

The Engineering and Mining Journal

VOL. LXXXII.

NEW YORK, OCTOBER 27, 1906.

NO. 17.

ORE BREAKING AT LAKE SUPERIOR

A Description of the Methods Employed in the Copper Mines

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The systems of mining employed in the Lake Superior copper mines were, until comparatively recently, practically the same, with the exception of a few modifications in pillar-forming and handling of rock in stopes and levels. But within the last few years, on the opening of more steeply pitching lodes, it has been found necessary or desirable to employ filling systems, such as are now the practice in the Baltic and Trimountain mines of the South range. Overhand stoping is, however, the method of attack, regardless of the system of mining employed.

At present there are really two distinct systems of mining employed, namely: room-and-pillar and what might be called long wall, the ultimate object in both being the total extraction of the copper rock. The former system is almost universally employed, but does not, except to a limited extent, attain full and complete extraction, which may be considered a positive advantage under existing conditions. By the latter system complete extraction is readily accomplished. It is a logical and practical outgrowth of certain more or less extreme conditions.

LOCATION OF SHAFTS AND LEVELS

Development by inclined shafts from the outcrop is, when accessible, the usual practice and may also be the method resorted to even though the outcrop does not lie within the property lines. The Allouez shaft, which has a pitch of 80 deg. until the lode is encountered, is a case in point. Further, it is common practice to sink the shafts in the lodes. Local variations in pitch may throw the shafts into the footwalls, if a fixed grade is maintained, or change the direction of the shafts, which is not desirable. Shafts may, then, be wholly or in part in the footwall; in the former case from choice, in the latter from necessity.

When a shaft lies within the vein it is customary to load the skips from the sides, i.e., the level tracks terminate at the sides of the shaft, although a line of track, connecting those in the levels on both sides of the shaft, is not unusual. A shaft sunk in the footwall must be connected with the levels, driven in the vein, by crosscuts. The main line of track is then continuous with respect to the two sides of the shaft,

a branch track in the crosscut making connection with the shaft compartments. In the former case the shaft stations are in the lode, while in the latter case they are cut in the footwall.

When more than one lode is worked from shafts sunk on one lode only, crosscuts may connect the separate lodes; if of any considerable distance apart, however, it is customary to sink shafts on the individual lodes, rather than handle rock through crosscuts. The two lines of Calumet & Hecla on the amygdaloid and conglomerate lodes illustrate this point. Further, crosscuts in the shape of drifts are largely employed in exploratory work; drifts are also a means of exploration in the lodes themselves.

The distance between shafts, which is determined largely by methods of handling rock underground, may be illustrated by the practice at the Wolverine and Atlantic mines, which distances are approximately as follows: Shafts Nos. 1 and 2, 2370 and 1570 ft.; Nos. 2 and 3, 570 and 850 ft.; Nos. 3 and 4, 1280 and 750 ft.; and Nos. 4 and 5 (Atlantic alone), 600 ft. However, the controlling factor is tramming, although extent of property and occurrence of pay rock have considerable influence in choice of distance.

Levels are driven from the shafts at distances, along the line of the shafts, of 100 to 125 ft. For the first 25 to 40 ft., on both sides of the shafts, the openings, or drifts, have dimensions of 6 ft. wide by 7 ft. high to the thickness of the lode in width by 8 ft. high. Occasionally, when poor or barren ground is encountered along the lines of the levels, drifts may be employed as connecting passages between the workable portions of the stopes, thus opening and maintaining haulage-ways throughout the mines. Drift stopes (passages 25 ft. wide) may, however, be employed in place of drifts, when pay rock prevails in the stopes, by means of which the expense of development is somewhat reduced and the subsequent work of stoping is facilitated.

EXTRACTION OF ORE

The work of extraction, i.e., stoping and handling of rock in the stopes, is largely determined by the width and pitch of the lodes. When the width is such, say under 20 ft., that the column support of the drills can be set up between the

hanging and foot walls, the work of stoping is comparatively easy. When, however, the width of lode precludes this and the column must be mounted on blockings or broken rock, the work is rendered much more difficult. Further, the ease, or difficulty with which the broken rock is cleared from the face of the stope influences to a marked degree the rate at which the stoping operations can be carried on.

The methods of working in the various mines, as previously indicated, have many points in common and, in fact, may be considered similar, the principal differences being in matters of support and disposing of pay rock and waste. In general the method of extraction consists in overhand stoping (overhand stoping in steeply pitching lodes and breast stoping the less steeply inclined) the stoping operations being subdivided, for convenience, into three operations, namely, drift stoping, cutting out stoping, and raise stoping.

Drift stoping has already been partially described, but to be more specific, it consists in driving a passage 25 ft. wide which is made up of 6 ft. of drift and 19 ft. of stope, both being carried forward at one and the same time, and running parallel with the line of a level. The miner is paid for the first 6 ft. (drift) by the number of linear feet advanced, while for the remaining 19 ft. (stope), he receives pay per fathom broken.

In cutting-out stoping, portions of the face of a stope, from 7 to 10 ft. in width and 100 ft. long, are removed in succession, thus advancing a wide expanse of face up the stope and parallel with the level. It may be considered stoping proper, as the greater part of cutting out, or removing the copper rock, is accomplished by this operation.

Raise stoping is begun at the footwall side of a drift, or drift stope, and is usually carried directly up the pitch to the level above, making connection by means of a break-through. Raise stoping is usually employed along boundary lines or in forming pillars; also in establishing connection, as soon as possible, between levels for the accommodation of air pipes and the passage of men and ventilating currents.

The center or draw-cut arrangement of

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holes is employed when convenient, although the condition of the face worked is the dominant factor in choice of position of the individual hole.

SIZE AND ARRANGEMENT OF PILLARS

Considerable care is usually taken in determining size and arrangement of the pillars left in the stopes, and although an attempt is made to follow a fixed system, it is often widely departed from, owing to the occurrence of pay rock and the

pitch of lodes. Shaft pillars are invariably employed and are of two kinds due to method of development. When a shaft is sunk in a lode, the pillars consist of the two portions of lode left between the shaft and the workings on both sides and range from 25 to 50 ft. in width, making a total width of 50 to 100 ft. of pillar for the protection of the shaft. Shafts sunk in the footwall have the same width of pillar as in the former case, but the shaft

called "wall pillars." Arch and wall pillars are left every 50 to 75 ft. along the stopes and vary in size from 6 to 16 ft. square, being roughly so only.

Beginning with the termination of the shaft pillars, at the top of the stopes, there is left, at the completion of the cutting-out stope operations, a long, thin pillar, or rather series of pillars, as the main pillar is pierced by a number of break-throughs, which forms the floor of

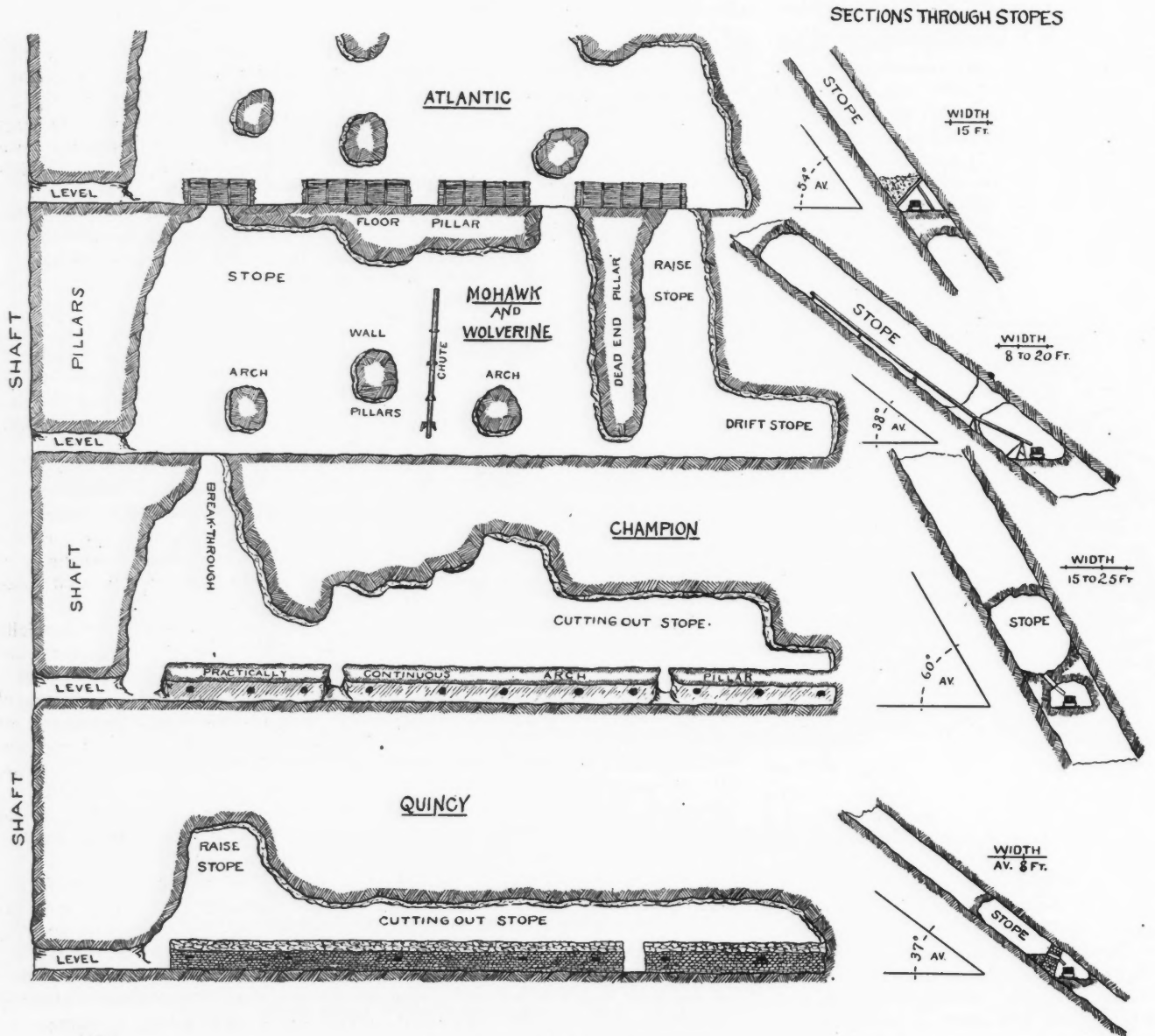


FIG. 1. TYPICAL FORMS OF STOPES

unstable condition of the hanging wall. Extra strong and firm hanging wall may lead the miner to extend, unduly, the limit set for spacing of pillars, or the occurrence of pay rock at the proper point for the location of a pillar may cause a similar shifting of point of support either along or up the stope.

The kind, position, and size of pillars employed vary somewhat with the prevailing conditions, such as width and

being outside of the lode leaves one continuous pillar, 50 to 100 ft. wide, instead of two, the sum of which is identical.

The next form, in order, from the shaft outward, is the "arch pillar," which is located a short distance up the stope from the level, or may form one side of the arch of the drift. Occasionally, these pillars are formed at some distance from the levels, even half-way, or more, up the stopes, in which case they are preferably

the level above and is known as "floor," or "chain" pillar. Width of this form of pillar is usually 8 to 10 ft., although it may, in special cases, be given a width of 20 ft. In the Champion mine no chain pillars are left; instead of them, 8-ft. arch pillars are left directly above the drifts forming the levels, which pillars are practically continuous, except for chute openings, or mill holes. Further, it may be of interest to note in this connection that in

the Quincy mine a similar pillar is employed, which is, however, built up of waste rock; floor or chain pillars are also employed.

At the end of every two or three stopes, of 100 ft. in length each, long pillars, known as "dead ends," are left, which extend from level to level transversely with the stopes. These pillars are really a combination of arch, wall and floor pillars, all run together, forming a long pillar which aids materially in insuring the integrity of the workings.

METHODS OF HANDLING ROCK

The really distinguishing features characterizing the practice of working in

through mill holes in pillars. No shoveling is necessary in loading cars. A method similar to that employed in the Champion is in use in the Quincy mine (pitch 37 deg.) except that walls of waste are built, reaching from foot to hanging walls, instead of leaving arch pillars. The fine rock broken in the stopes is shoveled down, while the coarse rolls down to platforms from which it is loaded into cars through chutes set in the walls. In the Wolverine and Mohawk mines, with pitch ranging from 35 to 40 deg., the broken rock runs down the steeper stopes, while on the flatter portions, it must be shoveled, or run down in chutes; in the

packwalls, which are 8 ft. high. Upon these walls 14-ft. timbers (18 to 30 in. in diameter), called wall pieces, are placed, reaching from wall to wall. On these timbers, in turn, is placed plank or pole lagging, and finally waste rock is thrown on, ultimately filling the whole space between hanging and foot walls. The levels are thus formed and their permanency insured. Milling holes are begun at the footwall side of the walled passages and are built up, as the stoping operations proceed upward, furnishing waste rock for their construction. The mill holes are round, 5 ft. in diameter, and when completed are about 50 ft. deep.

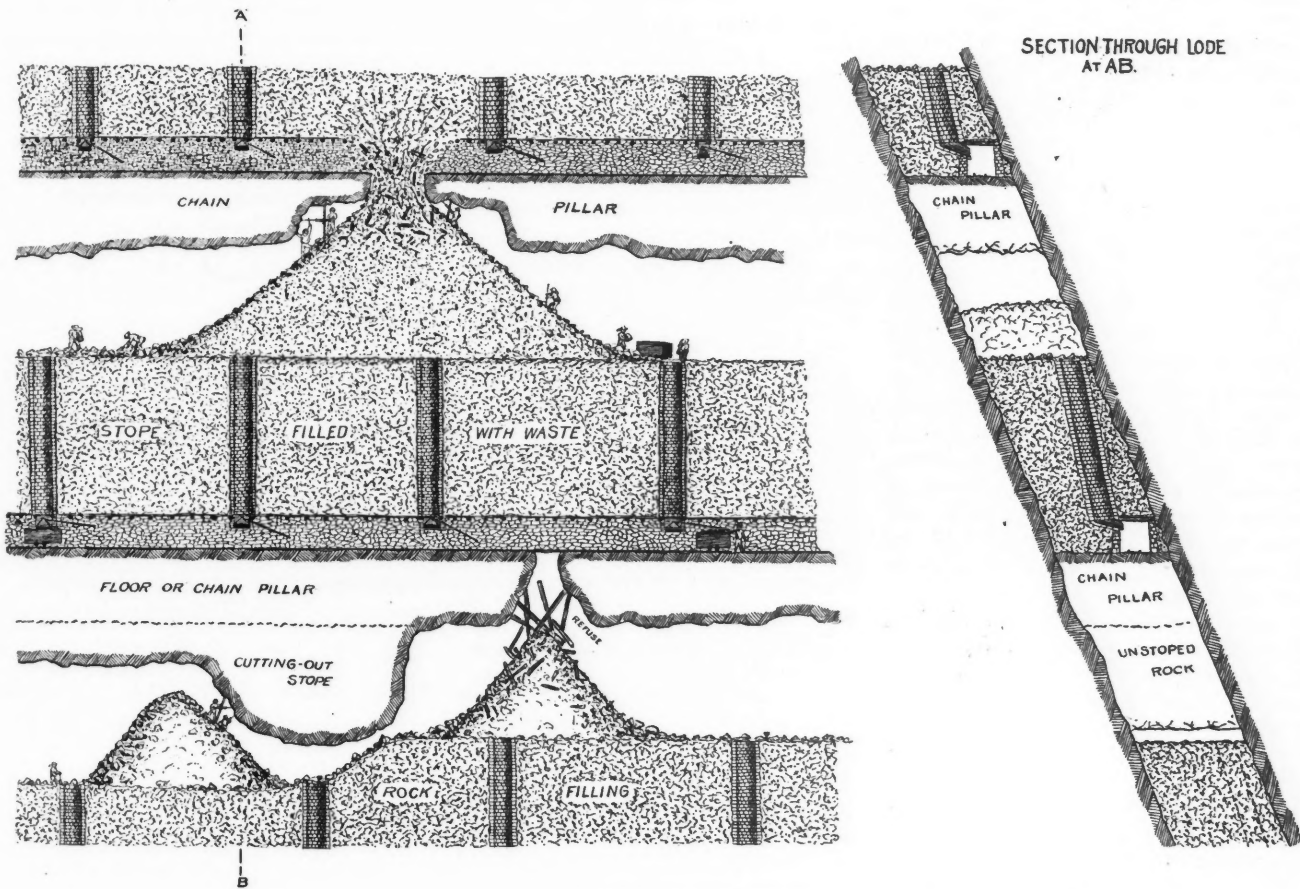


FIG. 2. THE FILLING SYSTEM

the various mines are the methods of handling the mine product, which influence, in turn, the methods of breaking ground in the stopes and to a certain extent their arrangement. A few of the typical methods of handling rock in the stopes are given and may be outlined as follows (see Fig. 1): In the Atlantic mine (now closed), with a pitch of 54 deg., stulls covered with lagging checked, to a certain extent, the run of broken rock, served as footing for men and drills, and permitted the storage of considerable waste rock. The rock was shoveled into cars. At the Champion mine, with pitch of about 60 deg., a continuous arch pillar holds broken rock in bottom of stope, to which point it has been worked from above, until drawn off

former case the rock is shoveled into cars standing on the level tracks; in the latter case the cars are loaded directly from the chutes.

THE FILLING SYSTEM AT BAL TIC AND TRIMOUNTAIN MINES

The filling system, in use at the Baltic and Trimountain mines, is shown to advantage in Fig. 2. It is not unlike the system known as rabbitage, a modification of which is employed in the Kimberley diamond mines. The system is briefly described as follows: Levels are driven, as is the usual practice, but are, in this case, 8 ft. high and the width of the lode wide. Cutting-out stoping is carried on along the level drifts, thus enlarging them, and from the rock broken down the larger pieces of waste are employed in building

Cutting-out stoping is accomplished in a manner similar to that employed in other mines, except that, owing to the steepness and width of the lode, it is necessary to work almost directly overhead. The drill columns are then mounted between the working face and a mass of broken rock, formed into a pile of 15 to 25 ft. in high as it is knocked down. Pickers and trammers work at the rear of the pile, i.e., in the direction opposite to that in which stoping is carried on, leveling it as it is formed in advance. The waste is stowed in the stopes, while the pay rock is thrown into the mill holes or loaded into cars, run to and dumped into the mill holes. From 25 to 45 per cent. of the lode content is waste and is available for the filling; however,

if there is not a sufficient quantity to fill the stopes, the footwall may be broken down to furnish more.

Cutting-out stoping is continued up to within about 20 ft. of the level above, when it is stopped, thus leaving a 20-ft. floor or chain pillar, which is broken, at more or less regular intervals, by break-throughs.

At the Trimountain, especially, owing to the irregularity of the footwall and fairly uniform hanging, it is considered advisable to carry on all development work close to the latter, exploratory work being done in the direction of the former.

The object of this system of mining is, as previously stated, the complete extraction of the vein content, stowing the waste and sending the pay rock to the surface, the filling taking the place of pillars as support for hanging wall. Logically the work of extraction should begin at the surface and extend downward. The levels would then present different degrees of exhaustion in descending order, the uppermost being completely exhausted, while the lowermost worked would simply show development.

It is evident that with even a fairly high percentage of waste material for filling purposes, there would not be sufficient fully and adequately to support the open stopes. Therefore, the idea was hit upon to draw the filling from the upper into the lower levels. By this means it is possible to remove, with safety, the last portions of the lode left standing, namely, the floor pillars. This is accomplished by making openings into the filled stopes at points directly above the break-throughs in the floor pillars of the stope which it is desired to fill (see Fig. 2). The stope is allowed to fill as full as the size of the opening in the floor pillar will permit. Drills are then mounted under the ends of the pillars, adjacent to and on the inclined surface of the fill. A portion of the pillar, about 10 ft. in width and from 15 to 20 ft. in length, is then removed, as in cutting-out stoping; whereupon the drill is reversed and holes are drilled that, when charged and fired, will break down the ends of the pillars, and thus enlarge the opening through which the filling flows. By these two successive operations the floor pillars are gradually removed, footing for the miners being provided by the continual flow of filling from above, thus maintaining the same relative position with respect to the pillars. The rock, as broken from the pillars, falls upon the surface of the filling and is carried to the pickers below by its downward and lateral movement. A number of break-throughs may be operated in the same stope, thus permitting rapid removal of the floor pillars and the filling of the stopes. Picking and spreading of pay rock and waste are carried on as in cutting out stoping.

The following are special costs obtained from practice in the filling system of

mining: Trimming, 17.4c.; picking, 13.8c.; stope filling and blasting extra filling, 0.35c.; wall building, 1.62c.; milling and transportation to mill, 43.7c.; hoisting, 5.70c.; and mining 35.8c. These figures are for year 1903.

It is not likely that the systems of mining employed in the mines of this district will suffer, for some time to come, any material change, except as they are affected by conditions existing at great depth, but how such conditions will be met yet remains to be seen. That possibly they will not be met altogether satisfactorily is hinted at by the fate of the Atlantic mine.

The Price of Manganese Ore

The frequent inquiries that we receive as to the market price of manganese ore would indicate a growing interest in the mining of this invaluable adjunct to the steel industry. Aside from the chemical and the glass trades, which employ only high-grade ore, free from iron, the steel makers of the United States consume the major part of the output of manganese ore, and import much larger quantities. The Carnegie Steel Company uses most of it and pays the prices quoted below for manganese-iron ores delivered at the Lucy furnaces, Pittsburg, Penn., the Edgar Thompson furnaces, Bessemer, Penn., or the South works of the Illinois Steel Company, South Chicago, Ill.

The following prices are paid per long ton and per unit of metallic manganese:

Manganese.	Price per Unit.
Above 49 per cent.....	\$0.30
46 to 49 per cent.....	0.29
43 to 46 per cent.....	0.28
40 to 43 per cent.....	0.27
Iron is paid for at the rate of 6c. per unit	

The above quotations are based upon ore containing not more than 8 per cent. silica and not more than 0.25 per cent. phosphorus, and are subject to the following deductions: For each 1 per cent. silica in excess of 8 per cent., 15c. per ton is deducted, fractions in proportion; for each 0.02 per cent., or fraction thereof, of phosphorus in excess of 0.25 per cent., 2c. per unit of manganese is deducted. Ore containing less than 40 per cent. manganese or more than 12 per cent. silica or more than 0.27 per cent. phosphorus is subject to refusal or acceptance at the buyer's option. Settlements are based on analysis of sample dried at 212 deg. F., and the percentage of water found by this drying is deducted from the gross weight of the shipment.

As a concrete example of the operation of this schedule, suppose an ore to analyze: Mn, 45; Fe, 15; SiO₂, 9; P, 0.26 per cent. The 0.01 per cent. excess of phosphorus over the base has the result of reducing the payment per unit of manganese from 28c. (to which ore of this grade in manganese is entitled) to 26c., and the total payment for manganese is thus 45 × 0.26

= \$11.70. Adding to this the allowance for iron, 15 × 0.06 = \$0.90, gives a total of \$12.60 per ton. The silica is 1 per cent. excessive, so that this total must be reduced by 15c., giving \$12.45 as the price per long ton of this ore. If the ore had not more than 8 per cent. silica, nor 0.25 per cent. phosphorus, it would bring \$13.50 per long ton.

Electricity in the Rolling Mill

Blooming mills require a prime mover to be self-starting and reversing, and all types demand enormous overload capacity. Electric motors receiving current from generators direct connected to gas engines appear to have, in combination, possibilities which are far beyond anything achieved by the older methods of engine drive. Electric motors are now used to drive three-high rolling mills with entire satisfaction, compound-wound motors being adapted to the widely varying character of the load and the requirement for roughly uniform speed between the violent momentary overloads. Recognizing the advantages of electrical drive in the rolling mill, the various constituent companies of the United States Steel Corporation and the large independent mills of the country are making extensive use of this system.

An instance of the application of this is found in a single motor of 180 h.p., 230 volts, 88 r.p.m., furnished by the Allis-Chalmers Company, of Milwaukee, for the Youngstown, O., plant of the Carnegie Steel Company, and installed complete, with yoke, shaft, pedestals and armature, for raising and lowering the tables of a blooming mill. The gear reduction for this machine will be about 6.5 to 1, based on a speed of 100 r.p.m. of the motor shaft and the motor will be required for continuous operation at full load for 24 hours without rising in temperature, in any part more than 45 deg. C above the surrounding atmosphere, and without sparking at the brushes. The machine will be used to raise and lower both front and rear tables of a three-high blooming-mill table, making 15 operations (7½ complete cycles) per minute. No binding wires will be used on the body of the armature. The shaft will be made replaceable without disturbing commutator or winding, and extended on the commutator end for a magnetic brake.

The line of improvement in electrical machinery, which has probably done most to encourage its adoption in mill operation, has been that of developing a high torque at starting.

A recent report gives the production of manganese ore in the Ural district in 1905 at 282,750 poods, or 4590 long tons. This is an increase of 115,008 poods over 1904. The manganese ore mined in the Ural is all used in the iron and steel works of the district.

Notes on Diamond Drilling in the Boundary District*

BY FREDERIC KEFFER,†

As an adjunct in prospecting and developing the low-grade ore deposits of the Boundary, the diamond drill has proved an unqualified success. As these great ore-bodies have been opened up, it has come to be more and more apparent that the ore exists in irregular masses with usually no very well-defined walls (except where it lies in contact with limestone). Further, the deposits are frequently separated by barren zones, so that when the boundary of an orebody is reached it is quite impossible to predict whether more ore will be found beyond or not. Commercially, the low grade of the ore prohibits cross-cuts or drifts being run in barren ground solely in order to prospect it, the only allowable dead work being that necessary to reach known deposits.

It is under these conditions of necessary economy and uncertainty of ore occurrences that the diamond drill has become so useful, not the least of its value being

diamond-drill cores and borings are likely to be erroneous, the ore when reached often being as a whole very different from what the drill assays would indicate. Nevertheless, the assays of borings are most carefully made and checked from time to time by assays made on samples of the cores. Borings are carried out by the stream of water and allowed to settle in a tub; every five feet they are taken from the tub and thoroughly mixed for the sample. Occasionally when the drill penetrates a cave the borings will not come out with the water, and in such a case the sample must be taken from the cores.

Most of the drilling done under my direction has been by day labor, this having been found to be more satisfactory than contract work, as well as more economical. The rock, while hard, is not excessively so, and the ground rarely caves, and in only one hole drilled so far has the water proved troublesome.

Total feet drilled during 1905 is 2241.5; average per shift during 1905, 10.32 feet; average cost per foot, \$2.1501; average cost diamonds per foot, \$1.0830.

Lime vs. Caustic Soda in Cyaniding

One of the experiments that the Golden Gate mill at Mercur, Utah, has recently been making with its cyanide process, has had for its object to find a cheaper agent than caustic soda for neutralizing acids given off by the ore in treatment.

Ever since the mill was built, caustic soda had been used to maintain the alkalinity of the solutions. The feasibility and economy of using lime for this purpose had been often mentioned but never seriously tried. Last November, the manager determined to make a thorough test with lime, to see if it would not answer the purpose. The results at once demonstrated, beyond expectations, the superiority of lime, and the mill has been using it ever since. Not only is lime cheaper than caustic soda, but it has diminished the consumption of cyanide astonishingly. For the entire year, July, 1905, to June, 1906, the consumption of cyanide averaged 0.68 lb. per ton of ore. From July 1 to November 4, it was 0.88 lb., while for the remainder of the year, or the period during which lime was used, the consumption of cyanide was only 0.59 lb. per ton of ore. This point is forcibly brought out by the following table, which portrays the cost per ton of ore treated for cyanide, caustic soda and lime, in each month of the year:

	Cyanide.	Caustic Soda.	Lime.	Total.
July	\$0.1721	\$0.0304	\$	\$0.2025
August .....	.1782	.0323	.. . .	.2105
September .....	.2072	.0374	.. . .	.2446
October .....	.1799	.0359	.. . .	.2158
November .....	.1622	.0258	.0067	.1947
December .....	.1086	.0215	.0132	.1433
January .....	.1353	.0066	.0187	.1606
February .....	.1429	.0020	.0177	.1626
March .....	.0918	.0027	.0206	.1151
April .....	.1225	.0042	.0175	.1442
May .....	.1043	.0042	.0215	.1300
June .....	.1023	.0029	.0245	.1297

To provide a cheap source of lime, Mercur being reached from outside only by a narrow-gage and very steep railroad, the company built a lime kiln near the mill, at a cost of \$3000, and supplies it with limestone quarried at the spot.

The success of the suction gas producer is not entirely due to the remarkable fuel economy over small steam plants, but is also due to the small amount of attention required. The suction gas producer requires but one or two hours a day, depending upon the size of the plant. It takes about 15 min. to start and make good gas, which is done by a hand- or power-driven fan. The producer needs to be fed three times a day at full load, and twice a day at half load; also it should be cleaned at night, which takes about 20 min. There are suction producers in operation which run 144 hours a week without a shutdown.

1. PROGRESS TABLE.

	Apr. May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Shifts.....	37	26	26	27	23	27	26	25
Feet drilled.....	304	253½	259½	295	250	245	278½	356
Hours drill was run.....	231	167	149½	194	164½	142	170	167½
Hours setting diamonds, moving machine, etc.....	57	44	79½	22	19½	101	38	32½
Feet per shift.....	8.21	9.75	9.98	10.93	10.87	9.07	10.71	16.24
Feet per running hour.....	1.31	1.52	1.74	1.52	1.52	1.72	1.64	2.13
Carats used.....	6.36	6.84	7.42	5.82	6.42	4.84	7.52	2.84

(Note.—Underground shifts are 8 hours. Surface shifts 9½ hours.)

2. COST TABLE.

	Apr. May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Labor.....	403.60	272.00	260.88	271.00	210.35	219.60	226.50	231.75
Diamonds.....	328.81	342.99	382.81	298.45	299.18	227.73	434.85	114.93
Power, etc.....	13.46	29.10	30.56	26.76	25.13	31.78	18.49	118.97
	745.87	644.09	674.25	596.21	534.66	479.11	679.84	465.55
Feet.....	304	253.5	259.5	295	250	245	278.5	356
Cost per foot.....	2.45	2.54	2.60	2.02	2.14	1.95	2.44	1.31

negative, for knowing where the ore is not to be found is only secondary to finding it.

When a new deposit of ore has been located by drilling, it is the practice in our mines to drill no further holes to determine its extent, for the reason that ore occurrences are seldom so limited that it will not pay to drift or crosscut to them; and, moreover, the irregularities of the deposits are such that judgments of size based on even a number of drill holes are unreliable. It is also general experience that ideas of quality based on assays of

In assaying it has been found that the general tendency is for samples to run too high in gold and too low in copper, when borings are being tested. This is easily accounted for, because the flow of water from the tub in which the borings are settled carries off a greater proportion of copper than of gangue, while on the contrary the gold (much of which is free milling) remains in the tub, thus enriching the sample. On the other hand, when samples are taken from the cores irregularities occur on account of the frequent grinding up of considerable proportions of the core, grinding which sometimes amounts to 50 per cent.

*Abstract of a paper in *Journal Canadian Mining Institute*, Vol. IX.
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DAVIS PYRITES MINE, MASSACHUSETTS

Details of Milling, Shipping, and General Operation

BY: J. J. RUTLEDGE*

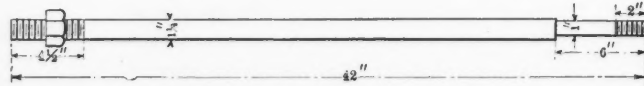
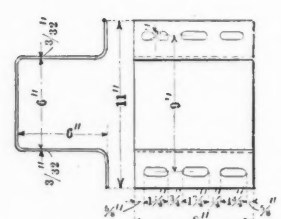
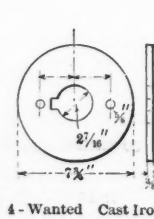
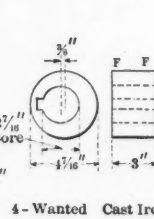
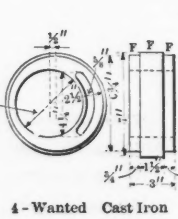
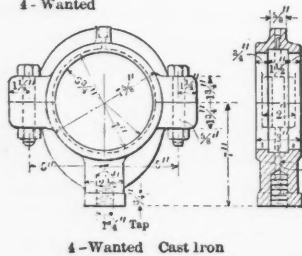
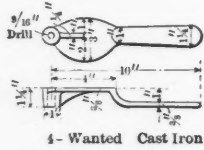
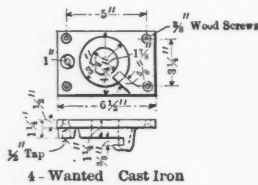
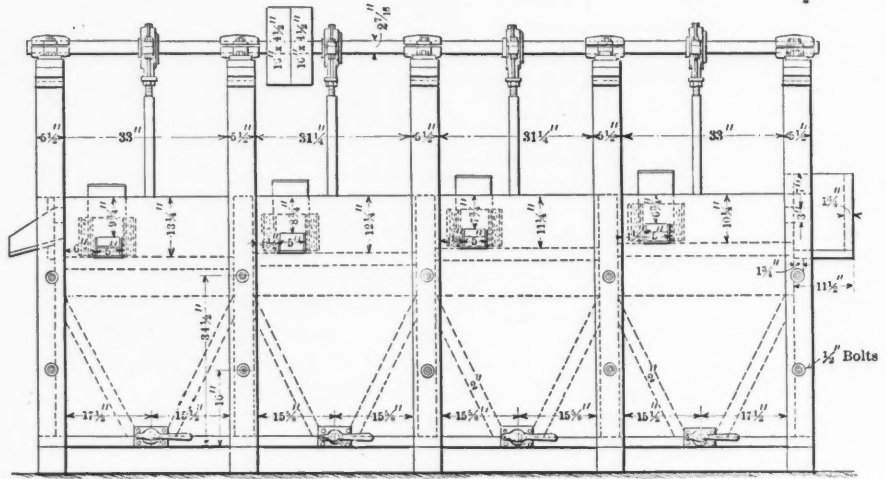
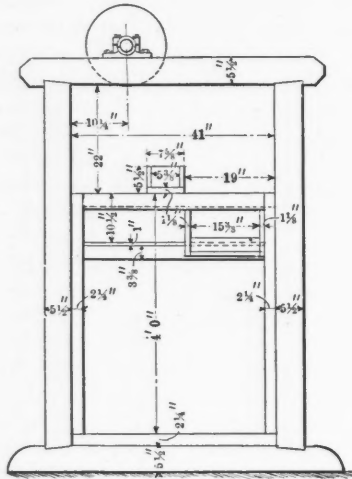
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MILLING PRACTICE.

Only the nut ore is milled, the fine ore is milled. The mine water delivered to the surface by the Cornish pump is

to separate the rock and pure ore at the ore shed by means of bull jigs, but at present the practice is to crush the rock and ore together and separate them by Hartz jigs.

Nut ore and the rock mixed with it is fed by hand into a double trommel having inside perforations of 3/4-in. diameter and outside perforations of 5/16-in. diameter. The undersize passes into a bin below the trommel, and is thence fed to the Hartz jigs. The oversize is spouted into



HARTZ JIGS (LEFT HAND SIDE OF CUT)

coming from the mine being clean enough to require no concentration. During the autumn, winter, and spring, the nut ore is dumped at the end of a trestle adjoining the mill, and in the summer the nut

*Consulting mining engineer, 213 Courtland street, Baltimore, Md.

is sluiced into the mill, and used for washing. This mine water is strongly acid, but does not contain nearly as much copper as the water of the Southern pyrites mines. Most of the waste is composed of pieces of the hanging-wall rock the size of a hickory nut. It is planned ultimately

to separate the rock and pure ore at the ore shed by means of bull jigs, but at present the practice is to crush the rock and ore together and separate them by Hartz jigs.

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The jigs are allowed to bed themselves with spalls and when once well bedded and left alone do very fair work. Iron gates are used, as the water is not very acid. The Harz jig has four compartments, but only the product from No. 1 and No. 2 compartments is used, that from No. 3 being shoveled back and thrown again into the feed from the bin. An average product is from 44 per cent. to 46 per cent. of sulphur, with between 1 per cent. and 2 per cent. in the tailings. The tailings are

The Bacon-Farrel crusher has shells made of Taylor manganese steel. These require renewing about every two years. These shells give excellent satisfaction. The mill is run on day shift only, and an average season's run of four or five months is from 1500 to 2000 tons. The bronze sheets on the Harz jigs are perforated with round holes, those in No. 1 compartment being of $\frac{1}{8}$ -in. diameter, in No. 2 of $\frac{3}{16}$ -in. diameter, in No. 3, of $\frac{3}{16}$ -in. diameter, and in No. 4 of $\frac{1}{4}$ -

thing were uniform, i.e., feed, rock and ore, two compartments would answer, but as these conditions cannot be obtained at all times, four compartments are better in this special case. In new installations I would use the two-cell jig for pyrites dressing.

GENERAL CONDITIONS.

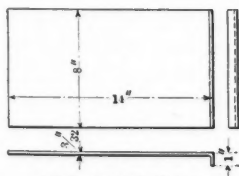
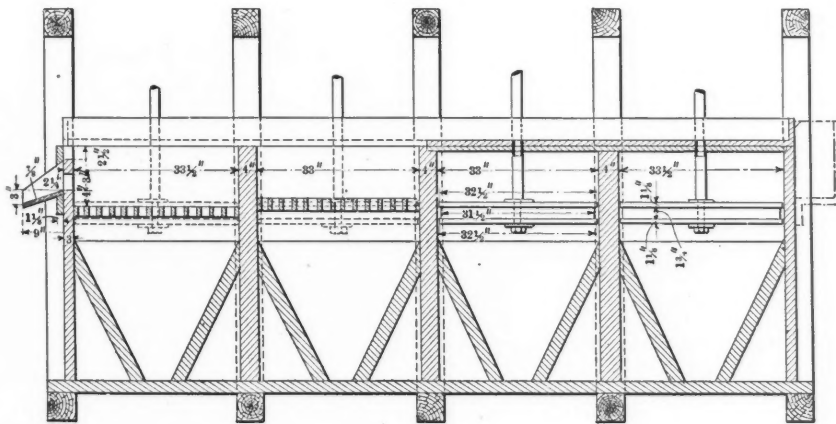
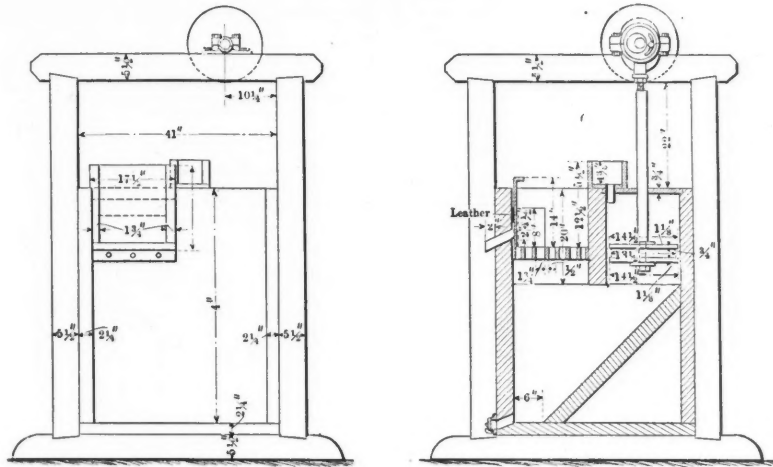
Very little of the native New England labor is employed about the plant and below ground. Drill runners, timbermen, muckers and other underground labor are mostly Irish, Cornish, Austrian, and Italian. The Italians are nearly all from northern Italy and the Austrians are from the Tyrol. They make excellent muckers and timbermen, and when trained, good drill runners. Ore breaking is done on the surface almost entirely by Italian labor. These men are mostly unaccompanied by their families and board themselves in co-operative companies in the houses furnished by the Davis company. I have never found more efficient and faithful workmen than the Toscani.

About 80 men are employed on the surface and underground at the present time, and the output averages 3000 tons of fines and lump per month. The lump ore is about 70 per cent. of the total output and the Davis mine is probably the only pyrites mine in the United States which enjoys this advantage, as the percentage of lump is usually very much less than 70 per cent. Upon this one fact largely depends the profit in the Davis mine. Fine pyrites ore must usually be burned in a mechanical roaster, with additional expense to ordinary burning, and inconvenience from dust. On the other hand lump ore, or broken, can be burnt in the old-fashioned brick furnaces, at small cost and little inconvenience. Davis lump ore is always in demand and the ore is shipped as far north as Portland, Me., and as far west as Detroit, Mich., but the larger part of it goes to Boston and vicinity, which is the natural outlet for the product.

Large warehouses, together with offices and scales shed, have been erected at Charlemont. At that point the company keeps constantly on hand from 3000 to 5000 tons of pyrites, so customers can always be supplied at short notice.

This mine being the only one of its kind in the State of Massachusetts, wages are high and the costs of mining are greater than at other points. In winter the hauling from the mine to Charlemont, all down grade but over a rough mountain road, is done for 50c. per long ton, when sleds are used. In other seasons, when wagons are employed, the cost is 70c. per ton. Coal and other supplies are hauled up to the mine at a cost of \$1.25 per ton.

Analysis of the concentrates shows about 47 per cent. sulphur. A complete analysis gives: 47 per cent. sulphur, 44 per cent. iron, 3 per cent. silica, 1.5 per cent. copper, and a trace of zinc. The ore is free from arsenic, which makes it particularly



4 Wanted Sheet Iron

HARTZ JIGS (RIGHT HAND SIDE OF CUT)

the cleanest I have ever seen at a pyrites mine, but the ore treated is rich. A Bacon jig of two compartments is also placed alongside the Harz jig now in operation, but the former cannot be used on account of the lack of water. It embodies the results of my experience in jigging pyrites, as rarely can the third-compartment product be used without very great reduction in value of the concentrate.

in. diameter. Old screens are generally used in No. 4 compartment. No. 1 plunger has a stroke of 2 in., No. 2 plunger, $1\frac{1}{2}$ in., No. 3, $1\frac{1}{2}$ in., No. 4, $1\frac{1}{4}$ in. Usually no finished product is obtained from No. 3 or No. 4 except when No. 1 or No. 2 is not properly bedded. The material from No. 3 hutch is thrown back again into the feed and re-jigged. The use of the four-compartment Harz jig allows some leeway in jigging. If every-

shipped to the mill. As a consequence the mine dumps are rapidly growing and they are estimated to contain between 800,000 and 1,000,000 tons assaying between \$4 and \$5 per ton. There are also several times that amount of \$4 ore standing in the old stopes.

The method of mining now pursued has

The company's chlorination mill is run as a distinct operation for the purpose of simplifying the accounting. It buys ore from the mine and charges for treatment. Its capacity is 325 tons per day. The total amount of ore from the mine treated in 1905 was 103,226 tons, having a gross value of \$2,407,893; and 8246 tons of ore

cent. The cash extraction was higher owing to the fact that the mill pays \$20 per oz. for the gold and sells it at \$20.67. The actual treatment cost at the chlorination plant, including taxes and insurance, was \$3 per ton. Including cost of treatment of concentrates and by-products at smelter, and construction and equipment expenses, the total chlorination cost was \$3.48 per ton, as compared with \$4.214 in 1904.

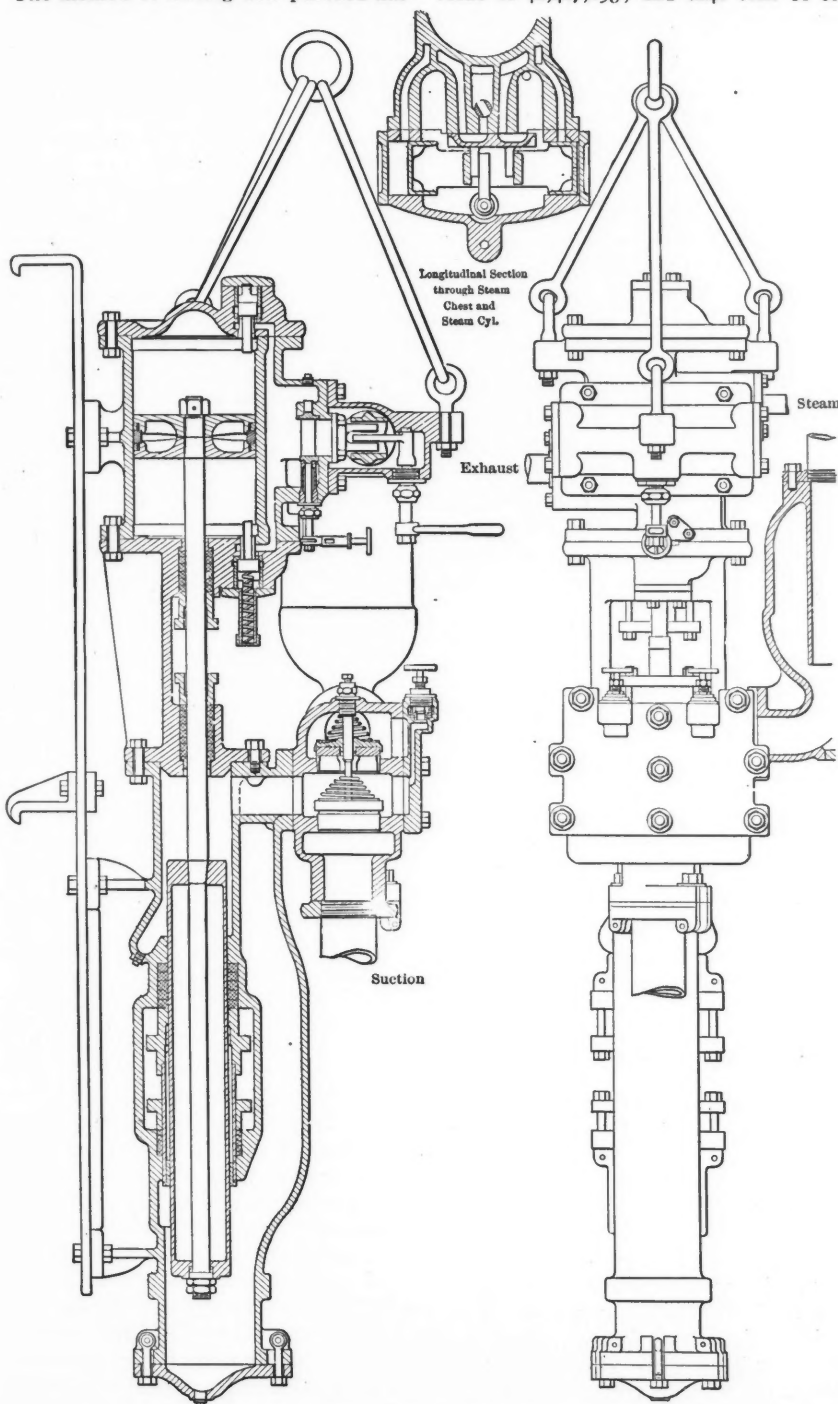
During the year experiments showed that, by mixing oxidized ore from the dump with the fresh mine sulphide ore, a better extraction could be obtained. As a consequence it has now become the settled practice to mix a little over 8 per cent. of oxidized ore with the sulphide ore from the mine.

In addition to the valuable milling ore, the company owns large quantities of sulphide ore averaging \$4 per ton. This ore would not leave much profit if treated by chlorination, and it is being held until some improved method of treatment can be demonstrated to deal with the ore at a profit. Certain owners of improved cyanide processes are confident of being able to cyanide the ore satisfactorily. The management will, naturally, afford them every facility to demonstrate their solution of the problem, as the directors recognize that, when this class of ore can be profitably treated, both the life of the mine and its dividend capacity will be greatly enlarged.

Notes from Cobalt

The producing mines of the Cobalt area are making arrangements to insure the continuance of work throughout the winter, completing the installation of new machinery, and putting up additional buildings. A large proportion of the output is being stored in readiness for shipment as soon as the smelters now in course of erection are ready to receive it. There are about 20 carloads of high-grade ore ready for treatment.

An important decision has been rendered by Commissioner Price at Haileybury, a dispute regarding a Cobalt mining claim. Alex. Campbell made a discovery north of Clear Lake, staking it out with posts as required by the act, but his application included an area south of the lake not embraced in the portion staked out. A prospector named Bailey made a discovery on the area south of the lake covered by Campbell's claim, and sunk a shaft. In the meantime Campbell's rights had been acquired by W. J. Green, of Toronto. The strike made by Bailey turned out to be valuable. The Commissioner decided in favor of W. J. Green, who had purchased Campbell's claim on the ground that Campbell had substantially complied with the requirements of the Mines Act, and that mere technicalities should not be allowed to invalidate a claim based on valuable discovery.



CAMERON SINKING PUMP, DAVIS PYRITES MINE

been developed after years of experimenting with different systems. The ore is first broken as coarse as possible, and the coarse waste is sorted out and packed away in the stopes. As there is not enough waste to fill the stopes completely, timbering has to be resorted to and large quantities of timber are required to support the ground.

from the dump valued at \$48,433; total value, \$2,456,326. The cost of treatment was \$388,583, leaving a net profit, based on a treatment charge of \$6.38 per ton, of \$314,278.

The metallic extraction by chlorination was as follows: Bullion, 91.93 per cent.; concentrates, 2.20 per cent.; by-products, 1.69 per cent., making a total of 95.82 per

PURIFICATION OF GAS FOR GAS ENGINES*

Economy From a Formerly Wasted Product—Nearly 400,000 h. p. of Gas Engines Now Used in German Smelting Works—Purity of Gas the Principal Factor in Successful Working

BY K. REINHARDT

The object of this abstracted portion of Professor Reinhardt's paper is to review: (a) The extent of the application of gas engines in ironworks and collieries in Germany; (b) The working results, including the influence of purification on the gases.

In order to arrive at as correct and complete conclusions as possible, the iron works and collieries possessing gas engines were invited to answer a series of questions, and the manufacturers of gas engines to supply detailed drawings. Answers to these inquiries, which were willingly and promptly accorded, disclosed that, of the 49 German smelting works questioned, 32 already had gas engines at work, and nine others had ordered them. At that time there were 203 gas engines in operation developing a total work of 184,000 h.p. and orders had been delivered for 146 more engines aggregating 201,000 h.p. Of the 349 engines, whose combined power was 385,000 h.p., thus in actual or contemplated operation, 136 engines (161,300 h.p.) were to drive blowers, 199 (206,100 h.p.) were to drive dynamos, 10 engines (16,100 h.p.) were to operate rolling mills, and four others (1500 h.p.) were to be used for miscellaneous purposes.

KINDS OF GAS USED

The largest aggregate of gas engines at a single works amounts to 35,000 h.p. Sixteen works possess over 10,000 h.p., and 27 works possess over 5000 h.p., in actual working. In most ironworks the whole of the gas engines work continuously without any reserve; a few have up to 40 per cent. reserve of gas engines, and a few have a similar reserve of older types of steam engines or steam turbines.

Nearly all engines in ironworks, naturally, work with blast-furnace gases. Two plants use only coke-oven gases, three use blast-furnace gas and coke-oven gas separately, and one plant uses the two gases mixed. Further, the Mansfeld company utilizes the waste gases from the copper-smelting furnaces for driving gas engines. Producers employing coke as fuel are kept as a reserve at seven works. They are really only of use in case of a strike, to assure the working of the most necessary part of the plant.

The application of gas engines in collieries is much less important. This is due to the fact that the heat given off by the older type of coke oven can be utilized

only under boilers, and for this reason, the use of boilers and steam plants is inevitable at the older collieries.

IMPORTANCE OF PURIFICATION

From what has been learned, it is clear that a thorough purification and drying of the gas is undoubtedly the principal factor in assuring a continuous and undisturbed working of gas engines. German gas-engine manufacturers have from the very first considered the cleaning of the gas an essential condition, while on the other hand, the Cockerill company, of Belgium, considered it unnecessary.

As a matter of fact, at many places Cockerill engines were working satisfactorily without any cleaning whatever, while at other works this practice resulted in very disagreeable experiences; in one case, owing to the excessive wear of the working-surfaces of the cylinder, and another time owing to premature ignition caused by the formation of a crust, chiefly on the piston ends, favored probably by excessive lubrication. The design of the older Cockerill engines was, as regards the inlet valves, not very sensitive to the effect of dust, the units most frequently constructed being 600 h.p. in one single-acting cylinder, and in consequence the sections of the gas passages before the valve and of the inlet valve itself were of large dimensions, and parts likely to be injured by the dust were not present with the system of governing then employed.

THE DIFFICULTIES FROM DUST

The methods of governing and of mixing the gases in newer constructions, in which more stringent specifications for smaller variations of speed are laid down, are much more sensitive to the presence of dust, owing to their being combined with springs as delicate as possible, in order to keep the resistance of the governor and back pressure upon it as low as possible. If the spindles or regulating slide valves become covered with dust, for instance, the springs are no longer sufficiently powerful to move these parts at all, or at the right moment, whence irregular working and disturbances result. This also occurs if dust is deposited on the valves or slides, the positions of which are regulated by the governor according to the load on the engine. The valves and throttle valves (manipulated by hand) of the gas-main leading to the engine are also sensitive to dust. In addition to the percentage of dust, the percentage of water

contained in the gas when admitted to the engine also exercises an injurious effect, since moist dust adheres with greater facility than dry dust.

Great trouble is experienced with moist and dusty gas when the engine does not run continuously, but stops working on Sundays, for instance. It may then happen that the deposit of wet dust, which, while the engine is working, does not offer great resistance to the motion of the valve gear, dries to a hard crust while the engine is not running, and prevents the starting of the engine.

The circumstances mentioned above are the result of the gas being insufficiently purified or dried, as well as of the greater consumption of oil necessitated, and the consequent increase of dirt inside the motor. As a matter of fact, they are the cause of most of the troubles experienced in working. For this reason, in all new plants, great importance is attached to the effective cleaning of the gas.

TYPES OF PURIFYING PLANTS

For a standard type of purifying plant for blast-furnace gas, the following may be observed: The gases on leaving the blast-furnace are led through a series of so called dry purifiers, and hence through long pipe-lines into the coolers or scrubbers, and from these into the so-called centrifugal purifiers. After leaving the above plant the purification of the gas should be complete, so that before being admitted into the engine the gas has only to be dried in filters or in capacious tanks.

In several plants, by drying and passing through a long main to the engine, a further noteworthy purification of the gas takes place.

With regard to the construction and manner of working of the various apparatus, the following remarks may be made: The dry purifiers consist generally of a combination of cylindrical vessels, in which the gas is led downward with a rapid motion and upward with a slow motion. During this movement, and especially during the change of direction of the stream of gas, the coarsest particles of dust are separated. The pipes leading from the above should be made as long as possible, with as large a section and as many sudden changes of direction as possible, in order that the gas may be further freed from coarse particles of dust.

The coolers or scrubbers are vessels in which the gas flows from the bottom to the top, and the water from the top to the bottom. The water must be finely sprayed in order to moisten the dust, and thereby increase its weight and cause it to settle to the bottom. At the same time the gas is cooled in the scrubbers, in which the water vapors are condensed and the dust is deposited. The vessels are either empty, in which case the water is finely divided by spraying nozzles, or the interior is arranged with sieves, wire-netting, coke, or wooden trays. The best example

*Abstracted from a paper read before the Iron and Steel Institute, July, 1906.

of the latter form is the Zschocke scrubber, which consists of a series of wooden trays, one above the other, intended to reduce the velocity of the falling water, and by reason of their special form to divide the water into fine streams, so that the large surface exposed may effect a satisfactory cooling of the gas. The precipitated dust is removed at the bottom of the scrubber.

CENTRIFUGAL PURIFIERS

In centrifugal purifiers the further separation of the dust is effected by centrifugal action on wet dust. The Theisen apparatus was the first centrifugal purifier in Germany. It reduces the amount of dust in a gas from 3 or 4 grams per cu.m. down to 0.02 or 0.03 gram with a water supply of 0.8 to 1.5 liters per cu.m. The washer is generally driven by a direct-coupled electric motor, and the smaller sizes by belting, at a speed of from 300 to 450 r.p.m. The sizes generally used range from 6000 to 33,000 cu.m. per hour, and the power required from 50 to 150 horse-power.

Theisen imputes the useful action in his washer to the steam present in the blast-furnace gas and to that formed by contact with the injected water, and on this account recommends his apparatus to be placed, not behind the scrubber, but succeeding to simple gas moisteners immediately behind the dry purifier, in order that the gas may be as hot as possible at the entrance into the apparatus. On the other hand, Professor Osann, in an exhaustive investigation of the purification of blast-furnace gases, chiefly by the action of cooling surfaces for the water vapors and the deposition of dust, considers it preferable to clean and cool the gases previous to their being introduced into the Theisen washer, so that the latter has only to remove the finer particles of dust which are otherwise difficult to separate. He hopes by this arrangement to effect a saving of power.

FANS AND GAS CLEANERS

It has been found that an ordinary fan, assisted by a water jet, is an efficient gas cleaner. The fans constructed by R. W. Dinnendahl, at Steele, differ from ordinary air fans only in the construction of the vanes and bearings, which are of a much heavier construction, to cope with the injection of water and the higher temperature of the gas. They are provided with a water inlet at the suction opening, and with an arrangement, as in disintegrators, for pulverizing the water, so that a sort of water curtain is formed through which the dust has to pass. The cohering particles of dust and water are separated by centrifugal action through which these particles are thrown against the inner circumference of the fan-casing. The under portion of the fan-casing opens into a tank, from which the separated slimes flow away and the purified gas escapes at the top outlet.

The usual sizes of gas-cleaning fans are

from 15,000 to 70,000 cu.m. of gas per hour, requiring from 40 to 110 h.p. The circumferential velocity of the impellers is up to 56 m. per second, with a diameter of from 1.1 to 1.75 m. For 1 cu.m. of gas from 1½ to 2 liters of water are required, and the dust is reduced from 3 to 0.2 gram; as a rule the percentage of dust is reduced to one-tenth of that before washing.

When two or more fans are arranged parallel to one another for the purification of large quantities of gas, it is often difficult to obtain outputs equal in quantity and quality. It is, therefore, advisable to provide regulating dampers behind the fans, and, above all, to make the mains, both before and after the branches to the fans, of large diameter, so that they can act as air-receivers.

In several ironworks it is not found possible to reduce the percentage of moisture in the gas arriving at the engine to the point of saturation at the corresponding temperature of gas. In such cases, after the supply of water to the scrubbers had been cut off, so that they were employed only as dry coolers or purifiers, the gas was not so perfectly cleaned, but was drier, and worked with less harmful results in the gas-motors than before.

RESULTS FROM PRACTICE

With reference to purification and its influence, the following may be seen from the answers to the questions: All smelting works have centrifugal apparatus in use for removing the fine dust, and indeed about half of them have scrubbers or Bian coolers with fans, and the rest scrubbers with Theisen apparatus, Theisen apparatus alone, or fans alone. The respective merits of the various apparatus or processes cannot well be ascertained from the information received from the ironworks, as it is not easy to reduce the results to a common basis. The following results nevertheless are perhaps of interest.

The power expended in cleaning 1000 cu.m. of gas per hour varies mostly between 6 and 13 h.p. Accordingly the power expended in cleaning varies from 1.8 to 4 per cent. of the power obtained by the purified gas.

The amount of water used for cleaning varies greatly. It requires on an average from three to eight liters per cu.m. of gas, and is naturally dependent on the temperature of the water. Generally speaking, the water used with centrifugal apparatus alone is less than when it is employed in combination with scrubbers. Similarly the cost of cleaning varies considerably, and, including interest and depreciation of the purifying plant ranges from 0.007 to 0.0014c. per cu. meter.

The percentage of dust in the gas after the dry purification is on an average 4 to 6 grams per cu.m. In a few cases, however, it is only 1 to 1.5 grams. In most

instances the gas for working the motors is reduced to a percentage of 0.015 to 0.03 grams of dust per cu.m., in a few works even to 0.005 to 0.004 grams per cu. meter.

If the purification effected by the Theisen apparatus is compared with that by fans, it will be found that, according to the manufacturers, the Theisen apparatus cleans in the proportion of 140:1. Thus for 1000 cu.m. of gas cleaned per hour there is required 5 h.p., and per cu.m. 1.15 liters of water on an average. With a fan the cleaning is on an average 10:1, the power required being 2.2 h.p., and the water used 1.75 liter.

PRACTICE IN IRON WORKS

From information supplied by the ironworks only the total result can in most cases be reviewed; however, in a few cases the result of the cleaning by each apparatus is given, and from this the author concludes that a single Theisen apparatus cleans better than a single fan, since with the former the proportion of cleaning is between 90:1 and 25:1, with about 6.5 h.p. per 1000 cu.m. gas, and with a fan the proportion is about 12:1 and the average horse-power 2.3. From two fans, one placed behind the other, a proportion of cleaning from 50:1 to 200:1 and power employed from 6.5 to 10 h.p. per 1000 cu.m. per hour has been attained. Without taking the consumption of water into consideration, one Theisen apparatus is approximately equal to two fans.

With one exception, all ironworks possess apparatus for drying the gas as described above. In no case does the gas contain any suspended water—that is, no water above the quantity at the point of saturation at the corresponding temperature. This temperature is in most cases the same as the temperature of the air, or only a few degrees higher. In a few cases the percentage of water is even lower than that corresponding to the point of saturation of the gas, but this is possible only when the cooling water is at a very low temperature and the gas is cooled to below its final temperature.

The pressure of gas at the engines is on an average from 2 to 4 in., but in many plants it is 8 in. and over. The variations in the gas pressure naturally depend on the number of gas engines at work and of furnaces in blast, and on whether the blast-furnace tops are provided with a double seal or not. As a rule, it is recommended that the gas pressure be maintained as regularly as possible, and not much above the pressure of the atmosphere (or from 1¼ to 2½ in. water). This can of course be done only by using a gas holder, which, besides being an excellent separator for water, possesses the advantage of preventing a reduction of speed or even the stopping of the gas engines when the supply of gas is suddenly interrupted for a short period, as may happen when only a small number of blast furnaces are at work. Long gas mains of

large section also serve as a reserve, although not so effectively, and for a short period tend to equalize the pressure.

ATTENTION TO ENGINES

The intervals at which the engine or its several parts have to be cleaned vary greatly. From information received from ironworks, it may be concluded that with gas well cleaned (0.015 to 0.03 grams of dust per cu.m.), and at the same time well cooled and dried, the inlet gear—that is, the parts before the cylinder of the engines—must be cleaned, at intervals of two to three months, and a complete internal cleaning must be undertaken every six or eight months.

In a few plants using gas which is especially clean, the engines require less frequent cleaning. In others, the inlet gear, throttle valves, and other similar parts require cleaning at periods of 14 days. At the same time, when the lubrication is not excessive, and even when the gas is not well cleaned, an internal cleaning of the engine every two to three months is sufficient.

The parts before the cylinder require for cleaning on an average from six to 20 hours, according to the size and build of the engine and the number of men employed, and the internal cleaning requires from two to eight days.

The quantity of water used for cooling cylinders and pistons averages 8.8 to 11 gal. per hour and per h.p., of which 2.2 to 2.6 gal. are for the pistons. The consumption of oil in most plants is reckoned at 1 to 1.25 grams per hour per h.p. The consumption of gas has not yet been sufficiently tested to compare the various systems.

According to trials made at ironworks, the heat employed by the engines varies from 2200 to 3300 calories per hour and per h.p. Most ironworks are at present not yet in a position to determine the consumption of gas in their engines, and content themselves with testing the exhaust gases, and thereby determining the completeness of the combustion in the motor.

From the answers received from the collieries, engines using coke-oven gas require cleaning after similar periods to those using blast-furnace gas. Generally speaking, however, at present the collieries have not sufficient experience to answer this and other questions authoritatively. The traces of tar in coke-oven gas, which are difficult to remove and to burn, probably necessitate more frequent internal cleaning; and above all, the piston rings, stuffing boxes, oil holes, and other similar parts require greater attention.

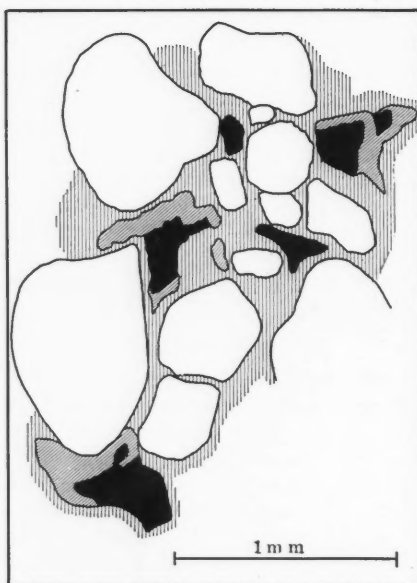
The lining for by-product coke ovens should be made of fire brick high in silica, whereas that for a rotary cement kiln should be high in alumina.

The Nonesuch Sandstone

BY G. W. COREY *

Of the Nonesuch mine, Horace J. Stevens says in the "Copper Handbook," Vol. II, it is "The pioneer and principal mine of the Porcupine mountain district, containing great copper treasures, on the extraction of which fortunes have been lavished unsuccessfully." According to Stevens, the lode averages 7 to 8 ft. in width, strikes N. 50 deg. E., with a southeasterly dip, and is as rich as the Calumet lode in content of copper.

In the hand specimen the material from this lode is a dull, dark greenish-gray, coarse sandstone, containing pebbles of felsite and melaphyre in about equal amounts. Native copper and magnetite are visible



The black areas are magnetite. The diagonally hatched areas are copper. The white outlines are rock and quartz grains. The vertically lined areas are chiefly chlorite, with some indeterminate fine mud.

with a hand lens. In the thin section, under the microscope, the Nonesuch sandstone is seen to consist of rounded grains of melaphyre, felsite and quartz, cemented by a dark brownish, compact matrix. The grains of melaphyre present some wide variations from a petrographic standpoint, some being compact and porphyritic basalts, diabases, olivine diabases and ophites. They are all brownish and dull in the thin section, the feldspars being kaolinized, and the dark silicates altered to chlorite and iron ores. The grains of felsite also present some wide variations for rocks of this type. Some are compact and cryptocrystalline, some microcrystalline, and some micro-pegmatitic. The quartz grains, which are less abundant than the melaphyre and felsite grains, are not as perfectly rounded as the latter. They contain abundant dust-like inclusions, some of which are glass.

The cementing material of this sandstone is made up chiefly of magnetite, cop-

per, chlorite, clay and little quartz. The magnetite is in the form of irregular grains. The copper forms little irregular masses closely in contact with the magnetite for the most part. The little masses of copper often have a thickness not greater than 0.05 mm. and lengths below 0.3 mm. This thin section was cut from a rich specimen containing fully 10 per cent. of copper, yet the largest single mass of copper was only 0.9 mm. in length and 0.3 mm. wide, as displayed in the thin section. The copper does not replace any of the grains of the sandstone, as far as could be discovered with the microscope. The minute size of the ragged copper grains has thus far proved a barrier to successful treatment. The rock breaks with a rough fracture which frequently traverses the grains of the sandstone like the fracture of a quartzite.

Railroad Building in Alaska

At present the only three active railway lines in Alaska are the White Pass & Yukon Railroad, from Skagway to White Horse, the Alaska Central Railway, from Seward, 50 miles northward across the Kenai peninsula, and the Nome-Arctic Railway, with a terminal at Nome and 16 miles of track toward the interior of Seward peninsula.

The two latter roads are to be greatly extended. The Alaska Central will pass the head of Cook inlet at Knik, thence northward along the Sushitna river, across the Alaskan range, east of Mt. McKinley, and into the Tanana valley, ending at Fairbanks, a total distance of 450 miles. The only gold areas thus far discovered along this proposed route are between Seward and Knik, and in the vicinity of Fairbanks, so that three-quarters of the line will be built through territory whose mineral resources are still problematical. Its agricultural products, however, are the finest in Alaska.

The Nome-Arctic is to be extended by the Northwestern Development Company, of New York, 110 miles northwesterly into the Kougarok district. The development of placers in this region has been retarded by lack of water and supplies. The line has now stopped at the Kuzetran river, where a long bridge must be built.

The largest enterprise yet suggested, in which many prominent financiers are interested, will be the building of a line from Valdez, east of the Kenai peninsula, northwesterly through the Copper River district to the Yukon. This will tap a district not yet thoroughly known, but of whose copper resources great things are anticipated.

While decrease of speed of rolls tends to decrease the production of undersized material, it does so in a degree so small that in general it is altogether disproportionate to the disadvantage of decreased capacity.

*Instructor in petrology, Michigan College of Mines, Houghton, Mich.

MINING HARD GROUND*

BY W. A. T. DAVIES

Selection of Machine—The machine that performs the most work in the shortest time, at the lowest cost and consumption of air, and whose parts will stand the roughest usage, wear longest, and are the least expensive to replace, is the machine to be chosen. The purchase cost is not worthy of consideration, as an inferior rock-drilling machine is a source of constant expense and serious loss, and when discovered should be at once placed on the scrap-iron heap. In hard uniform rock,

lineal footage bored at the end of the shift is unsatisfactory and costly.

Under no circumstances should a machine be taken to pieces underground, as parts are liable to be lost, while dirt and grit will adhere to the oily portions and cause ceaseless trouble. The machine should be unrigged and laid aside for overhaul. Spare machines should always be held in readiness, and put into immediate use when an accident occurs to one of those working. It is essential to

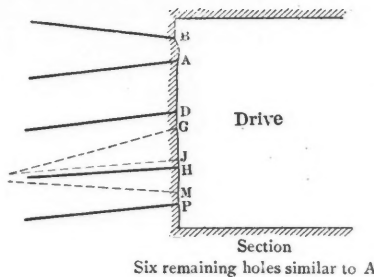
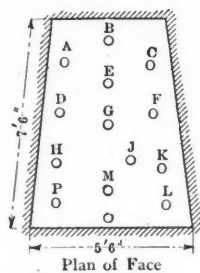


FIG. 1. TRIANGLE CUT

a machine having a cylinder of 3 to 3½ in. in diameter is necessary; smaller sizes give constant trouble, frequently getting out of repair with the severe strain, and the progress of boring a given lineal footage in a given time is slow.

Method of Mounting—In general underground work the use of iron columns or bars, across which the machine is fastened by clamps, clips, etc., is decidedly the best. The use of the single-screw bar or column in stopes, drives, etc., of small dimensions is preferable. In drives, stopes, and excavations where the faces are of large area, the double-screw column, with swinging arm upon which the machine is mounted for boring operations, is good, and has many valuable advantages to the furthering of cheap mining, and should be used whenever practicable.

Maintenance—This is essential to good results. Starving machines of necessary renewals is false economy, more especially in regard to the air chest, valve gearing, piston rings and springs, any of which, upon showing the slightest wear, should be replaced. The "shell" or jacket guides, when worn, allow the machine too much play, which is liable to break the feed-screw, and considerably affects the boring operations, as the machine slightly wavers, each blow of the drill increasing the friction and thus reducing its efficiency. As soon as a machine becomes out of order, time should not be wasted by miners in trying to remedy it, as, if successful, its work in all probability will be intermittent and inefficient, and the

overhaul and clean all machines periodically.

Rigging Up and Working—Columns of various lengths should be always on hand; time is often lost by having a column too short for the working face, necessitating its being built up on numerous blocks, which are liable to shift when boring operations are in progress.

Before the machine is mounted, the column or bar should be rigidly and firmly secured and have a tight grip of the

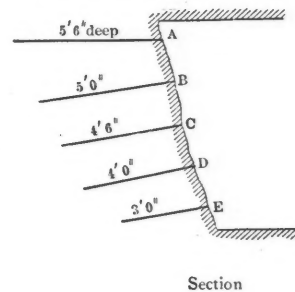
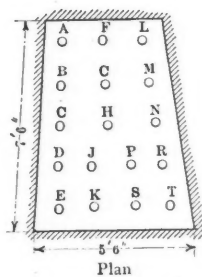


FIG. 2. DRAG CUT

country at each end, and kept constantly screwed up to the utmost limit.

The machine should be placed on the bar so as to bore the greatest number of required holes to the best advantage before it is again dismantled. The firm fixing of the bar at the commencement is very important, as if it moves while the machine is boring, the drill is carried out of its true alinement, increasing the friction on the drill, and resulting in loss of time and trouble in screwing and wedging it up again to its original position, besides which the hole being bored is probably lost.

After the boring has been completed, the machine and its connections should be removed well away from the firing face,

so that the shots will not damage it. In removing a machine from its column, it should be strictly seen that the air inlet and outlet are plugged up, to prevent dust and grit getting into the working parts. Only experienced and trained men should have charge of the working of rock drills underground. Good machine men are valuable in mining, and are not as plentiful as they might be.

Air Pressure—A pressure of at least 90 lb. of air should always register on the surface air receiver, which should be of large dimensions, to equalize the pulsations of air and deliver a steady flow to the machines. The air mains leading from the "receiver" to the working parts of the mine should be of adequate size, the larger the better, to reduce the friction of air in them. All unnecessary bends, elbows, tees, and other irregularities in the pipe lines should be strictly avoided. When bends, etc., are necessary, it is well to increase them beyond the diameter of the main or branch pipe in which they are connected.

All leaks, however small, in valves, pipes and connections should be carefully remedied; this is frequently neglected and regarded as trifling they are more costly than steam leaks, and all help to reduce the pressure of air in the pipes.

Air Hoses and Connections—Hoses when worn or damaged should be at once put aside. The marine-wound air hose, though expensive, is the best, and when damaged will usually rebind to its true circumference, and the marline is easily renewed, which is not the case with the steel-wired or armored hosing. Contortions in air hose are objectionable. In-

ternally perished hosing should be guarded against, as small leaves of rubber are liable to blow into the machine, reducing its working efficiency and causing trouble.

Lubrication—The lubrication of air rock-drilling machines demands careful attention, and yet this is often overlooked. The general practice is to pour a quantity of oil into the machine and expect it to work for several hours. This is a mistake, most of the oil being blown out of the air exhaust by the first few strokes of the machine, and the vital parts become insufficiently lubricated, shortening the life of the machine as well as materially reducing its working efficiency. There is, further, a waste of oil and when working in

*Abstract of a paper entitled, "The Science of Economically Mining Hard Ground with Percussive Rock Drills and Compressed Air," in *Transactions Australasian Institute of Mining Engineers*, Vol. XI, No. 4, April, 1906.

gold ore this waste finds its way to the treatment works, which is decidedly objectionable and dangerous in the amalgamation of fine and free gold. A limited, regular and sufficient lubrication is needed, which can only be obtained by special lubricating oilers of the drip-cup or plug-cock types. It is as well, however, after a machine has been out of use for any time, to pour oil freely into it when starting, but care should be exercised in collecting the waste on a piece of bagging to prevent it from mixing with the ore.

Only the best quality oil, specially prepared for the type of machine being worked, should be used.

Drill Steel—The class of drill steel is an important question. In hard ground only the best quality should be used. The use of inferior material is a most expensive item to any mining company. A 3-in. rock drill is capable of striking a blow of 600 lb. per stroke and working at 300 strokes per minute. Hence the necessity of using the highest grade steel to

nature. In the above mentioned typical set of steel, the bits of the first section (the shortest) should be $2\frac{1}{2}$ in. in length, and successively diminishing in length $\frac{1}{8}$ in. in each section; the cutting edge of the last and longest section being $1\frac{1}{8}$ in. in length.

Dressing of Drill Bits—This is of vital importance, and may vary the speed of boring 10 or 20 per cent. per diem. There are many ways of dressing the chisel bit for hard ground. The shoulders should not be too slender; the cutting edge square, if anything the center slightly below the line of the corners; the corners well formed, evenly dressed, with plenty of metal behind them, as they have the most work to do, the greatest resistance occurring at the rim or circumference of the hole. The proper size of the bit should be maintained in its proper order each dressing. A tool smith, however competent, should be compelled to use a gage in the sharpening process, so that the bits will, as accurately as possible, follow each other in the boring of the same hole with-

cause of the high speed and heavy blow of the drill. This naturally heats up the bit, often destroying its proper temper and resulting in the immediate softening and beating down of the cutting edge. The services of a good, painstaking tool smith are not to be despised, and every convenient tool should be supplied him for his work.

Boring of Machine Holes—I now touch on one of the most vital questions of economic rock drilling, viz., the drilling of holes, their position, their depth, their angle in country, and their relationship to each other in boring and breaking a given quantity of rock. The method of boring out ground with machines is termed "cuts," which are of different shapes and give different results, and are adapted to different working parts of a mine. Upon the adoption of the class of cut depends to a very large extent the cost of breaking the ground. All boring operations should, after the character of the rock has been determined, and the class of cut adopted for various work,

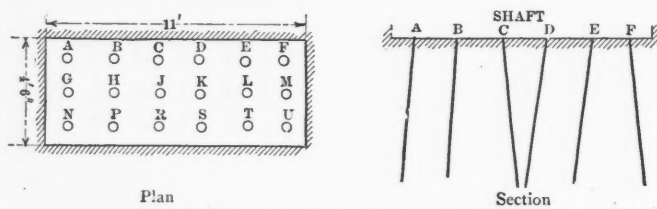


FIG. 3. V OR CENTER CUT

stand such a severe strain is obvious. A typical set of machine steel for hard rock should consist of 40 pieces, in eight sections of five each, the shortest piece being 16 in., and the longest 96 in., each piece successively increasing in length by two in. The diameter of steel for the first two sections $1\frac{3}{8}$ in., of the third and fourth sections $1\frac{1}{4}$ in., and the remaining sections $1\frac{1}{2}$ in. Each set of drill steel should be consecutively numbered throughout according to their respective "follows," as time is often wasted underground by miners having to search for a suitable "follower." A duplicate set of steel should always be kept for each machine working, so that as one set is in use the other set is being dressed.

Bits—The designs of bits for rock-drill machines are numerous, and the best must be determined by the character of the ground to be mined. In hard and uniform country, such as diorite and other similar volcanic rocks, the star bit and the chisel bits undoubtedly give good results, and there is a diversity of opinion as to which is the better, but I think the preponderance of opinion is in favor of the chisel bit, which can be more readily dressed, and bores the same amount of ground in the same time and under the same circumstances as the star bit, with slightly less consumption of air. Nevertheless, the star bit is preferable for collaring holes, and a valuable bit when working in twisty and irregular ground of a fitchery

out sticking. Double work in dressing rock-steel bits is often incurred through the steel not being changed at the proper time in boring operations.

It will be observed in many mines upon examining the "blunts," that the cutting edge has been beaten down to a $\frac{1}{4}$ -in. face, while the corners have been completely worn away before the steel has been thrown aside. This is an evidence of either gross carelessness on the part of the machine men, or of an insufficient supply of "sharps," and, where the rock chips, this is a loss of labor, power and time, several hundreds, probably thousands, of machine blows having been struck with practically no result. It is folly to be short of plenty of well dressed steel where rock machines are in use.

All steel should be carefully trued at time of dressing, as a drill slightly bent and out of its true alinement will bore the hole in the rock greater in diameter than it should be; also cause sticking or grooving of the big hole being bored. For this reason drill steel should never be thrown down passes or from any other height.

Tempering Bits—For hard rock this is essentially important. The ground to be mined should be carefully studied to find the right temper; once this has been found it should not be varied. Loss of temper and premature dulling of the cutting edge require watching. In the boring of hard rock may be seen flying from the hole a constant stream of fire flashes be-

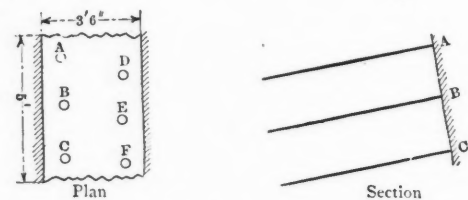


FIG. 4. STOPPING

carried out strictly under the supervision of the underground foreman. It is a common occurrence that men working in a face are allowed to bore out to their own—often bad—judgment, using whatever cut they like, and boring holes anywhere and everywhere without any intelligent object in view, and subsequently making explosives do what brains should have done.

All holes bored should be well balanced, and distributed equally over the lines of greatest resistance. Bad judgment in placing holes results frequently in great waste of explosives, the ground having almost to be burnt out. Two cases of explosives are often used in firing a round of holes where one case would have been sufficient had the burden of the holes been equalized. Advantage should always be taken to bore to a "wall," or "dig," or "fault," or "discoloration" in the country, as it means one side is already broken by a natural division in the rock.

In driving, the "triangle" cut is usually preferable to the "V" cut, as there are less dry holes to bore, and to the "drag" cut because a greater quantity of ground can be broken in a given time with less boring; nevertheless the drag cut is often used to advantage, especially where there is a wall or dig in the face to bore to. For sinking, in faces of large area, the V or center cut is usually preferable, more especially where there are electrical appliances for firing, and where

there are no walls or natural fractures in the rock to bore to. Further, the "cut opening" is the full width of the face, which is not the case with other cuts. The V is also preferable to the drag cut, because more ground is broken by one rigging of the bar or column. It is, nevertheless, very destructive to timber in the locality. In sinking where no electric battery is in use and there is a quantity of water to contend with, the drag cut is often adopted and used to advantage, as the water is always confined to one end of the shaft. In rising, the triangle cut is usually adopted in preference to the drag cut, as there is not the difficulty in collaring the holes, the face being always at right angles to the machine drill. In stoping, the general stope or drag cut is used; the holes should be horizontally zig-zag, vertically in line. In stoping hard ground a considerable saving can often be effected where holes are all "water holes," by having the stope face a good height and following up the same line of holes after each firing until the stope has "run out."

In the general use of the triangle and V cuts the center holes should always be fired first and cleaned up, thus giving the surrounding holes clearance and more force. In some cases a marked saving can be effected by boring the center holes, removing the machines, firing and cleaning-up same; better judgment can then be formed in boring out the remainder of the cut a considerable amount of boring and explosives thus being saved. The loss of 20 or 30 minutes through the second rigging of the machine is more than compensated by the above advantages. In the carrying out of all boring, care should be exercised in not collaring on a "slanting head" or angular surface of rock, as the drill, on striking same, will glance off heavily, jarring the machine and probably breaking the piston; if not this, the line of hole will not be in a true line with the drill, and, as the hole in the rock is deepened, the greatest portion of the blow will be lost in friction, and the hole becomes rifled. Before starting a machine hole, a flat surface at right angles to the drill should be made in the rock by hand labor.

Firing—This should in most cases be carried out in sections. The system, though occupying a little more time, is wise, as a whole round may be destroyed by a miss-fire, throwing double burden upon the nearest holes, and thus ineffectively breaking the ground and spoiling the shape of the face for the next boring out, thus resulting in loss of time and costly work.

Good results are seldom obtained by firing grooved or rifled holes; the wall of the hole not being perfectly round, the force of the explosion is not evenly distributed, hence the effect is not general.

The illustrated cuts should be fired as follows:

Triangle cut—1st section, G, J, M; 2d section E, H, K; 3d section D, F; 4th section A, B, C, P, N, L.

The "drag" or "draw" cut—1st section, E, K, S, T; 2d section, D, J, P, R; 3d section, C, H, N; 4th section, B, G, M; 5th section, A, F, L.

The V or center cut—1st section, C, D, J, K, R, S; 2d section, B, H, P, E, L, T; 3d section, A, G, N, F, M, U.

Stoping—1st, C, F; 2d, B, E; 3d, A, D.

In dead ends and places where the ventilation is artificial or natural resources limited, the section system cannot be profitably applied. In such cases after the "cut" holes are fired and cleaned up, the fuses of the remaining holes should be accurately timed to give successive explosions when lighted at the same time.

Use of Explosives—Great waste is frequently practiced in hard ground. Large quantities are constantly consumed when half the quantity would have done the same amount of work. On the other hand, care should be taken not to underestimate the required amount. Close observations as to the nature of the rock are necessary, and once the right amount has been arrived at, a strict check should be kept over all explosives used.

A general idea with miners is to put a certain quantity of explosives into the holes, and "let Jimmie Nobel bring it out," and as long as the ground is broken they regard the work as satisfactory (especially wages men). When a hole is excessively charged the explosion naturally finds the weakest point, and the collar of the hole only is probably torn out, while every man within 1000 ft. of the face has to "hold his head on" with the concussion.

The illustrated cuts above mentioned should in very hard diorite rock be effectively blown out with the following quantities of Nobel's gelignite, though what applies in one case may not in another, as the actual consumption wholly depends upon the nature of the rock: Triangle cut 8 packets; drag cut 4.5 packets; center cut 10.4 packets; stope cut 2.5 packets.

The use of inferior explosives is foolish economy. It is more profitable to pay a high price for a good brand than a low price for an inferior one.

The Broken Hill South Company, New South Wales, had a satisfactory half year, as, after paying £60,000 in dividends, the books show a credit balance of £71,000. The North Broken Hill Company was unable to carry out any development work of importance during the half year, as the mine was flooded, to extinguish thoroughly the fire in the Junction mine adjoining. However, two dividends absorbing a sum of £62,000 were declared, and the half year closed with a credit balance of £26,000.

Rambler-Cariboo Mines, Ltd.

SPECIAL CORRESPONDENCE

One of the most important developments yet made in the Slocan district is the striking, during this month, of ore at a depth of about 1250 ft. in the Rambler-Cariboo company's mine, situated well up in Mc-Guigan basin, at an altitude of about 6000 ft. In his report on this property, which he visited in 1904, the provincial mineralogist said: "The rock formation of the district is slate, through which a great boss of granite has been forced up, the whole being much cut by porphyry dikes. A well defined quartz vein cuts through both slate and granite, and across the contact, and has been traced on the surface for a long distance, in a N. E. by N. direction, with a dip to the south or into the hill. The mine was originally opened by three cross-cut tunnels, connecting with levels about 100 ft. apart. No. 3 is the main working tunnel, and has a cross-cut 510 ft. long to the vein, and drifts to the extent of more than 1200 ft. Above this level all the ore, except a few bunches, was extracted some time ago. From this No. 3 level a shaft has been sunk for 500 ft., with levels Nos. 4, 5, 6, 7 and 8, at intervals of about 100 ft., and here the recent productive mining has been done. From this shaft and levels some very good ore has been obtained, and it is reported by the management (the lower workings were flooded at the time the mine was visited) that the orebody is strong in the bottom of the shaft, and is continuing with depth. The cost of hoisting from this shaft to a higher level, together with the cost of keeping it unwatered, added so much to the cost of mining that the company decided to abandon these workings temporarily and run a long cross-cut tunnel in to the vein at the 1400-ft. level and raise from it to meet the shaft, and thus cut the known orebody from below. This tunnel was started on July 9, 1904, and it will take about two years to complete it. It will cost, exclusive of plant, approximately \$60,000. The tunnel is 7x7½ ft. in the clear, with water box 1x2 ft. under car track. At about 4300 ft. in it passed through what may prove to be the lead, but if so it was much broken up where cut, and did not carry ore. A raise from the tunnel encountered, at about 150 ft. up, what is believed to be the lead, about 8 ft. in width where cut, and carrying ore in bunches and stringers. As the water in the shaft, the bottom of which is 450 ft. above, has been gradually lowering since the raise cut this lead, there seems to be no room for doubt that the same lead has been entered by the raise. No other mining development in the history of the Slocan has been regarded as so important, since it appears to prove that ore of good grade certainly does live down, and that it will pay to mine for it."

THE POCAHONTAS COLLIERIES COMPANY

Details of an Ideal System of Mining a Monster Vein of Coal

BY F. W. PARSONS AND WILLIAM LECKIE *

The mining and coking operations of the Pocahontas Collieries Company are at present concentrated principally at Pocahontas, Virginia, the pioneer town of the district. The coal in this region is deservedly famous not only because of its wonderful steaming qualities, but from the superior coke it produces.

HISTORICAL

The Pocahontas Collieries Company several years ago succeeded the South-West Virginia Improvement Company, the oldest and largest operator at that time in the region. Recently this company has become closely identified with the Pocahontas Consolidated Company, one of the largest operations in the State.

THE TOWN AND PLANT

The company's main office and largest mines are located at the town of Pocahontas, on the Norfolk & Western Railway. The company has its own machine shops, car shops, power station, water works, electric light plant, supply stores, commissary, cold-storage plant and about 400 comfortable dwellings for its employees. Pocahontas is an incorporated town of 4000 inhabitants. There are schools, churches, a number of lodges and societies, all modern improvements such as water and light, and lastly, an excellent municipal government. The location is considered healthy, being 2300 ft. above sea-level. Labor is here unorganized, and strikes are unknown. As a consequence of these conditions, work is furnished the men every week-day in the year.

PRESENT AND FUTURE OUTPUT

Four mines are now operated at Pocahontas, the Baby and the West mines producing from 4000 to 6000 tons of coal per day. The West mine has the reputation of being the largest bituminous coal mine in the world. The coal here worked, known as the Pocahontas seam, is 10 ft. thick and is unusually clean, with practically no partings and an excellent top. The Pocahontas company is now busily engaged opening up its new plant at Boissevain, three miles west of Pocahontas. Two other plants, three miles west of Boissevain, are to be opened in the near future; each operation is expected to produce from 3000 to 4000 tons of coal per day.

NEW DEVELOPMENT

These new mines will be located in the valley of Laurel creek and will be reached by a new railroad now under construction from Pocahontas westward, in the direction of the Berwind-White and Faraday

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properties. This new road will in all probability become the main line of the Norfolk & Western Railway when the resources of the country adjacent to the new line are more fully developed and its new mining towns built up.

At the Boissevain plant, a large number of dwellings have been erected. A church, school, and store have also been constructed. The houses are lighted by electricity and a water system is being installed.

SYSTEM OF MINING

The method of mining at the Baby and West mines of the Pocahontas company is entirely on the panel system, with 25 rooms to the panel. Large barrier pillars are left to protect haulways, and overcasts carry the air from each panel to the main return airway. What experience has taught in operating these mines will be used to create an ideal system for the Boissevain and other new operations. In referring therefore to the methods used by the Pocahontas company, the system hereafter described will deal with the methods to be used at the Boissevain mine.

The coal seam to be worked at this mine varies in dip from 90 deg. (perpendicular) to level, and will in all probability be gaseous. The mine will also have bad top, so that the system installed must be one able to overcome these obstacles.

The dip of the seam seriously affects both the haulage and the mining of the coal. To counteract this, three different systems will be used. Where the dip is less than 5 per cent, the entries will be driven along the strike of the seam, and the rooms turned toward the rise. The haulage of these sections will be done by a motor cable, whose heaviest load will be to push an empty car up a 5 per cent. grade. Where the dip is over 5 per cent. and less than 20 per cent, the entries will run toward the rise and the rooms be turned at a slight angle with the strike of the seam, so as to have a slight down grade, about 1 per cent., from the face of the room to the entry. Haulage from these parts will be done by third-rail motors. The motors will always be on the lower side of a trip; this will allow the motor to push an empty into a room, and permit the loads to drop out of the rooms against the loaded trip so that, in case a coupling breaks, the car will be prevented from running away down a steep grade, with loss to property and perhaps life. When the dip is above 20 per cent. (this section of the mine lies along the outcrop on the Laurel creek side) the entry will run along the strike of the seam, and the room

turned toward the rise. This area will be worked with two jugular man-ways. A battery of timbers will be placed at the mouth of each room to catch the mined coal as it falls from the face, and from here it will be passed through a sheet-iron chute placed at the lower end of the cut and will fall into a car. The haulage of this section will also be done by third-rail motors.

ECONOMY OF WORKING

The mine will be laid out in rectangular shape, having haulways paralleling each other about every 1500 ft. each way. Each of these main haulways (accompanied by its air course) will be driven through a solid pillar of coal at least 250 ft. thick, which will be left untouched as long as the haulageway is used. The remaining spaces between these main roads (each called a block) will be mined at once. Each block will consist of four panels, each panel to be an entry with air course on one side and rooms on the other. Each panel will have its entry and air course driven to their full extent before any rooms are turned; then beginning at the face of the entry, the rooms will be turned successively, so as to make the line of the room advancing, having an angle of 45 deg. with the entry. As soon as a room is driven to its limit, the pillar between it and the next room will be robbed, the robbing beginning at the face of the room, and working toward the entry. This will make the line of ribs retreating have an angle of 45 deg. with the entry. In panel No. 1 of each block, the rooms will be driven a required distance and stopped; in panels Nos. 2, 3 and 4, the rooms will be driven through an air course and into the entry of the next panel, and will then be robbed back from there. While each panel will have its own line of room advancing, the line of ribs retreating will be the same for all four panels in the same block. As the rooms take out only one-third of the coal, this will allow the robbing miner the protection of two-thirds of the entire seam as pillars, and will also permit the total extraction of the seam in each block. The mining will be continued in this manner until the limit of the entry is reached, when, beginning at the farthest point, rooms will be turned in the pillars surrounding the entry and driven through them; the ribs will then be robbed back, and this system of robbing the main pillars carried steadily back to the place where the haulway is still being used. The coal will be raised through a shaft on a self-dumping cage and delivered to a conveyor, which will throw it on the screen, and then into the railroad cars, thus saving the expense of a tippie crew.

The method of driving entry and air course to their full length before any rooms are turned involves a primary expense for the narrow work in the first entries and air course driven, but in no oth-



A PORTION OF THE POCAHONTAS COLLIERIES, POCAHONTAS, VA.

ers. For example, according to the present system of mining at Pocahontas, the expense of the narrow work in each entry is borne by the rooms turned from it.

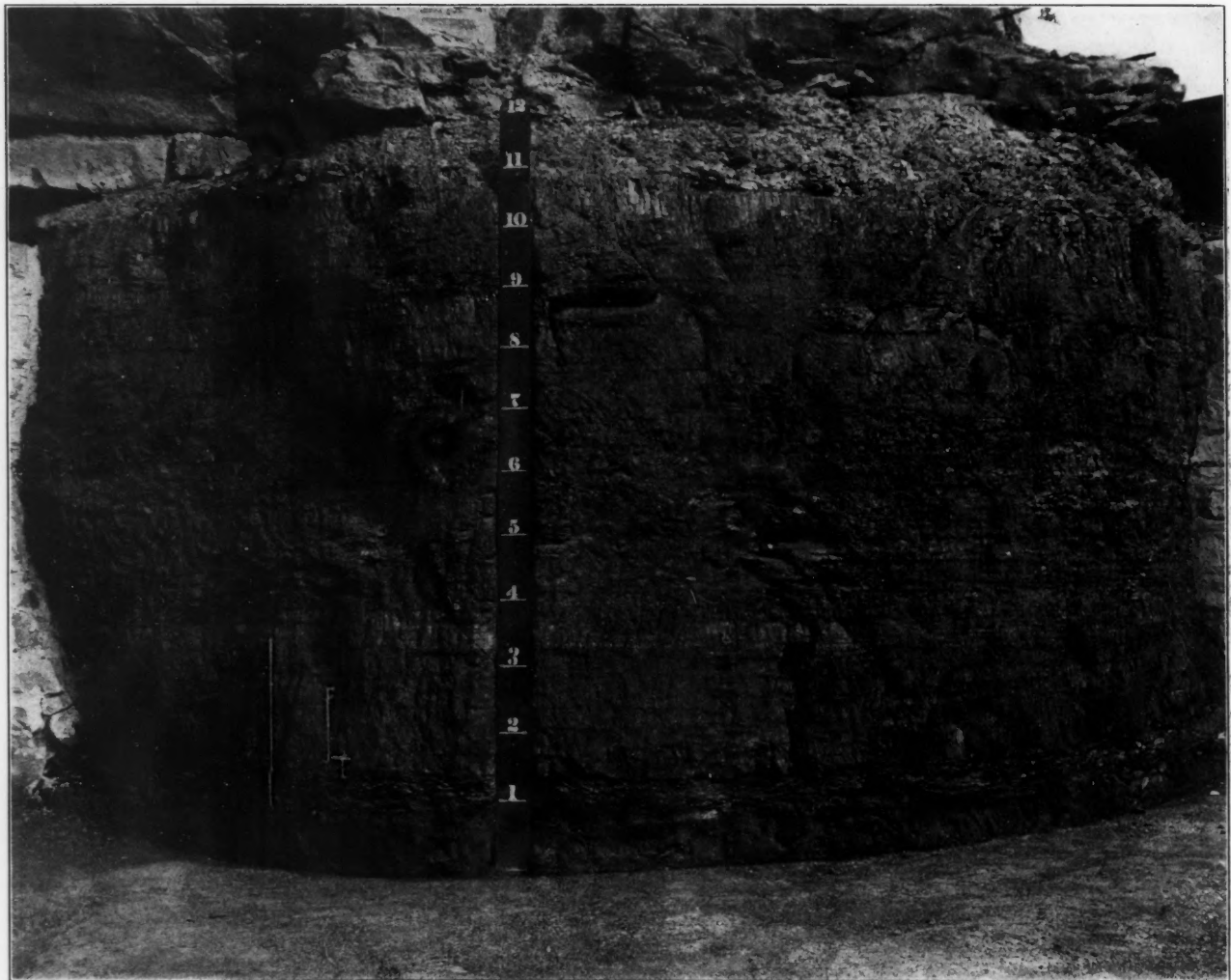
According to the system here described, the expense of the first entries will be borne by the company. The rooms turned from the first entries will bear the expense of the narrow work in the entries being driven at that time; the rooms from these entries will pay for the next set of entries, and so on, as far as the mine extends, when the rooms for the last set of

each room, which latter would be considerable, owing to the bad top of the mine. It may be mentioned in this connection that, at Pocahontas, coal mined from the pillars between the rooms costs in all cases about 15c. more per car than coal mined in the rooms. This increase in cost is due to the falls which it is necessary to clean up. Considering the average thickness of the seam as 10 ft., we may roughly estimate a yield of 10,000 tons of coal per acre. The mine will have an extent of at least 3000 acres, which will place the total

the mine has advanced far enough in that direction to justify it, the main pumping station will be moved to the western edge of the mine, and natural drainage will carry all water to this point, where it will be thrown to the surface as before, through bore holes.

SAFETY FROM GAS

Every panel in the entire mine will receive its separate split of fresh air, and its air course will deliver it through a main return airway, direct to the fan. Air will



OUTCROP OF THE COAL SEAM AT POCAHONTAS, VA., SHOWING COAL 11 FT. HIGH

entries turned will have no narrow expense to bear. Were the rooms turned as the entry advanced, one of two evils, greater than entry expense, would be sure to follow.

First: If the pillars were robbed as soon as the rooms were driven, this would cut off all air from the workings of each panel, and would leave no pillars to protect the haulage road and outway, rendering possible a serious fall of roof at any moment.

Second: If the rooms were left standing, and were robbed back from the face of the entry, this would involve the double expense of re-laying the track and cleaning up whatever falls might have occurred in

output of the mine at 30,000,000 tons; allowing a loss of 10 per cent. would reduce the total output delivered to the railroad to 27,000,000 tons.

DRAINAGE

The drainage of the mine will be done by electric pumps. The seam dips from both the Laurel creek and Tug river sides. At the point where the seam is lowest will be established the main pumping station. Natural drainage will carry all the water in the mine (except from the west, where it will have to be pumped) to this point; from here it will be thrown out on the surface through one or more bore holes. The seam dips slightly to the west, and when

in no case, after having been used by one panel, pass into a haulage road. Each panel, too, will have a regulator, by which the panel can be given just as much or as little air as it requires, without affecting the air in any other part of the mine. Each panel will, therefore, according to its needs, receive sufficient fresh air to carry away all gases. One man would attend to the regulation of the air in the mine, throughout its entire extent, and no one else, except in case of emergency, would be allowed to adjust the regulators. Should an explosion occur, from any cause, in any part of the mine, the panel, block or section in which it occurred could be treated independently, if desired, and the venti-

lation could be shut off entirely from it. If it were wished to clean out the affected portion, the products of combustion would pass directly out of the mine through the fan, and seldom, if ever, would the influence of the explosion extend beyond its immediate vicinity, or stop work in any other portion of the mine.

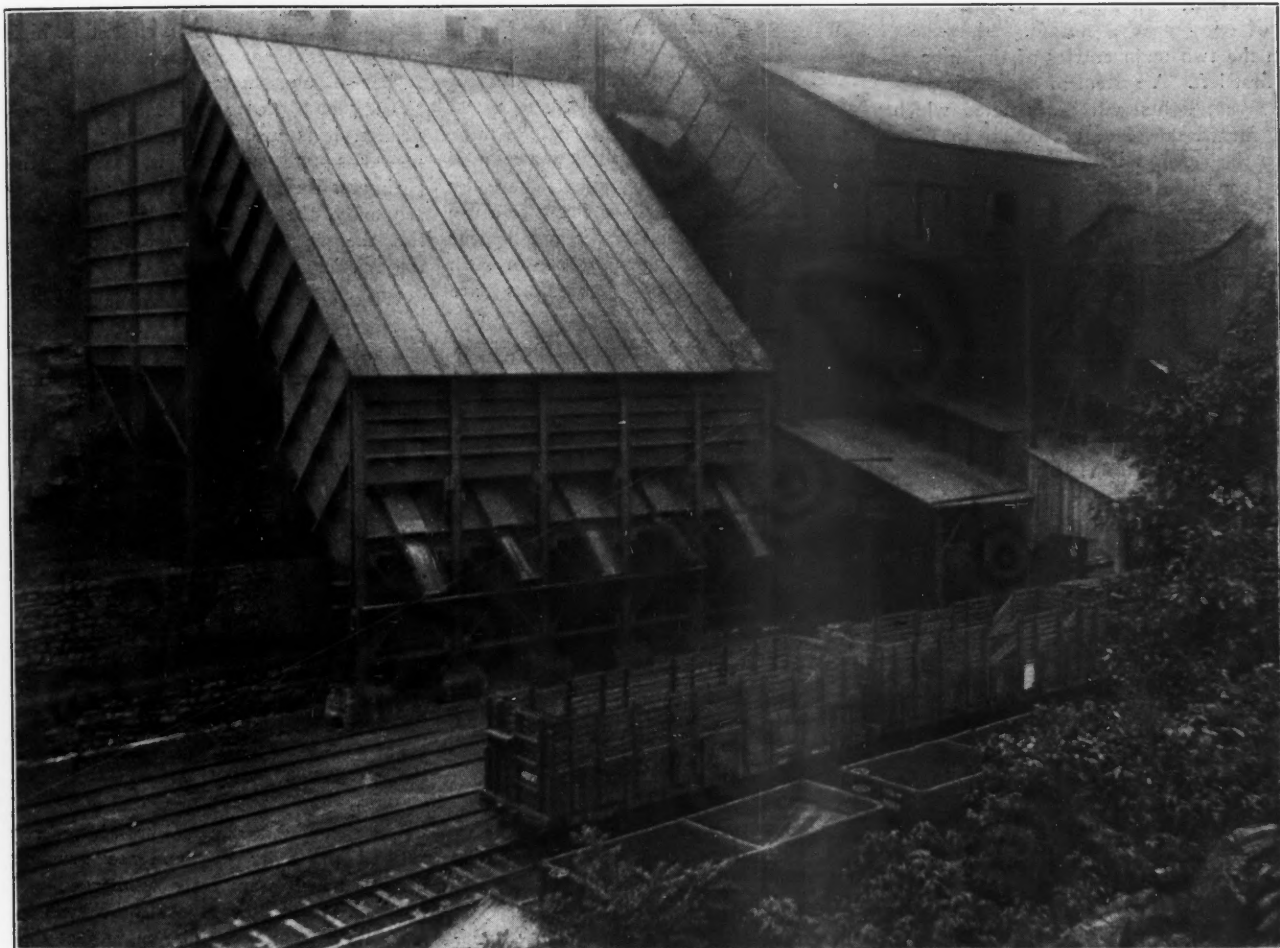
VENTILATION

The mine will be ventilated by a fan of ample capacity. The shaft and two man-ways will be intakes, delivering the air to the two main haulage roads of the mine. The air will have a first split into the cross

versed, should a contingency occur to require it.

This system of ventilation necessitates using overcasts in place of doors, but in the long run it is more economical, satisfactory and safe. If the cost of an overcast is estimated at \$150, taking the place of a door whose first cost is \$15 and whose daily cost is 75c. for a boy to attend it, it can be seen that each overcast will pay for itself in less than a year. An overcast is subject to no inconvenience or danger, while a door has many disadvantages. The door boy may not come

of an overcast. However, the greatest reason in favor of an overcast is that only by using them can each entry have its own supply of fresh air. If doors are used, the air cannot be split, but must be continuous; it must pass from one panel into another, and in case of fire or explosion, the affected part would discharge the gases into some of the working panels between it and the fan. The ventilation of each panel could not be regulated, but must have the same air as the rest. To stop the air in one panel is to stop it in every inside panel as well. This overcast method



NEW STEEL TIPPLE AT THE BABY MINE, POCAHONTAS, VA.

main haulage roads, and from each of these it will have a second split into the haulways for each block, where it will be split a third time into the different panels, returning in precisely the same manner to the two main return airways, each 12 ft. wide, which accompany the two main haulage roads of the mines. These collect all the impure air and carry it beyond the shaft, where one of the returns, overcast above the man-way, and the two return airways become one, having a width of 24 ft. This airway will be substantially timbered, and will follow the seam to the outcrop, where it will deliver to the fan. The fan will be provided with an arrangement by which the direction of the air can be re-

versed, should a contingency occur to require it. This system of ventilation necessitates using overcasts in place of doors, but in the long run it is more economical, satisfactory and safe. If the cost of an overcast is estimated at \$150, taking the place of a door whose first cost is \$15 and whose daily cost is 75c. for a boy to attend it, it can be seen that each overcast will pay for itself in less than a year. An overcast is subject to no inconvenience or danger, while a door has many disadvantages. The door boy may not come

None of these disadvantages hold true

is not only more economical, but, by splitting, greatly reduces the power required at the fan.

SIMPLICITY

The system can be readily understood. Should a sudden emergency arise, it would not be necessary for a rescue or exploration party to be acquainted with the exact place in the mine; by being acquainted with the system they would know how to proceed, where to examine, and that done, would know how to act to the best advantage. In some cases, break-throughs exist in a mine, connecting separate parts of it and these break-throughs are not shown on a map, and in a case like the

one above cited may occasion the death of a rescue party. At the Pocahontas mines, Superintendent O'Malley and his rescue party lost their lives by being caught in the after-damp which passed through break-throughs from the Baby mine into the West mine. According to the system here described no such cross cuts would exist, save where they would be expected.

SAFETY TO THE MINERS

The safety afforded inside men has already been described. Two slope manways with easy grades have been provided, which pass around the shaft, where the incessant switching of cars and passing of trips make it unsafe, and connect with the two main entries of the mine at the first left. A system of automatic electric signal lights will be installed which will furnish absolute protection to trips when they are on the main haulway, and will keep them from running into each other, while maintaining their full speed.

GENERAL REMARKS

It may be stated that, whatever the condition of the seam may be in the unprospected parts of the basin, this system is flexible enough to adapt itself to that condition, and to mine the coal in that district to the best advantage.

Colliery Notes

A mine mule should always be watered before, and not after eating hay and grain. Likewise hay should be fed before grain.

In non-condensing engines the back pressure is usually measured from the atmospheric line, while in condensing engines it is measured from the vacuum line.

The coal output of Indiana in 1905 decreased about 100,000 tons as compared with 1904. The causes assigned for this decrease are heavy spring floods, lack of summer market, and car shortage during the last quarter. The selling price of the Indiana coal in 1905 was higher than in 1904.

Where feed-water for boilers is hard and contains from 20 to 100 grains of mineral solids per gal., much of this impurity can be thrown down if the exhaust steam is blown into the feed-water tanks. In one instance 12,000 gal. of water containing 70 grains of mineral matter per gal. required 8 lb. of quicklime and 22 lb. of soda to reduce it to a hardness of 4 grains per gallon.

Montana possesses an area of 1300 square miles of known coal-bearing formation, ranking ninth as compared with the other States in this respect. Although a number of properties are idle, there are at present about 49 plants producing. Eighteen years ago Montana produced practically no coal at all. Nearly all the coal properties are controlled by the large copper companies of the Butte district, or by one of the transcontinental railways.

Many investigators are recommending the use of the hydrogen flame for testing for gas in a mine. Such a flame is very sensitive and small percentages of gas present can be detected. One fact, however, must be remembered, that no flame gives off more heat than a hydrogen flame, and if caution is not observed, the gauze will be burned through. Especially is this true where the makers of the lamp use copper gauze. The more modern practice is to use steel instead of copper gauzes.

Experiments show that in an ordinary Davy safety lamp the flame of the lamp will pass through the gauze when the air is traveling 300 ft. per minute. The Clanny lamp is likewise unsafe when the current travels 480 ft. per minute. With either of these lamps it is seldom possible to detect less than 2 per cent. of gas in the mine air; whence, since less than 1 per cent. of inflammable gas in a dry mine, where the dust is highly volatile, is sufficient to cause a serious explosion, does it not appear dangerous ever to allow the use of such lamps where safety precautions are needed?

One condition not generally considered in connection with mine explosions, is the tremendous pressure of the air produced almost simultaneously with the disaster. It is now known that this pressure alone often renders the miner unconscious when he is not burned or even near the initial explosion. Before consciousness returns, the afterdamp arrives and kills almost immediately. It is this great pressure also that makes it hard to confine an explosion to one panel or locality, for even though the flame is not transmitted, the percussive effect on the mine atmosphere will often communicate the explosion to other districts.

In considering the cost of generating power with gas engines, care must be observed not to base costs on retort gas. This gas has a calorific value four times that of producer gas, but also costs 20 times as much. Gas engines require no expensive chimney and condensing apparatus, nor do they need as substantial a foundation; consequently the cost of installing a producer-gas engine is 15 per cent. less than that of a steam engine. In addition to this the cost of operating and maintaining a steam engine of 50 h.p. is 40 per cent. greater (according to R.E. Mathot) than the operation and maintenance of a producer-gas engine.

West Virginia still ranks third as a coal-producing State, its output being exceeded only by those of Pennsylvania and Illinois. In 1905 West Virginia produced 35,000,000 short tons of coal and 2,800,000 short tons of coke. Of this State's output the Baltimore & Ohio carried 7,988,955 tons in 1904 and 7,864,308 tons in 1905. The Chesapeake & Ohio carried 5,976,644 tons in 1904 and 7,700,811 in 1905. The Norfolk & Western carried 6,749,131 tons

in 1904 and 8,227,419 tons in 1905. The Kanawha & Michigan hauled 1,503,861 tons in 1904 and 1,865,130 tons in 1905. The only other large carrier of West Virginia coal was the West Virginia Central & Pittsburg, which carried 1,821,690 tons in 1905, as compared with 1,809,833 tons in 1904.

In order to determine the pressure necessary to overcome the resistance or friction of the air current in an airway, the most general method is to represent the total pressure by pa , which is placed equal to ksr^2 . In this formula k is a constant determined by experiment and (according to Atkinson) equals 0.000,000,02. Therefore, if an airway is 10 ft. wide, 6 ft. high and 5000 ft. long, and the air travels 500 ft. per minute, $pa = 0.000,000,02 \times 2(6 + 10) \times 5000 \times 500^2 = 800$ lb. In this connection it is well to remember that the nearer square an entry is, the less the perimeter for a given sectional area; consequently, the smaller the perimeter, the less the pressure necessary to overcome the frictional resistance.

Where gas engines are used, it should be remembered that too much oil is as bad as too little. If high efficiency is desired, all parts of the engine cylinder must be perfectly jointed; the valves should frequently be inspected and ground; the governor must be clean and well lubricated, using petroleum occasionally; the water circulation must be watched and the cylinder not allowed to get too cold, or bad combustion of the explosive mixture will result. The higher the compression of the engine the lower should be the temperature of the water. To prevent water being held in the cylinder, it is an advantage to have a drain cock in the cylinder. Premature ignition due to excessive heating from overloading, or bad circulation of gas, is a most fruitful source of trouble.

The theory that our coal beds have been formed primarily by immense growing forests, which were later submerged and covered, is not now generally believed by students of geology. The main fact disproving such a theory is the uniformity of structure and thickness of the various seams. Nearly all coal beds have clear, sharp, definite dividing lines between the floor of the seam and the roof of the seam. The large stumps and roots of forest trees would make impossible such a clear parting at the bottom of the seam. If thin pieces of coal are studied under the microscope, traces of interlacing vegetable tissue, may be plainly discerned. This has caused some scientists to believe that our coal beds are formed from deposits of small aqueous plants which feed upon water alone. The remains of these "Desmines," as they have been called, accumulate at the bottom of ponds and soon form a layer of pure vegetable matter, homogeneous and free from foreign impurities.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the
Hill Publishing Company
505 Pearl Street, New York.

London Office: 20 Bucklersbury, London E. C., Eng.
CABLE ADDRESS "ENGINJOUR, N. Y."

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

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

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

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

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

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

During 1905 THE ENGINEERING & MINING JOURNAL printed and circulated 454,250 copies, an average of 8735 per issue. Of this issue 8000 copies are printed. None sent regularly free. No back numbers beyond current year.

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The American Mining Congress

The meeting of the American Mining Congress at Denver, which is reported on another page, was by far the best which has ever been held by that body. We have always believed that there was a place for the congress; that it could occupy a field not held by any of the technical associations, and could accomplish much that would be beneficial to the mining industry. Some of the earlier meetings were not encouraging; they were given over to the promoter and the man with a hobby, and the results were such as might be expected. For two years past, however, the tendency has been to eliminate the undesirable elements and to make the congress a practical, working body. With this meeting it seems to have acquired a purpose, and to have entered fairly and earnestly upon its work.

As we have said, there is a wide and important field before it. The American Institute of Mining Engineers fills the technical field, as Dr. Raymond shows in his paper, also given on another page. But outside of that, there are a multitude of questions—of law, of business, of methods, of relations with employees, of organization—which must be discussed. The gathering of mining men, in earnest to forward and improve their work and their opportunities, cannot fail to throw light on these questions. The discussions will not only help those who hear them, but the whole industry; and may, in many cases, lead to better understanding between interests that seem to be conflicting.

With the present meeting, the American Mining Congress seems to have found its true field. It has now become a practical and useful body, and there is every reason to hope for its continued success.

Copper in California

Among the States which will show an increase in copper production this year, California will hold an important place. Of the group of new mines now being developed, to which we look for the required increase in production in 1907, certain in Shasta county, California, promise to be the first to pass beyond the constructive stage. Because of some temporary drawbacks, the copper output of California in 1905 was only 13,089,933 lb. against 29,974,154 lb. in 1904. It is doubt-

ful if the latter figure will be surpassed this year, but surely it will be in 1907.

The old smelter of the Mountain Copper Company in Shasta county, which was shut down on account of litigation over damages from fissures, is still idle, but the company's new smelter on San Francisco bay is actively working. The Bully Hill company's smelter shut down chiefly on account of the cost of transporting fuel, is preparing to start up with better facilities; while the Mammoth has become a large producer. There are many smaller mines in California, which have not sufficient output to justify the construction of a smelting plant for each, and with the provision of treatment facilities by the larger companies, these mines may furnish a supply of ores which will be large in the aggregate. Thus the Trinity in Shasta county, has just made a contract for the smelting of its ores, and others are following this example.

An incorrect belief, commonly held, is that the copper resources of the State are confined almost entirely to Shasta county. That county has the largest mines, and has been the largest producer; but copper mining is carried on in eleven counties of the State.

In Calaveras, for instance, there are two important mines, and several other counties make a good showing.

Great things are promised for the new Greenwater district, in Inyo county, in the southwestern part of the State. Prospectors are busy there, and large amounts of money have been paid for claims and prospects there. The district is too new, however, to permit of trustworthy predictions as to its future, and it will take many months before development work can be carried far enough to establish its real value, and make it a factor in the copper production. The present indications, however, are promising.

Copper production in California is likely to increase in the future, so that it will be of considerable importance; though the State will probably never be a close rival of Montana, Arizona or Michigan.

Utilizing Blast - Furnace Gases

While European metallurgists have been far ahead of their competitors in the United States in the utilization of waste gases for the production of power, it seems that the question has now been taken up seriously here, and that rapid ad-

vances are probable in the future. The first company in this country to enter into such utilization on a large scale was the Lackawanna Steel Company, in its new works at Buffalo. Those works have some 40,000 horse-power of gas engines used as blowing engines, and for generating electric power, with results which, we understand, have been entirely satisfactory.

The experts of the United States Steel Corporation have evidently approved of the innovation, for gas engines are being introduced into several of the older plants; while they are to be used on a large scale in the new plant at Gary, Ind., which is intended to be a model of the best practice. According to a list compiled by the *Iron Age*, there are now under construction, and ordered by the Steel Corporation, gas engines aggregating a total of 102,000 horse-power; of which 44,000 horse-power will be in blowing engines, and 58,000 horse-power for other purposes, chiefly for the generation of electric power. Only a few of these engines will be supplied with producer gas for special purposes; the rest, furnishing a total of 100,000 horse-power, will be operated with the gases from the blast furnaces, which would otherwise go to waste, with the exception of that portion which is utilized in the hot-blast stoves and under boilers.

This is a large beginning, much larger than most people know. Our iron metallurgists have been a little slow in taking up this important question; but now that it has been taken up, it is quite possible that they may surpass their European brethren before many years.

Minerals on Railroad Lands

The residents of Hemet and vicinity, in Riverside county, California, who have purchased lands from the Southern Pacific Company, now find that the deeds giving them title reserve to the Southern Pacific the mineral in the lands, leaving the owners only the agricultural or surface rights. As extensive iron and manganese deposits have recently been found near Hemet, this is a grave disappointment to the land-owners.

Much might be written as to this reservation of the mineral in the lands. When Congress made the land grants to the railroad, the mineral was reserved for the benefit of the people, but the railroads got most of the mineral nevertheless. Of course, where individual protests were

made in the cases of known mines, the patents did not issue to railroads for those particular pieces. But by the process of patenting large tracts of many thousands of acres at once, without such tracts being investigated as to their mineral nature, patents did finally issue to the railroads, and the mineral became their property.

The California Miners' Association made a determined fight on this issue for several years, trying to prevent patents issuing for railroad lands until they were examined by competent geologists, but its efforts were unsuccessful. The friends of the railroads in Congress always prevented any legislation requiring examination of the lands before issuing patents. Now, however, the railroad, having got possession of the land, is selling them to settlers and reserving the mineral which actually never belonged to the company. A suit to determine the rightful ownership of the mineral in such lands might bring results of much interest to the mining community.

A Nevada Miners' Association

Nevada mining people are getting ready to organize an association something similar to the California Miners' Association and a meeting has been held in Reno, to consider the matter. For several months there has been a general agitation throughout Nevada in favor of new mining laws relating to "wild-cattling," the location and improvement of claims and the safeguarding of employees working underground. The mining industry overshadows all others in Nevada and the development in this respect is so extensive, and so much money is being invested, that legitimate operators are demanding better laws. The mining men of all the districts are to be consulted and their opinions taken before any organization is perfected. Judging from experience in California, if this is done, the question of safeguarding the underground employees will not be taken up. That point had early to be dropped in California, most mining companies objecting to interference in this matter. In this connection it may be stated that the California Miners' Association has been intending to enlist the cooperation of the Nevada mining people. A union of the two States would make a strong association; but it seems possible that there are too many divergent interests to make such union quite practicable.

Some of the newer districts in southern California, however—the copper and gold camps of Inyo county, for instance—would naturally affiliate with a Nevada association rather than with the California society.

Mine Labor

Constant complaints are being received regarding the scarcity of good miners in the various mining districts of California. The same condition of affairs exists in Arizona, Colorado, Idaho, New Mexico and Utah. In California very high wages are offered for men in all branches of industry in the rebuilding of the city of San Francisco, and even with this incentive labor is scarce. But it is the mines of Nevada which are principally attracting the miners from the other States.

The new camps in process of development in Nevada are in a "poor man's" country, as prospects are readily sold, there being plenty of money seeking investment there. Money has been made by hundreds of men on leases, and moreover there is a vast tract of country still unprospected. The trend of prospecting work is now into southeastern California, where many promising discoveries have been made. Several railroad lines are being built in that section, opening districts which have long been kept back by lack of transportation facilities.

THE PRICE OF copper continues its upward course and bids fair to go higher still. It is interesting to compare with previous high figures. Lake copper averaged 24 $\frac{1}{8}$ c. in January, 1880. To find a higher figure than that we have to go back to May, 1874, when the average was 24 $\frac{3}{4}$ c. In 1864 Lake copper reached 60c., but that was on currency basis.

FOR THE FIRST half of the current year, the Rio Tinto has declared a dividend on its ordinary stock of 50 per cent., or at the rate of 100 per cent. for the year. This is the highest dividend payment ever made by the company, and shows the effect of the strong copper market. From all present appearances, the dividend for the current half-year may be even higher.

THE BRIEF ARTICLE by Mr. Corey on the Nonesuch sandstone of Michigan, published elsewhere, is interesting because it throws light upon the physical conditions of this remarkable sandstone, which has heretofore baffled the best efforts of millmen, chemists and metallurgists.

THE AMERICAN MINING CONGRESS

A Successful Meeting. Discussion of Topics of Much Importance to the Mining Industry.

EDITORIAL CORRESPONDENCE

The ninth annual meeting of the American Mining Congress, the opening sessions of which on Oct. 16, were reported in our last issue, was characterized by a large attendance of thoroughly representative mining men, including mining engineers, mine operators and many persons interested in mining as investors. The promoters and men with axes to grind were conspicuous by their absence. The meeting was devoted especially to the consideration of questions, many of them important, directly affecting the welfare of the mining industry, which left but little time for the reading and discussion of the technical papers that were listed. It was the consensus of opinion that the Congress had at last "found itself," and would be hereafter an important element in affairs concerning the mining industry.

The morning and afternoon sessions of Oct. 16 were of an introductory character, during which the members and delegates took advantage of the opportunity to become acquainted. In the evening session at the Brown Palace Hotel, where all subsequent sessions were held, business was promptly inaugurated. J. H. Richards, president of the Congress, presented an address outlining the aims of the organization. He was followed by D. W. Brunton, who read a brief paper pointing out the necessity for the establishment of mine drainage districts; that is, districts in which groups of wet mines may be unwatered by joint action. A law providing for such drainage districts, based on the idea of city improvement and swamp-drainage districts, had been drafted by a committee of which Mr. Brunton is chairman. This draft was adopted by the Congress, after considerable discussion, and the mining States are urged to adopt it. We shall refer at more length to this proposed law in a subsequent issue.

In the morning session of Oct. 17, W. M. Porter read a paper outlining a plan for a mining exposition at New York in 1907. After the introduction of various resolutions, discussion of a proposed law for the prevention of mining frauds, introduced by Governor Pardee, of California, was taken up. This proposed law, which is based on the law for the same purpose now in effect in California, provides for the punishment of persons who knowingly make false statements concerning the affairs, pecuniary condition or property of any corporation, co-partnership or individual, but provides no means for its execution beyond such as already

exist. There was an animated discussion of this proposal, the desire of many members of the Congress being evidently that the States should supervise mining proposals submitted to the public, a purpose which is obviously infeasible and impolitic. The consideration of this question was concluded by the Congress adopting the draft submitted by Governor Pardee, which all of the States are asked to enact.

Papers were then read by Dr. J. A. Holmes on "The Waste of the Nation's Resources," in which special attention was called to the remarkable inefficiency with which the heating power of coal is utilized; and by Dr. E. R. Buckley on the "Zinc Resources of the Joplin District" (the latter paper having been prepared by Chris. Guengerich, of Joplin). The paper by Dr. Holmes was particularly interesting and treated of a subject, in a clear and concise way, which is very appropriately brought to the consideration of mining men. Of the papers presented at this meeting, the two by Dr. Holmes are excellent examples of the kind of technical papers which ought to be presented before such a body as the American Mining Congress.

The evening session was devoted to the official business of the Congress, and to the final discussion of the mine drainage bill, which was adopted as reported by the committee, with a few amendments.

In the morning session of Oct. 18, E. M. De La Vergne, of Colorado Springs, read a paper on "The Mutual Relations and Grievances of the Smelting Trust and Ore Producer," the burden of which was dissatisfaction among the ore producers, particularly of Cripple Creek, with the methods of the Trust in buying ore, and the general treatment by the latter of the miners. These complaints apparently voiced the sentiment of a large portion of the meeting. Senator De La Vergne was replied to by Franklin Guiterman, general manager of the Colorado and Utah Department of the Smelting Trust, in a masterly address, delivered in a calm and forcible manner, which won applause from a somewhat hostile meeting. Mr. Guiterman's defense that the Trust still had competition to meet in many districts was not very convincing, but his argument that the interests of the Trust and the miners were largely identical, that there had been no unfair changes in the methods of sampling and settling for ores, that the smelter could not always afford equal treatment to all producers, because of the limitations of metallurgical reasons, and

that since 1901 the rates for smelting in Colorado had been materially reduced (a contention which was supported by many figures) was powerful and impressive.

After the conclusion of Mr. Guiterman's address there was a general discussion, chiefly as to the terms on which settlements for ore are made. There is evidently considerable dissatisfaction toward the Trust among many of the miners, and it being impossible to go fully into the matter in the limited time of the meeting, a resolution was adopted appointing a committee to consider the relations between the ore producers and the smelting interests, and seek to harmonize them in so far as may be necessary.

At the afternoon session several resolutions were adopted, including one by H. S. Josephs, providing for a committee to present and urge upon the various State legislatures and the National Congress the measures advocated by the mining congress; one by W. R. Ingalls reiterating the sentiment of the American Mining Congress that the law of the apex should be repealed and a side-line law substituted for it, and providing for the appointment of a committee to cooperate with that which has been engaged during the last year in drafting a side-line law; one by W. R. Ingalls providing for a committee to draft a uniform law governing quarrying and metalliferous mining in the various States with a view to securing its general adoption as a substitute for existing laws; and appointing a committee to urge upon the coal-mining States the appointment of a commission to investigate the conditions affecting safety in coal mining, with a view toward the formulation and enforcement of adequate laws governing this branch of the mining industry. Papers were read by A. W. McIntyre on the "Copper Deposits of Washington," by Prof. F. W. Traphagen on "Recent Litigation Involving Questions of Damages from Smelter Fumes, Tailings, Water and Tailings Débris," and by C. L. Dignowity on "Mining and Mineral Resources of Nevada."

In the evening the members of Congress, as guests of the entertainment committee of the citizens of Denver, attended the Orpheum theater.

Friday morning was devoted to the passage of resolutions, among which was one offered by former Governor Prince, of New Mexico, calling upon the Federal Government to open the Spanish and Mexican land grants to miners and prospectors; one by the committee on resolutions recommending that the governors of States, which may pass the so-called Pardee law, commission some official to investigate charges of its violation, a fee for examination to be paid by the person requesting it; and one recognizing the importance of good roads as a means of developing the mining industry and urging

members to cooperate with the good roads movement.

Judge J. H. Richards was re-elected president of the congress, while he and Thomas Ewing were re-elected to the board, and W. F. R. Mills was elected thereto in place of J. F. Watson. After an animated discussion, Joplin, Mo., was selected as the place for the meeting in 1907. After the adjournment of the meeting, Friday afternoon, many members of the congress went to Cripple Creek as guests of the entertainment committee, the railways and the Mine Owners' Association, returning Saturday afternoon.

Thus ended the most successful meeting in the history of the American Mining Congress, and one that promises to lead to important practical results. It will take time to determine what may really have been accomplished; but whatever it may be, a meeting which brings mining men together for acquaintanceship, discussion of the matters affecting them, and an exchange of opinions serves a useful purpose.

Accidents in Marquette County Mines

In his report to the Board of Supervisors of Marquette county, John T. Quine, inspector for that district, gives a detailed account of the causes of 22 fatal accidents occurring during the year ending Sept. 30, 1906.

The casualties occurred among seven nationalities: 12 of the deceased were Finns, two Italians, 2 English, 2 Swedish, one Irish, one Polish, and two French Canadian.

Falls of ground resulted in six fatalities, three men fell down shafts, two were killed by riding on skips and two by suffocation. Nine other causes, detailed in the report, resulted in the death of the remainder.

The Republic mine of the Pennsylvania Iron Company led the list with four fatal accidents; Lake Superior Hard Ore and Negaunee came second with three each.

This year the number of accidental deaths was the same as last.

Of the 22 reported, three occurred on surface and of the total two could have been avoided had the unfortunates simply obeyed orders.

A generalized summary follows: Total number of mines in operation in the county, 31; quarries, 1; explorations, 1; total number of men employed, 5840; fatal accidents, 22; fatal accidents per 1000 men employed, 3.76. The mines of the county are all iron-ore mines.

The production of coal in France during the first half of 1906 decreased by two million tons from the figure of over seventeen millions in the corresponding half of 1905.

The American Institute of Mining Engineers*

BY R. W. RAYMOND

Having been almost continuously an officer of this society since its organization in 1871, I may claim an intimate acquaintance with its history and administration; and I welcome the opportunity to explain in this contribution some features of its plan which are not perfectly understood by the public. Unfortunately, time is not at my command for an elaborate and complete discussion of the subject, and this sketch must necessarily be brief and fragmentary.

The period following the war for the Union was characterized by great activity in mining, and a great demand for mining engineers. The mining industry of the Pacific States had been, ever since the discovery of gold in California, the leading factor in the settlement of that region, the improvement of communications and the establishment of civilized communities, with auxiliary agencies of commerce and manufactures, as well as education and religion. The governmental aid given to the Pacific railways, on the ground that these lines were military necessities for the handling of the Indian tribes and the maintenance of sovereign Federal authority throughout the vast Pacific slope, could scarcely have been secured, had not the mineral resources of that territory given it a thrilling romantic interest and a boundless value in the eyes of the people of the East. At the same time, the exploitation of the western mines and the rapid development of coal, iron, zinc, copper and lead mining in the older States, called for trained engineers; and successive technical schools were established in response to this demand, while technical journals flourished, and became more and more devoted to problems of theory and practice, as well as records of new enterprises. Meanwhile, the actual mining engineers of the United States—those who were doing the great work of mining both East and West—could not be said to form an organized profession at all. There were a few graduates of foreign schools; many civil engineers who had turned their attention to mining; a much larger number of miners from Cornwall or Germany, who had risen to be mine-captains and "experts;" and a still larger number of self-taught American miners and prospectors, ignorant and jealous of book-knowledge, and over-conscious of superiority in many respects to its possessors and professors. This heterogeneous multitude had no common ground for the interchange of views and experiences, and no organized common feeling inducing them to seek and occupy such a ground. The technical journals and the technical

schools alike needed to be reinforced in their endeavors by some agency which should promote personal acquaintance and mutual esteem among the men in whose hands were the mining operations of America.

It was my realization of this feature of the situation that led me, as the editor of the *ENGINEERING AND MINING JOURNAL*, to attend at Wilkes-Barre, in May, 1871, the meeting called by three mining engineers, Eckley B. Coxe, Richard P. Rothwell and Martin Coryell, to organize an association. As a beginning, in default of a duly elaborated scheme to suit our special case, the Rules of the North of England Institute of Mining Engineers were adopted in substance, and the name of "The American Institute of Mining Engineers" was chosen for the new society without debate, as a matter of course. The rules were subsequently re-written; but the name, though in some respects a misnomer, since it does not fully describe the scope of the Institute, has survived, and has become so dear to the members and so well known to the world, that it is not likely to be changed. A lucky misnomer is sometimes a "mascot."

At the outset, a most important question arose, the settlement of which involved the whole future of the society. Several educated engineers protested against the admission to full membership of persons not belonging to the profession, and not possessed of a certain degree of professional standing and experience. They could not insist upon the degree of M. E. or E. M. as a qualification. They did not themselves hold that degree; but they felt that C. E., or its equivalent in certified experience and knowledge, ought to be required. In a word, they did not wish to recognize as fellow members (though they would consent to admit as associates) common miners, foremen and self-educated mine captains.

There was much to be said in favor of this feeling. Professional societies usually represent professions, and membership in them is accepted as a guaranty of professional standing. Consequently, they make careful preliminary examination into the training and achievements of candidates, and sometimes impose a period of probation as "junior" before advancement to full membership. All this is excellent, for the purpose for which it was designed. But that was not the purpose of the Wilkes-Barre meeting of 1871; and if that had been its purpose, the movement would have failed. This point is so important as to warrant further explanation.

There was at that time no such thing in the country as a distinct profession of mine-engineering, numerous enough to support an active and useful society. Any attempt to create one by means of a society would have resulted in a small, select (i.e., self-selected) coterie, barren of influence and outside of practical connection with the national mining industry.

*A paper presented to the American Mining Congress, at Denver, Colo., Oct. 16, 1906.

The pressing need of the hour was not the segregation of a select body, but the cordial coöperation of all the representatives of a great industry or group of industries. This could only be effected by bringing together on terms of friendly equality the schoolmen and the fieldmen, and persuading the latter to do what they were naturally shy and reluctant in attempting, namely, to tell what they knew, for the benefit of all. Unquestionably the self-educated, practical mining men and furnace men at that time knew more than the school graduates about the actual facts of American ore deposits, mine workings and furnace management. It was not the nominal manager but the Cornish captain who knew the mine; it was not the chemist but the founder who ran the furnace. If these practical men were slighted at the beginning, they would stand aloof, giving no aid in the way of fresh facts, and leaving the theorists to exchange their speculations with little profit, like the traditional boys confined in the garret, who professed to have made money by swapping jack-knives, back and forth.

Again, the work of publishing and distributing useful information could only be done upon an influential scale by a society with a large income; and this would require either a select, small society supported by heavy annual dues, or a numerous membership paying small dues. Beyond question, the latter was both easier to secure and more fruitful of influence as well as revenue. The result of thirty-five years' experience has left no doubt on that head. What the Institute has given to its members in the way of publications for the annual fee of \$10 may be confidently compared in both quantity and quality with the similar publications of any society in the world, supported by annual dues of twice or thrice that sum.

Another point is worthy of note. A large membership, even if it be not narrowly confined to men of a certain ascertained standing in a single profession, furnishes an attractive and inspiring public to ambitious authors. A famous engineer (member of several other American and foreign professional societies, as well as of our Institute) once said to me: "The Institute is an association largely composed of young men with reputations to win, instead of older men with reputations to maintain. The consequence is, that your members are eager to communicate what they know or think, instead of being afraid to 'give it away,' or reluctant to incur criticism by offering professional contributions not monumentally complete and creditable to their acknowledged professional standing."

The *Transactions* of the Institute illustrate the truth of this keen, discriminating observation. Some of their most valuable papers have come from men who

could not have claimed membership in more "select" societies, and who wrote, not because they were already known, but in order to make themselves known.

At all events, the force of circumstances dictated, and the experience of thirty-five years has approved, the decision which admitted to membership in the Institute all persons trained for, or practically connected with, the professions and industries which it represented.

But this decision involved the simultaneous adoption of another. In 1871 (and the same is true to a more limited extent today), the American mining engineer had to know many things besides mine engineering proper. He was expected to do, or intelligently to superintend, the work of assaying, milling, smelting and general construction and management. Moreover, a man who was running the mine today might be superintending the furnace tomorrow. Hence it was found both advisable and practicable to include in the membership of the Institute those who were connected with geology, chemistry, and civil, mechanical or electrical engineering, as applied to mining or metallurgy.

The American Society of Mechanical Engineers and the American Institute of Electrical Engineers are both younger than our Institute, and, in some sense, its offspring. They have fields of their own, which they most creditably occupy; yet great numbers of their members still seek or retain membership in the Institute of Mining Engineers, and the Institute has had no reason to close the doors once opened to such candidates.

The original scheme of the Institute led to an unprecedented growth, both at home and abroad. The membership increased rapidly from year to year, and now numbers more than four thousand names, distributed throughout the world. This forced upon the management two additional problems: one of government; the other of policy.

The meetings of the Institute were, from the beginning, peripatetic. Nothing else could have prevented its degeneration into a local organization, or kept alive the national sympathy necessary to its success. Until its incorporation in 1905, it had no official headquarters aside from the office of its secretary, which had been located, without any official action, wherever the secretary happened to reside—first at Lambertville, N. J., then at Philadelphia, then at Easton, Penn., and finally at New York City. It was manifestly impracticable to leave the decision of business questions to the vote of such members as might happen to attend a meeting in some particular locality. Consequently, almost absolute powers were given to the Council, chosen annually by postal ballot.

But such a grant of absolute power demands a precise limitation of its sphere; and accordingly the Council of the Insti-

tute was prohibited from any act or utterance outside of the management of the proceedings of the society itself, namely, the holding of meetings, and the acceptance, publication and distribution of papers. Gradually it came to be recognized that the Institute itself, as represented by the members attending a given meeting, was still less competent than its representative Council to express opinions or approve propositions of any kind outside of its own immediate affairs; and the final result was the present rule:

"The Institute shall not assume responsibility for any statements of fact or opinion advanced in the papers or discussions at its meetings. Neither the council nor the Institute shall officially approve or disapprove any technical or scientific opinion or any proposed enterprise, outside of the management of the meetings, discussions and publications of the Institute, and the conduct of its business affairs by the board of directors."

This policy is not only approved by our experience, but also founded in a correct theory of the relation of the Institute to its individual members.

A man who joins the society for the sake of the benefits offered by its publications and its fellowship* has a right to the assurance that neither his name, his money, nor the influence of the organization which both his name and his money have strengthened, shall be used to promote any outside cause whatever. No matter how ignorant or prejudiced he may be, he is entitled to be protected against unwilling partnership in an opinion, or a movement, or an enterprise which he has not contemplated.

Several instances from the earlier history of the Institute will further illustrate this principle.

In the first decade, there was a brilliant discussion before the Institute of the question "What is Steel?" and in 1876 an international committee of high distinction reported for our adoption a new nomenclature for the products of the iron blast furnace, the bessemer converter, the forge and the crucible. But, underneath the technical questions involved, there were important questions of tariff classification, involving, perhaps, millions of dollars; and a sweeping decision of the Institute on either side of the case would have been used in argument before the United States Treasury Department, to the injury of the business interests of many members. This result was wisely averted by a refusal to promulgate any such general decision.

*I must be content with a mere passing notice of the advantages of this fellowship, which has proved in innumerable cases the sufficient motive for a frank interchange of information, quite outside of the formal published papers and discussions. It has been for many years my practice as Secretary to refer members desiring information which I did not possess to other members who had it. And I can recall no case in which such an appeal did not meet a courteous response.

Later, there was a memorable debate, concerning the metric system of weights and measures, on a resolution recommending Congressional legislation to make this system obligatory. Here, again, the proposition was passionately opposed by members whose business interests would, at least in their own opinion, be injuriously affected by it, as well as by those who, on principle, disapproved it. In this case, the speeches on both sides were reported in the *Transactions*; but when the time came to vote on the resolution itself, the presiding officer declared it to be out of order, as not included in the declared purposes of the Institute, and, therefore, declined to put it to vote. This decision, sustained by the meeting, may be said to have settled, once for all, the principle which, after several similar precedents, was formally embodied in the rule already quoted.

It is evident that no rule of this kind could be enforced if there were any recognized distinction as to the merit of the scheme or proposition seeking support. Such a scheme or proposition, if of such a character as, almost beyond doubt, to command the hearty assent of all members, would surely constitute an excellent precedent and illustration for the support of the existing rule.

Ever since the Institute became successful, influential and widely known, innumerable attempts have been made, in entire good faith, to secure the aid of its name and authority for propositions honestly believed to be (as, in most cases, they were) meritorious. Recommendations that Congress should make appropriation for the representation of the U. S. mineral industry at this or that exposition at home or abroad; that the Institute should unite with this or that society to form a joint committee on national or international standards, etc., have all been "turned down"—the more meritorious, the more promptly. It was the only way to preserve our plan and purpose.

This statement may explain why the Institute and its officers, as such, have taken no part in the successive meetings of the American Mining Congress, with the purposes of which a large number of our members are in sympathy.

I feel bound to add that the restricted policy above outlined has had somewhat unexpected and most gratifying results. The Institute has been the forum, and its *Transactions* the records, of the free discussion of nearly every important and pertinent question connected with the progress of modern engineering. Expressing no opinions, we hear all, and furnish to the proposer of any reasonable novel view an appreciative audience. And no student of the practice of the last thirty years in any department represented by our membership can afford to overlook the authoritative and suggestive

contributions made by us to the technical literature of this generation.

There are many other features of the history, tradition, and consequent present administration of the Institute, concerning which I would gladly speak, and feel myself exceptionally qualified by circumstances to speak; but I cannot thus add to the present sketch, which, I venture to hope, has explained (and even justified) the three leading peculiarities of the Institute, namely:

1. Its wide and liberal conditions of membership.

2. Its absolute government by a central body—i.e., its representative, rather than purely democratic, organization.

3. Its strict limitation of the functions and powers, both of the governing body and of the Institute as a whole.

Each of these features has been often criticized, usually in perfect good nature and good faith. I shall not now undertake to offer any further defense of them, not incidentally implied in the foregoing explanation. But I think I may fairly claim to have shown that they came into existence as the natural and necessary results of the conditions attending their origin. Even if something better might have been imagined, nothing better could have been done.

Finally, may I not modestly, but confidently, claim that the results of this enterprise, whatever may have been the defects of its plan, have been, somehow or other, such as to warrant us in "letting well enough alone?"

The Colorado School of Mines

SPECIAL CORRESPONDENCE

It was about a year ago, when, in the presence of a notable assemblage, the corner stone was laid of an \$85,000 administration and library building, the gift to the State School of Mines, at Golden, from Simon Guggenheim. Oct. 17, in the presence of the governors of three States, the heads of Colorado's educational institutions, a large number of the alumni, the present students, about 1200 of the prominent people of Denver, besides many delegates to the American Mining Congress, the magnificent structure was formally dedicated and presented to the board of trustees by Mr. Guggenheim in person. Dr. Gunsaulus, of Chicago, delivered the dedicatory address. The unveiling of life-sized paintings of Dr. Regis Chauvenet, the first president of the school, which he served for about 20 years, and of Mr. Guggenheim, was one of the most interesting features of the celebration. These paintings are the gift of the alumni and are finely executed. In an eloquent address, the donor of the building stated that it had always been his conviction that citizens who have been successful in their enterprises owe the State an obligation, that he felt the

responsibility as steward and that he was glad to do something for the benefit of the many. Dr. John P. Kelly, president of the board of trustees, when he received the keys of the building from Mr. Guggenheim, in a short speech acknowledged the high appreciation of the great gift. Dr. Alderson, president of the institution, announced with much pleasure the promise of the following prizes on the part of two public-spirited citizens: Mrs. Edward G. Stoiber will give \$200 annually for the best senior thesis; Frank Bulkeley, \$100 for the best senior thesis on the examination of mines and mine reporting.

After the exercises were completed, the entire building was thrown open for inspection and great admiration was expressed on all sides for its beautiful furnishings. It is undoubtedly the finest structure on the grounds of the school, which of late years has been securing such a deservedly high reputation.

Platinum in the Yukon

Fine-grained platinum was recognized in the black-sand residue obtained along the Teslin or Hootalinqua river, Yukon Territory, as early as 1898, but until recently no active preparations have been made to recover it. The Hootalinqua drains Lake Teslin, and is one of the southern tributaries of the Yukon. Its gravel bed carries gold in payable quantities, even by hand working, continuously, throughout the lower 120 miles of its length. Here the river averages a quarter-mile wide, has a sluggish current, and is shallow, though navigable for light boats. Its banks have long been a favorite working ground for prospectors.

The British-American Dredging Syndicate, Ltd., whose concessions cover 15 consecutive miles up the river from its mouth, is preparing to exploit the river bed with a Risdon dredge, which will be equipped for saving the black-sand residues, and extracting the platinum from them. Heavy machinery is readily carried from Skagway to White Horse by rail, and thence to any point in the Hootalinqua river by boat, passing through Lake Lebarge and the Lewes river.

Black sand from this river was treated by the United States Geological Survey's plant at the Portland exhibition in 1905, the opinion being that the platinum, although exceedingly fine, is capable of recovery by Wilfley, Pinder or Christiansen tables. From about 10 oz. of black sand, taken at random from a gold washer, Dr. Day saved platinum worth 60c., and a more recent test on 15 oz. black sand, recovered from 200 lb. of original gravel, yielded 0.7 gram of platinum, and 0.023 gram iridosmium. Considerable attention has been given to the sources of platinum in British Columbia, but this will be the first attempt to recover it in the North.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

Drawing Water from Flooded Workings

I note in your recent issue an inquiry concerning the drawing of water from flooded workings into a shaft. This problem was successfully encountered by the writer in 1891 in the George's creek region, and a paper describing the work may be found in the *Transactions of the American Institute of Mining Engineers*, Vol. XXIV, 1894, p. 21.

BEVERLEY S. RANDOLPH.
Berkeley Springs, W. Va., Oct. 14, 1906.

In answer to your correspondent, H. B. C., who puts the query as to the best means of controlling the supply of water in the unwatering of old workings, I would respectfully suggest the use of the Burnside "patent safety boring apparatus" which is much used in England. I had the pleasure of seeing this apparatus in use in a coal mine in Fifeshire, Scotland, in the summer of 1904, where it was employed in the unwatering of old workings which were first tapped at a pressure of about 280 lb. per square inch, and it proved itself to be thoroughly satisfactory and complete.

Failing the use of the above apparatus I would suggest the following hints and precautions:

1. Brace the wrought-iron pipe in the enlarged hole as suggested.
2. Assure yourself that the pipe is thoroughly watertight in the hole by wedging hard with wood and steel wedges, or other means, because the control of the water must be absolute. Moreover, with a leakage at high pressures, in ground which is in any way soft, the effect of erosion is speedily disastrous.
3. From the bottom of the wrought-iron pipe, a few inches on the inside of the gate-valve, have a downward branch pipe of about 1 1/4 in. diameter, with a cock valve for the discharge of the sludge from the boring bit.
4. On the top of the pipe, near the same point, fix a pressure gage.
5. On the outside of the gate-valve have an arrangement for clamping the rods. This will be found a very desirable feature when the holing has been effected and on the withdrawal of the rods. A good arrangement is to interpose between the gate-valve and the stuffing-box a suitable valve-casing, from which the valve has been removed, a block of hard

rubber being substituted on the end of the spindle.

6. When the holing is about to be made, be in readiness to clamp the rods and shut the sludge-cock.

7. When the water is first tapped, be on the outlook for any release of noxious gases.

I trust the foregoing hints may be of some use to your correspondent.

H. STEWART
Shelby, N. C., Oct. 16, 1906.

Air - Drill Efficiency

Sir—In your issue of Sept. 22, I note an interesting letter from Chas. A. Chase, of the Liberty Bell Gold Mining Company, Telluride, Colo., and your editorial upon the subject of electric drills vs. air drills. I note that there is a great diversity of opinion relative to the amount of power required to operate air drills. At the Rose Deep mine I note that in a six-hour test with thirty-one 3/4-in. air drills, the average work of the compressor engine was 12.7 i.h.p. This low result was doubtless caused by the fact that not all the drills were in operation at once, no time being taken out for setting up and tearing down. I note also that C. E. Hutton reported the determination of 28 i.h.p. per 3/8-in. drill when running. Mr. Chase states that 50 h.p. was required for two drills, or 25 h.p. per drill. I have not seen the paper by Mr. Hutton, and do not know how he arrived at his conclusions; but I have done a little theorizing on the subject which shows the amount of power thrown away by the fact that the drill exhausts air at full pressure. In order to secure as much power as possible from a given weight of drill, it is necessary to use the air non-expansively, and at the end of each stroke a volume of compressed air equivalent to the volume of the cylinder is discharged into the atmosphere. The energy thus wasted is measured by the power required to compress to the given pressure a sufficient volume of free air to make a volume under pressure equal to the contents of the cylinder. This in cubic feet per minute for a 3/4-in. drill of 6 1/2-in. stroke, 350 strokes per minute, operating at 90 lb. pressure, the diameter of the piston rod being 1 5/8 in., is as follows: Area of cylinder, 8.29 sq.in.; area of piston rod, 2.07 sq.in.; volume of cylinder, forward stroke, 53.38 cu.in.; volume of cylinder, back stroke, 34.21 cu.in.; total

displacement at 350 strokes, 30,831 cu.in., or 17.84 cu.ft.

The quantity of free air required to make 17.84 cu.ft. at 90 lb. pressure, together with the horse-power required at various altitudes, assuming perfect cooling, with two-stage compression, is about as follows:

Altitude.	Free Air Required, cu.ft.	H.P. Required to Compress 100 cu.ft.	Total H.P. Required.
Sea level.....	125	14.7	18.37
5,000 ft.....	149	13.45	20.04
10,000 ft.....	179	12.33	22.07

This gives the loss occasioned by exhausting at full pressure. The total theoretical horse-power that it is possible to transmit to the rock (forward stroke only) equals 8.29 sq.in. \times 90 lb. per sq. in. \times 190 ft. per minute equals 141,729 foot-pounds per minute, or 4.29 horse-power.

It will thus be seen that, when theoretically considered, it is possible to convey into actual work not more than 10 to 20 per cent. of the power used in compressing the air. When the losses from radiation from the air receiver and air pipe are considered, together with the friction of the air in passing through the pipes, as well as the friction in the air drill, loss of air from leaky valves, etc., it will be realized why so little of the power expended at the compressor is actually transmitted into work at the breast.

Denver, Colo. E. C. REYBOLD, JR.

The Black-Sand Investigation

In response to your request for information concerning the Black Sand and Gold Recovery Company, of Chicago, I write to advise you that the statements of this company indