.12½
Overman	.17	MISCELLANEOUS	
Potosi	.11	Bonnie Clare	.07
Savage	.26	Lee Gold Grotto	1.50
Sierra Nevada	.26	Nevada Hills	1.25
Union	.21	Nevada Smelting	1.25
Utah	.04	Nevada Wonder	.40
Yellow Jacket	.36	Nevada-Utah	3.06½
TONOPAH STOCKS		Penn-Wyoming	.17
Belmont	.87	Pittsburgh S. Pk.	.84
Extension	.40	Rawhide Coal	1.06
Golden Anchor	.01	Round Mt. Sphinx	.16
Jim Butler	.17		
MacNamara	.40		
Midway	.20		
Montana	.87		
North Star	.06		
Tono'h Mine of N.	6.68½		
West End Con.	.40		

COLO. SPRINGS Nov. 21

Name of Comp.	Clg.	Name of Comp.	Clg.
GOLDFIELD STOCKS		Acacia	7½
Adams	.04	Black Bell	6
Atlanta	.19	C. C. Con.	13¾
Booth	.27	Dante	6
Columbia Mt.	.16	Doctor Jack Pot.	7
Comb. Frac	1.37	Elkton	68
Con. Red Top	.10	El Paso	47½
Cracker Jack	.05	Findlay	17
Dia'offield B. B. C.	.10	Gold Dollar	8½
Goldfield Belmont	.05	Gold Sovereign	13¾
Goldfield Daisy	.87	Isabella	27
Great Bend	.28	Index	.....
Jumbo Extension	.27	Jennie Sample	5½
Kendall	.09	Jerry Johnson	3½
Lone Star	.07	Mary McKinney	31¾
May Queen	.04	Pharmacist	3½
N. Y. C. O. D.	.10	Portland	1.03½
Oro	.12	Un. Gold Mines	4
Red Hill	.20	Vindicator	81
Roanoke	.....	Work	18
Sandstorm	.20		

Assessments

Company	Delinq.	Sale.	Amt.
Amador, Ida.	Nov. 20	Dec. 19	\$0.02
American Fork, Utah	Oct. 28	Nov. 25	0.01
Blackjack Con., Utah	Dec. 15	Jan. 6	0.01
Cedar, Utah	Nov. 20	Dec. 10	0.03
Con. Cal. & Va., Nev.	Nov. 24	Dec. 15	0.20
Confidence, Nev.	Dec. 9	Dec. 30	0.20
Crown Point, Nev.	Nov. 17	Dec. 8	1.00
Ely Con., Nev.	Nov. 28	Jan. 11	0.02
Gould, Mont.	Nov. 7	Dec. 7	0.05
Liberty, Utah	Nov. 5	Dec. 2	0.03
Little Chief, Utah	Dec. 15	Jan. 5	0.01
Lower Mammoth, Utah	Dec. 18	Jan. 8	0.05
Lucky Dutchman, Nev.	Nov. 21	Dec. 12	0.01
Mexican, Nev.	Nov. 12	Dec. 3	0.10
Overman, Nev.	Dec. 2	Dec. 23	0.05
Prudential, Cal.	Dec. 3	Dec. 21	0.05
Roosevelt Oil, Cal.	Nov. 30	Dec. 19	0.03
Seg. Belcher & Mides, Nev.	Nov. 7	Nov. 28	0.03
Wabash, Utah	Nov. 10	Dec. 3	0.08
Washakie-Nev., Utah	Nov. 27	Dec. 18	0.10
Zeibright, Cal.	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.739
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.870
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	53.115	31.366	24.514
August	68.745	51.683	31.637	23.855
September	67.792	51.720	31.313	23.777
October	62.435	51.431	28.863	23.725
November	58.677	49.647	27.154	22.953
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

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

COPPER

Month.	NEW YORK.		LONDON.	
	Electrolytic	Lake.	1907.	1908.
January	24.404	13.726	24.825	13.901
February	24.869	12.905	25.236	13.096
March	25.065	12.704	25.560	12.875
April	24.224	12.743	25.260	12.928
May	24.048	12.598	25.072	12.788
June	21.665	12.675	24.140	12.877
July	22.130	12.702	21.923	12.933
August	18.356	13.462	19.255	13.639
September	15.565	13.388	16.047	13.600
October	13.169	13.354	13.551	13.646
November	13.391	14.130	13.870	14.386
December	13.163	.....	13.393	.....
Year	20.004	.....	20.661	.....

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

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	29.207
February	42.102	28.978	August	37.667	29.942
March	41.313	30.577	September	36.689	28.815
April	40.938	31.702	October	32.620	29.444
May	42.149	30.015	November	30.833	30.348
June	42.120	28.024	December	27.925	.....
Av. year.	.....	.....	.....	38.160	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.928	14.469
February	6.000	3.725	19.531	14.260
March	6.000	3.838	19.708	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.000
July	5.288	4.447	20.360	13.600
August	5.250	4.800	19.063	13.375
September	4.813	4.615	19.775	13.135
October	4.760	4.351	18.531	13.375
November	4.376	4.330	17.261	13.535
December	3.658	.....	14.500	.....
Year	5.325	.....	19.064	.....

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

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.876
March	6.837	4.665	6.687	4.527	26.094	21.076
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	4.485	5.922	4.338	23.850	19.031
August	5.701	4.702	5.551	4.516	21.969	19.563
September	5.236	4.769	5.086	4.619	21.050	19.563
October	5.430	4.801	5.280	4.651	21.781	19.750
November	4.925	5.059	4.775	4.909	21.438	20.875
December	4.254	.....	4.104	.....	20.075	.....
Year	5.962	.....	5.812	.....	23.771	.....

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

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the *ENGINEERING AND MINING JOURNAL* to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for \$1.00, thirty-three for \$5.00 and one hundred for \$15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM

7902—ALUMINUM CORPORATION, LTD.—The Development of the Aluminum Corporation, Ltd. (Elec. Rev., Nov. 6, 1908; 4 pp.) Reviews the development of the aluminum industry and describes the works of this company which is situated in North Wales. Illustrated. 20c.

7903—ALUMINUM INDUSTRY—The Situation in the Aluminum Industry. (Eng. and Min. Journ., Nov. 21, 1908; 1 p.) Editorial discussion of the market conditions and the effect the present prices has upon the use and consumption of the metal. 20c.

ANTIMONY

7904—PRODUCTION of Antimony in 1907. Frank L. Hess. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 3 pp.) Describes the production and principal features in the industry, together with other statistical data of interest.

ARSENIC

7905—PRODUCTION of Arsenic in 1907. F. L. Hess. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 3 pp.) Gives information and statistics relating to production, imports and prices during 1907.

BAUXITE

7906—ITALIAN BAUXITE—I Giacimenti Bauxitici di Civita d'Antino e Balsorano (Abruzzo). C. Martelli. (Rassegna Mineraria, Aug. 1 and 8, 1908; 5 pp.) Describes the occurrence and method of working several bauxite deposits in the province of Abruzzo. 60c.

CEMENT

7907—CEMENT INDUSTRY. Review of the Cement Industry for 1907. R. W. Lesley. (Cement Age, Oct., 1908; 14½ pp.) Reprint from THE MINERAL INDUSTRY, Vol. XVI, reviewing the principal features in the cement industry during 1907 and giving statistics of production in the United States and foreign countries. 20c.

7908—MANUFACTURE—Cement Raw Meal Mixer and Stores. (Engr., Nov. 13, 1908; 1½ pp.) Gives information on this subject which was received after the publication of an article in the issue of March 20, 1908. Gives detailed working drawings of the mixer, stores, cement weighing mechanism and the delivering and weighing mechanism. 40c.

7909—MECHANICAL EQUIPMENT—The Mechanical Side of the Cement Industry. (Cement Age, Oct., 1908; 44 pp.) A series of short articles, describing and illustrating the various mechanical appliances used in the manufacture of portland cement. The advantages of electricity to drive cement machinery are first discussed by J. B. Porter, and then steam shovels, rock crushers, grinding machinery, cement kilns, pulverizing machinery, screening and packing machines, are taken up in turn. 20c.

7910—PORTLAND CEMENT—The Commercial Value of Fine Grinding of Portland Cement. Ira A. Williams. (Eng.-Con., Oct. 14, 1908; 1½ pp.) Discusses the paper on this subject by Richard K. Meade and gives additional information. 20c.

7911—TESTS OF CEMENT with the Addition of Colloids. M. H. McGee. (Cement Age, Nov., 1908; 4½ pp.) Describes experimental tests conducted by the Ulster & Delaware Railroad Company to determine the impermeability of concrete by the addition of so-called "colloids or clay," and also to determine if increased strength is obtained by such an addition. Illustrated. 20c.

7912—WHITE PORTLAND CEMENT—Results of the Use of White Portland Cement. M. M. Smith. (Can. Engr., Oct. 23, 1908; 1½ pp.) This appeared in the annual report of the Indiana Engineering Society and describes tests made with white portland cement. 20c.

CLAYS

7913—ARKANSAS—The Clays of Arkansas.

John C. Branner. (Bull. No. 351, U. S. Geol. Surv., 1908; 247 pp.) Discusses the topography and geology; character, origin, occurrence and uses of Arkansas clays; geologic age and geographic distribution of the clays and a detailed report by counties. Illustrated.

COAL AND COKE

7914—ARGENTINA—El Carbon Argentino. Luis A. Huergo. (Bol. de la Soc. Nac. de Minera, April, 1908; 5 pp.) A review of the past and present condition of coal mining in the Argentine Republic.

7915—AUSTRALIA—Coalfields and Collieries of Australia. F. D. Power. (Aust. Min. Stand., Aug. 26, Sept. 2, 9, 16, 23 and 30, 1908; 8 pp.) Continuation of article previously indexed. \$2.

7916—AUSTRALIAN COLLIERIES—Use of Electricity in Australian Collieries. A. S. Brown. (Eng. and Min. Journ., Nov. 14, 1908; 1½ pp.) Discusses the work of a commission to investigate the conditions of coal mines in Australia and the results of the investigation. 20c.

7917—BELGIAN COLLIERIES—Some Belgian Electrically Operated Collieries. F. C. Perkins. (Min. Wld., Oct. 17, 1908; 2 pp.) Collieries producing 750,000 tons annually and employing more than 4000 miners operate with electric motors of 1260 h.p. capacity. Illustrated. 20c.

7918—BLASTING—Loading Blast Holes. J. K. Hay. (Eng. and Min. Journ., Nov. 14, 1908; 1 p.) This is a discussion of an article on this subject which appeared in the JOURNAL of November 7, 1908, in which additional information is given. 20c.

7919—CANADA—The Mining Operations of the Dominion Coal Company. F. W. Gray. (Can. Min. Journ., Nov. 1, 1908; 3½ pp.) Continuation of article published August 15. Describes the Dominion No. 6 colliery, including the surface plant. Illustrated. 20c.

7920—CHARCOAL—The Use of Charcoal in Blast Furnace Practice. (Iron and Coal Tr. Rev., Oct. 2, 1908; 1½ pp.) Describes the kiln for charring timber described by Dr. G. Gröndal, and methods of working, including the recovery of by-products; also gives details regarding the smelting of iron, using charcoal as fuel. 40c.

7921—COAL DUST—The Present Position of the Coal Dust Problem. James and John Ashworth. (Can. Min. Journ., Nov. 1, 1908; 2 pp.) Discusses the phenomena of coal dust explosions. Paper read before the Can. Min. Inst. 20c.

7922—COAL HANDLING.—Immense Grab Buckets Cut Down Handling Costs. (Black Diamond, Nov. 14, 1908; 1½ pp.) Describes the method of handling large quantities of coal at the plant of the Astoria Light, Heat and Power Company. Illustrated. 20c.

7923—COAL HANDLING MACHINERY—Simple Forms of Coal and Ash Conveyors. W. O. Rogers. (Power, Nov., 1908; 3½ pp.) Describes several types, some hand controlled and others requiring machinery, and shows how they are operated. Illustrated. 20c.

7924—COMBUSTION OF COAL—Regulation of the Economical Combustion of Coal. Richard K. Meade. (Min. Sci., Oct. 29 and Nov. 5, 1908; 5 pp.) Describes methods for checking improper firing, the excess of air used, the heat carried off by waste gases and the determination of economic conditions. Illustrated. 40c.

7925—ELECTRIC POWER—Development of Electric Power in Coal Mines. George E. Walsh. (Eng. and Min. Journ., Nov. 21, 1908; 1½ pp.) Discusses the transmission of electric power, electrically operated breakers, electric haulage and the use of induction motors. 20c.

7926—EXPLOSION—The Norton Hill Colliery Explosion. J. S. Martin. (Iron and Coal Tr. Rev., Oct. 30, 1908; 1½ pp.) This is a report by the Government Mine Inspector upon the circumstances attending the explosion which occurred in the Slyven vein incline of the Norton Hill Colliery in Somerset in April, 1908. Illustrated. 40c.

7927—EXPLOSIONS—Coaldust and Explosions. Victor Watteyne. (Min. Eng., Nov., 1908; 3½ pp.) Gives a comparison of some facts acquired at Courrières and La Boule. Translation of report published in *Annales des Mines de Belgique*. 20c.

7927-a—EXPLOSIONS—Prevention of Coal Dust Explosions in Mines. William N. Page. (Min. Wld., Nov. 28, 1908; 1 p.) Discusses the explosive power of dust in coal mines and suggests that an effective remedy is to reduce the velocity of ventilating currents. 20c.

7928—EXPLOSIONS—Prevention of Mine Explosions, Report and Recommendations. Messrs. Watteyne, Meissner and Desborough. (Bull. No. 369, U. S. Geol. Surv., 1908; 11 pp.) In this report recommendations are made concerning the selection of explosives, carrying explosives into mines, their use in the mine, the care of roadways, wetting coal dust, special precautions for gaseous mines, use of electricity, precautions against miscellaneous accidents, mine supervision and inspection and training for mine foremen, inspectors, etc.

7929—EXPLOSIONS—The Prevention of Mine Explosions. (Eng. and Min. Journ., Oct. 31, 1908; 2½ pp.) This is a report of the foreign experts who visited the United States and discusses precautions as to the handling and use of explosives, wetting the dust and the employment of electricity in underground operations. 20c.

7930—EXPLOSIVES FOR GASSY MINES—Nouvelles Recherches sur L'Emploi des Explosifs en Présence du Grisou et des Poussières de Charbon. H. Schermer. (Le Génie Civil, Aug. 15, 22 and 29, Sept. 5, 1908; 11 pp.) Describes in detail the structures and other apparatus, and the methods followed in the experiments at Frameries. \$1.40.

7930-a—FIRE—An Underground Fire Disaster. James Ashworth. (Eng. and Min. Journ., Nov. 28, 1908; 2½ pp.) This is the official account by the English Chief Inspector of Mines of the disaster which occurred at the Hamstead colliery in England. Describes the cause of the accident, the attempts at rescue and the use of rescue apparatus. Illustrated. 20c.

7931—FIRE—Underground Fire at Lochhead Colliery. (Min. Eng., Nov., 1908; 1½ pp.) Describes the workings of this colliery and the fire which took place. Illustrated. 20c.

7932—GAS-HOUSE COKE AND BY-PRODUCTS—Production of Gas, Coke, Tar and Ammonia at Gas Works and in Retort Coke Ovens and of Gas and Tar at Water-Gas Works in 1907. Edward W. Parker. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 34 pp.) Describes the production and principal features in the industry, together with other statistical data of interest.

7933—HAULAGE—Underground Haulage in Coal Mines. (Eng. and Min. Journ., Oct. 31, 1908; 1 p.) Discusses the growth of electric haulage in the anthracite field of Pennsylvania and the gradual replacement of horses and mules by electric haulage. 20c.

7934—HYGROMETRIC OBSERVATIONS in Coal Mines. A. H. Stokes. (Iron and Coal Tr. Rev., Oct. 2, 1908; 1 p.) Gives details of experiments made with the hygrometer in coal mines to ascertain the extent of moisture in the ventilating current, together with tabulation of results obtained. 40c.

7935—ILLINOIS—Studies of Illinois Coals. (Paper read before A.I.M.E., Oct., 1908; 72 pp.) This is a series of articles relating to coal in Illinois, having the following titles: Introduction, Summary and Conclusions, by H. Foster Bain; Coal Resources of Illinois, F. W. DeWolf; Sampling and Analysis of Illinois Coals, J. M. Lindgren; Occluded Gases in Illinois Coals, Perry Barker; Mining Waste and Mining Cost in Illinois, George S. Rice; Use of Illinois Coal for Domestic Purpose, J. N. Snodgrass; The Smokeless Combustion of Bituminous Coal, A. Bement; The Weathering of Coal, W. F. Wheeler; The

modification of Coal by Low-Temperature distillation, C. K. Francis. Illustrated.

7936—LONGWALL METHOD—The Cost of Longwall in England. George R. Dixon. (Eng. and Min. Journ., Nov. 14, 1908; 2½ pp.) Gives details and dimensions of the system, division of labor and wages paid, method of shooting down stone and loading out coal. Illustrated. 20c.

7937—MINE CAGES—The Arrangement of Keys for Modern Collieries. J. S. Barnes. (Iron and Coal Tr. Rev., Oct. 16, 1908; 2½ pp.) Describes methods for bringing a cage quickly to rest and for holding it steady for decking operations. Illustrated by working drawings. 40c.

7938—MINING METHODS at Seaton-Delavel Colliery. L. W. Mayer. (Eng. and Min. Journ., Oct. 17, 1908; 4½ pp.) A thick coal seam with strong cover is mined by longwall, which under similar conditions is considered impracticable in America. Illustrated. 20c.

7939—NORTH DAKOTA AND MONTANA—Investigations of the Coal Fields of North Dakota and Montana. Messrs. Leonard, Smith, Collier, Woolsey, Stone, Woodruff and Calvert of the U. S. Geol. Surv. (Bull. No. 341-A, U. S. Geol. Surv., 1908; 120 pp.) Describes the Sentinel Butte lignite field, the Miles City and Bull Mountain coalfields, the occurrence of coal near Crazy mountains, Mont., the Red Lodge and Lewistown coalfields. Illustrated.

7940—PEAT—The Utilization of Peat for Industrial and Metallurgical Purposes. E. Nystrom. (Journ. Can. Min. Inst., July, 1908; 5 pp.) Describes the investigation which has been carried on to determine the commercial value of the peat bogs of Canada. A commission was appointed to study the peat industry in foreign countries.

7940-a—PHILIPPINE COALS. Alvin J. Cox. (Eng. and Min. Journ., Nov. 28, 1908; 1½ pp.) This is an abstract of a paper in "Mineral Resources of the Philippine Islands," Manila, 1908. The development of coal in the Philippine Islands will be of great importance. Although coal occurs abundantly it is used only sparingly as a fuel. Gives data on the composition, steaming ability, fuel temperature and loss of combustible matter in ash. 20c.

7941—SHAFT SINKING AND EQUIPMENT—Re-sinking and Re-equipping the Great Western Colliery Company's Maratone Pits. Hugh Bramwell. (Iron and Coal Tr. Rev., Oct. 23, 1908; 4 pp.) Paper read before the South Wales Institute of Engineers describing the methods used to deepen and enlarge the shafts and to drift across the anticlinal in the "steam coal" measures. 40c.

7942—SHOT FIRING—Science and Art of Electricity. George Farmer. (Sci. and Art. of Min., Oct. 17, 31 and Nov. 14, 1908; 4 pp.) Continuation of article previously indexed. Discusses exploders used for electric shot firing, and the use of high and low tension detonators; also describes the method of connecting the cables and gives general hints for safety. 60c.

7943—SILESIA—Advance Methods of Mining Coal in Silesia. Lucius W. Mayer. (Eng. and Min. Journ., Nov. 7, 1908; 5½ pp.) Describes a system of mining in which filling is flushed into the workings and total extraction of unusually thick seams is accomplished. Illustrated. 20c.

7944—STOWING—The Flushing System of Stowing. (Sci. and Art. of Min., Oct. 31, 1908; 2½ pp.) Notes on the flushing system of stowing coal as adopted in the Pas de Calais coalfield. Illustrated. 20c.

7945—TIMBERING—Treating Mine Timbers: An Economical Movement. (Black Diamond, Nov. 14, 1908; 1 p.) Suggestions by forestry experts to Illinois coal operators regarding methods for cutting down the expense of supporting the roof. 20c.

7946—TUBBING for Modern Collieries. J. S. Barnes. (Engr., Oct. 23, 1908; 1½ pp.) Describes the construction of the shaft lining at English collieries. Gives the mathematics and formulas used in the design. Illustrated. 40c.

COPPER

7947—ATACAMITE ORE—The Commercial Extraction of Copper from Atacamite Ore. A. J. Evans. (Min. Journ., Oct. 10, 1908; ½ p.) Describes the deposits of atacamite in Chile and gives a resumé of the principal methods for treating atacamite ores as tried up to the present time and then describes the author's process, the main feature of which is the use of hydrogen sulphide as a precipitant. 40c.

7948—BRASS PLANT—The Plant of the Michigan Copper and Brass Company. (Metal Ind., Oct., 1908; 6½ pp.) Describes the new plant which this company has erected at Detroit, Mich. Illustrated. 20c.

7949—CALIFORNIA—Bully Hill Smelter and Mines, Shasta County, California. A. H. Martin. (Min. Sci., Oct. 29, 1908; 1½ pp.) Describes the mining and smelting methods employed at this rich copper producer on the Shasta belt. Illustrated. 20c.

7950—CONCENTRATING PLANT—The Boston Consolidated Company's Concentrating Plant. L. A. Palmer. (Min. Sci., Nov. 5 and 12, 1908; 1 p.) Gives an illustrated description of the

construction, equipment, arrangement and methods of this plant at Garfield, Utah. To be continued. 40c.

7951—CONVERTER PRACTICE—Operation of an Anaconda Copper Converter. C. Offerhaus. (Eng. and Min. Journ., Oct. 17, 1908; 5½ pp.) Reactions of the process, details of lining, charging, blowing, pouring and changing the vessels and methods of overcoming difficulties. Illustrated. 20c.

7952—MATTES—The Constitution of Copper-Iron and Copper-Lead-Iron Mattes. Charles H. Fulton and Ivan E. Goodner. (Paper read before A.I.M.E., Oct., 1908; 37 pp.) The constitution of copper-iron and copper-lead mattes is determined by metallographic and chemical means in the light of recent data supplied by a number of eminent authorities. Illustrated by curves and photo-micrographs.

7953—MEXICO—Growth of the Cananea Copper Smelting Works. Charles F. Shelby. (Eng. and Min. Journ., Nov. 14, 1908; 3 pp.) Describes pictorially some of the changes which have taken place at the smelting plant of the Cananea Consolidated Copper Company at Cananea, Sonora, Mexico, during the last few years. 20c.

7954—MEXICO—Notes on a Douglas Copper Property in Mexico. W. P. Tucker. (Min. Wld., Oct. 17, 1908; 1½ pp.) Describes cost of treatment, method of handling flue dust, traction haulage and the equipment for a 1000-ton furnace. Illustrated. 20c.

7955—MICHIGAN—Lode Copper Mining on Keweenaw Point, Mich. Charles J. Stone. (Min. Wld., Oct. 17, 1908; 1½ pp.) Describes some of the operations at this portion of the Michigan copper district which are attracting the attention of the mining men of Lake Superior. It was on this point that the first discoveries of copper were made and some of the old mines are now being reopened. Illustrated. 20c.

7956—MONTANA—The Relation of Copper to Pyrite in the Lean Copper Ores of Butte, Mont. J. F. Simpson. (Econ. Geology, Oct.-Nov., 1908; 10 pp.) Gives the results of an investigation of these lean pyrite ores which are sufficiently definite to warrant careful presentation. The purpose of the investigation was to determine whether the copper in the Butte ores forms a chemical compound or a mechanical mixture with the pyrite when there is an extremely small percentage of copper present. Illustrated. 60c.

7957—PYRITIC SMELTING—La Fundición Pirítica de los Minerales de la Mina Viuda-Algarrobo-Copiapo. F. A. Sundt. (Bol. de la Soc. Nac. de Minería, May, 1908; 3 pp.) States results of treating this Chilean ore by pyritic smelting.

7958—RECOVERY FROM MINE WATERS—A Copper Precipitating Plant. H. W. Chittenden. (Eng. and Min. Journ., Oct. 31, 1908; 1½ pp.) Describes a plant for the recovery of copper from mine waters which has been installed by the Copper Queen Consolidated Mining Company at Bisbee, Arizona. Illustrated. 20c.

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8035—MALLEABLE CASTINGS—Production of Malleable Castings.—IX. Richard Moldenke. (Iron Tr. Rev., Nov. 12, 1908; 3 pp.) Continuation of article previously indexed. Describes the construction of the open hearth and discusses the heating of the furnace and gas and oil fuel. Illustrated. 20c.

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PETROLEUM

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8151—SMELTER FUMES—Device for Shaking Bags in Smelting Baghouse. (Eng. and Min. Journ., Nov. 21, 1908; 3 p.) Describes an invention by means of which the bags may be shaken more efficiently by hand from the outside without opening the room. A large number of bags may also be shaken at one time. 20c.

8152—SMELTER FUMES.—Their Condensation and Utilization. F. R. Carpenter. (Proc. Colo. Sci. Soc., Vol. IX, Oct., 1908; 14 pp.) Describes various methods which have been used for collecting smeltery smoke and gives the author's methods for condensing the fumes. The paper includes a discussion by C. W. Comstock and a reply by Mr. Carpenter. Illustrated.

MINING AND METALLURGICAL MACHINERY

8153—AIR COMPRESSORS. C. S. Vesey Brown. (Cassier's Mag., Oct., 1908; 274 pp.) Gives an elaborate description of the construction of air compressors and the parts composing them. Profusely illustrated. 40c.

8154—CONDENSER—An Improved Air Cooled Surface Condenser. (Min. Wld., Oct. 24, 1908; 14 pp.) Gives the advantages of the Hornbrook air-cooled surface condenser in mining localities where water for the steam plant is scarce or impure. Illustrated. 20c.

8155—CONVEYING OF MATERIALS. (Journ. A. S. M. E., Mid-Oct., 1908; 5 pp.) Continued discussion of three papers on this subject, which were previously read before the Society.

8156—DERRICKS—Design of Derricks. William Reed. (Industrial Mag., Nov., 1908; 11 pp.) Discusses the mechanics of the derrick and gives data used in their construction. Illustrated. 20c.

8157—ELECTRIC POWER for Quarrying Marble. C. T. Maynard. (Power, Oct. 13, 1908; 24 pp.) Illustrated description of the plant of the Vermont Marble Co. at Proctor, Vt. 20c.

8158—GAS ENGINE—The Du Bois Gas Engine. G. W. Malcolm. (Power, Nov., 1908; 54 pp.) Gives the salient features of a new single-acting type embodying interesting departures in the application of standard principles of design. Illustrated. 20c.

8159—GAS PRODUCER PLANT—A Large Suction Gas Producer Power Plant. (Power and Engr., Oct. 27, 1908; 34 pp.) Describes the large suction plant in service at the works of the Fairbanks, Morse Co., Beloit, Wis., with reference to special features of engine and producer design. Illustrated. 20c.

8160—GAS PRODUCER PLANT—The Reliability of the Producer Gas Plant. T. L. White. (Cassier's Mag., Oct., 1908; 54 pp.) Describes a test made upon a producer gas plant and discusses gas plants from the view point of reliability as compared with other sources of power. 40c.

8161—GAS PRODUCERS for Bituminous Coal. Oskar Nagel. (Cassier's Mag., Oct., 1908; 4 pp.) Describes methods for removing tar and discusses numerous makes of producers. Illustrated. 40c.

8162—HOIST—High-Power Electric Hoist at Elizabeth Mine, Belgium. Frank C. Perkins. (Min. Sci., Nov. 19, 1908; 14 pp.) Describes the method of applying electricity to large hoisting plants and gives a description of the equipment. Illustrated. 20c.

8163—OIL ENGINE PLANT—Large Oil-Engine Electrical Plant. (Elec. Wld., Oct. 3, 1908; 24 pp.) Describes the new power plant of the Prairie Pebble Phosphate Company at Mulberry, Fla. Illustrated. 20c.

8164—ROASTING FURNACES. Oskar Nagel. (Electrochem. and Met. Ind., Nov., 1908; 24 pp.) Describes the Brown, Wethey, White-Howell, McDougall, Herreshoff and Wedge roasting furnaces. Illustrated. 40c.

8165—SAFETY DEVICE for Mine Cages. E. D. Spencer. (Min. Wld., Nov. 7, 1908; 4 p.) Abstract of a paper read before the Midland Counties (Eng.) Institution of Mining Engineers, September, 1908, describing a safety device, the important feature of which is the design of the gripping device which utilizes the weight of the cage as well as contact with the guides. Illustrated. 20c.

8166—SUCTION GAS PLANT—New Chum Goldfields Mine, Bendigo (V.). Donald Clark. (Aust. Min. Stand., Sept. 23, 1908; 1 p.) Describes the operation of the suction gas plant of the Crossley type, installed at the above mine, and states the results obtained. 40c.

8167—TRANSIT SUPPORT—Universal-Grubenspreize and Zentrierapparat der Gebrüder Rost in Wien. E. Dolezal. (Oest. Zeit. f. B. u. H., July 4 and 11, 1908; 5 pp.) Describes a useful attachment by means of which a transit can be centered and supported from opposite walls. 60c.

8168—WATER ANALYSIS—The Mineral Analysis of Water for Industrial Purposes and Interpretation by the Engineer. Herman Stabler. (Eng. News, Oct. 1, 1908; 3 pp.) Discusses the four classes of water impurities which are suspended matter, colloidal matter, dissolved solids and dissolved gases. Contains much valuable information regarding water softening, boiler waters, etc.

8169—WATER SOFTENING and Practice at Broken Hill Proprietary. Leslie Bradford. (Aust. Min. Stand., Sept. 23, 1908; 14 pp.) Discusses various methods of softening hard water, giving the reactions involved and the theoretical amounts of chemicals to be added. Illustrated. 40c.

ANALYTICAL CHEMISTRY

8170—BRASS ANALYSIS—The Complete Analysis of Brass. Albert J. Hall. (Electrochem. and Met. Ind., Nov., 1908; 34 pp.) Gives detailed methods of determining tin, lead, copper, zinc, iron, antimony and arsenic and in the case of copper and zinc, both volumetric and gravimetric methods are given. Instructions are included for the standardization of solutions. 40c.

INDUSTRIAL CHEMISTRY

8171—NITRIC ACID—Manufacture of Nitric and Mixed Acids. (Chem. Engr., Oct., 1908; 84 pp.) Describes the various methods of manufacturing nitric and mixed acids used in the manufacture of nitro explosives. Gives the various steps in the process and considerable detail as to temperature, weights, etc. 40c.

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

ABRASIVES—		COPPERAS —Bulk 100 lb. \$0.55	POTASSIUM—
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Carborundum, f.o.b. Niagara Falls, powd. lb. .08		In bags.60@.70	Powdered or granulated. " .09@.09½
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Emery, in kegs; Turkish flour.01½@.02½		American. per M. 30.00@40.00	Carbonate (80@85%) " .03½@.04
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Grains, in kegs.02½@.03		ordinary. 2.50	Carloads (30,000 lb.) 18c.
Jarnet, per quality. sh. ton 25.00@35.00		Dowestic f.o.b. shipping port:	5-ton lots. 18½c.
Umice Stone, Am. Powd., 100 lb. 1.60@2.00		FLUORSPAR—	Less than 5 tons. 19c.
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Lump, per quality.03@.20		Lump. lg. ton. 8.00@10.00	Permanganate. lb. .09½@.10
Rottenstone, ground.01½@.04		Ground. 11.50@13.50	Prussiate, yellow. " .13@.13½
Lump, per quality.05@.25		Foreign crude ex. dock. 8.00@10.00	Red. " .30@.33
Rouge, per quality.05@.30		FULLER'S EARTH —Lump, 100 lb. .75@.85	Sulphate. 100 lb. 2.15½@2.21½
Steel Emery, f.o.b. Pittsburg.07½@.07½		Powdered.75@.85	PYRITE—
ACIDS—		GRAPHITE —Ceylon.	Domestic, non-arsenical, furnace size, f.o.b. mines. per unit. 11@11½c.
Acetic 28%. lb. .021 up		Flying dust, finest to best. lb. .02½@.04	Domestic, non-arsenical, fines, per unit, f.o.b. mines. 10@10½c.
Boric.07		Dust.04½@.05	Imported non-arsenical, furnace size, per unit. 12½
Hydrofluoric, 30%.02½@.03		Chip.04@.08	Imported, arsenical, furnace size, per unit. 12
" 48%.06		Lump.05½@.12	Imported fines, arsenical, per unit. 108½@.09
" 60%.10		Large lump.08½@.10½	Imported fines, non-arsenical, per unit. 10½@11c.
Hydrochloric acid, 20°, per lb. 1.25@1.50		GYPSUM—	Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.
Nitric acid, 38°. 4.25@4.62½c.		Fertilizer. sh. ton. 5.00	SALT —N. Y. com. fine 280 lb. bbl. .72@1.13
Sulphuric acid, 50°, bulk per ton. \$12 up		Ground. 4.00@7.00	N. Y. agricultural. sh. ton. 3.80@4.50
60°, 100 lb. in carboys.85@1.12½		INFUSORIAL EARTH—	SALTPETER —Crude. 100 lb. 4.00@4.50
60°, bulk ton. 16.00@18.00		Ground Am. Best. lb. .01½	Refined, crystals. " 5.50@6.00
66°, 100 lb. in carboys. 1.00@1.25		German.02½@.02½	SILICA—
66°, bulk ton. 18.00		LEAD —Acetate (sugar of) brown,07½	Ground quartz, ord'ry, lg. ton. 10.00@15.00
Oxalic.06½@.06½		Nitrate, com'l.08½@.08½	Silex, ground. " 13.00@15.00
ALCOHOL —Grain 95%. gal. 2.63		MAGNESITE —Greece.	Silex, floated. " 35.00@40.00
Denatured.45@.49		Crude (95%). lg. ton. 8.00@10.00	Lump quartz. " 5.00@6.00
Refined wood, 95@97%.49@.55		Calcined, powdered. sh. ton. 26.00@35.00	Glass sand. " 2.75
ALUM —Lump. 100 lb. \$1.75		Bricks, domes, per qual. f.o.b. Pittsburg. M. 160@200	SILVER —Nitrate, crystals. oz. .37½@.40
Ground. 1.85		MAGNESIUM—	SODIUM—
Chrome Alum.04½@.04½		Chloride, com'l. 100 lb. .90@1.25	Acetate. lb. .04@.04½
ALUMINUM —Sulphate, com'l. lb. 1.10@1.75		Sulphate (Epsom salt). 100 lb. .85@1.00	" Alkali. per 100 lb. 58/48. 80@.87½
AMMONIA —24 deg. lb.04½@.05½		MANGANESE—	Bicarb. soda, per 100 lb. 1.00@1.30c.
" 26 deg. lb.04½@.05½		Foreign, crude, powdered:	Soda, caustic, per 100 lb. 76/60 1.75@1.85
AMMONIUM—		70@75% binioxide. lb. .01@.01½	Soda, caustic, powdered.02½@.03½
Bromide. lb. .23		75@85% binioxide. " .01½@.01½	Salt cake, per 100 lb., bulk.40
Carbonate.07½@.08		85@90% binioxide. " .01½@.05	Salt cake, bbl.65@.85
Muriate grain.05½@.06½		90@95% binioxide.06½	Soda, monohydrate, per lb. 1.4@1.75c.
Lump.09½@.09½		Ore, 80%-85%. sh. ton. 16.00@32.50	Bichromate. lb. .07½@.07½
Sulphate, 100 lb. 3.05@3.10		MARBLE —Flour. sh. ton. 8.50@10.00	Bromide. " .13@.14
Sulphocyanide com.30		MINERAL WOOL—	Chlorate, com'l. " .09@.09½
chem. pure.40		Slag, ordinary. sh. ton. 19.00	Cyanide ("100% KCN")
ANTIMONY —needle, lump.03½@.03½		Selected. " 25.00	Carloads (30,000 lb.) 18c.
ARSENIC —White.03@.03½		Rock, ordinary. " 32.00	5-ton lots. 18½c.
Red.07½@.07½		Selected. " 40.00	Less than 5 tons. 19c.
ASPHALTUM—		MONAZITE SAND—	Hyposulphite, Am. " 1.35 up
Barbadoes. per ton. 40.00@80.00		Guar. 97% with 5% Thorium oxide, nominal. lb. .08 and up	German. " 1.60@1.70
West Indies. 20.00@60.00		NICKEL—	Phosphate. 100 lb. 2.10@2.30
Egyptian.10@.11		Oxide, crude, lb. (77% for fine metal contained.47	Prussiate. " .08@.08½
Gilsonite, Utah ordinary per ton. 22.50@30.00		Sulphate, single. lb. .09@.11	Sal soda, f.o.b. N. Y.65@.70
Trinidad. 22.50@30.00		Sulphate, double. lb. .06½@.08	Foreign, f.o.b. N. Y.80@1.00
California. 21.00@27.00		NITRATE OF SODA —100 lb. 95% for '08 2.15	Silicate, com'l. " .80@1.15
BARIUM—		95% for 1909. 2.15	Sulphate, com'l (Glauber's salt) 100 lb. .60@.75
Carb. Lump, 80@90% lg. ton. 30.00@35.00		95% for 1910. 2.15	Sulphate, com'l, calcined.65@.85
Precipitated 96@98%. lb. .02@.02½		96% is 2½@7½c. higher per 100 lb.	STRONTIUM —Nitrate. lb. .07½@.08
Powdered, 80@90%. lb. .02@.02½		OZOKERITE —best. lb. .14@.17	SULPHUR—
Chloride com'l. ton. 39.00@41.00		PAINTS AND COLORS—	Louisiana (prime) to New York, Boston or Portland. lg. ton. 22.50
Nitrate powdered, in casks. lb. .05½@.06		Litharge, Am. powdered. lb. .06½@.07	To Philadelphia or Baltimore. 22.50
Blanc Fixe. per lb. .02½		English glassmakers'. " .08½@.08½	Roll. 100 lb. 1.85@2.15
BARYTES—		Lithopone.03½@.07	Flour. 2.00@2.40
Am. Ground. sh. ton. 14.00@17.50		Metallic, brown. sh. ton. 16.50@22.00	Flowers, sublimed. 2.20@2.60
Floated. 18.00@21.00		Red. 14.00@18.00	TERRA ALBA —French & Eng. 100 lb. .85@1.00
Foreign floated. 19.50@22.50		Ocher, Am. common. " 8.50@9.00	TALC —Domestic. sh. ton. 15.00@25.00
BISMUTH —Sub-nitrate. lb. 1.50		Best. 16.00	French. " 16.00@25.00
BLEACHING POWDER —35%, 100 lb. 1.25@1.40		Dutch, washed. lb. .02½@.03	Italian, best. " 35.00@40.00
BLUE VITRIOL —(copper sulphate), carload, per 100 lb. 4.75		French, washed. " .01½@.02½	TIN —Bi-chloride, 50%. lb. .09½ up
BONE ASH lb. .02½@.04		Paris green, pure, bulk. " .21½	Crystals. " .21 up
BORAX , sacks.04½		Red lead, American.06½@.07	Oxide, lb. " .33@.35
CALCIUM —Acetate, gray, 100 lb. 1.50@1.55		Foreign.08½@.08½	URANIUM —Oxide. " 3.50
Acetate, brown. lb. 1.00@1.05		Turpentine, spirits bbl., per gal.43	ZINC—
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. sh. ton. 65.00		White lead, Am., dry. lb. .05½@.05½	Chloride solution, com'l 20°.02½
Chloride, f.o.b. N. Y. 11.00@14.00		American, in oil.06½@.07	Chloride, granular. " .04½@.05
CEMENT—		Foreign, in oil.10½@.10½	Dust. " .04½@.05
Portland, Am. 500 lb. bbl. 1.55@1.60		Zinc white, Am. extra dry.05½@.05½	Sulphate. " .02@.02½
Foreign. 2.25@2.90		French, red seal, dry.08½@.08½	
" Rosendale," 300 lb.85		French, Green seal, dry.10½@.10½	
(in sacks).65		PHOSPHATES —Acid. 60c. per unit	
Slag cement.75@1.25		*Fla., hard rock. 10.00@10.25	
CHROME ORE—		land pebble 68%. 4.25@4.50	
New Caledonia 50% ex. ship N. Y. per lg. ton. 17.50@20.00		†Tenn., 78@80%. 6.00@6.50	
Bricks, f.o.b. Pittsburg, M ton 175.00		75%. 5.00@5.50	
CLAY, CHINA —Am. common ex-dock, N. Y. ton. 8.00@9.00		68@72%. 4.00@4.50	
Foreign. 10.00@17.50		‡So. Car. land rock. 6.75@7.00	
COBALT —Oxide. lb. 1.40		river rock. 5.00@5.50	
		*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.	

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites, and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract.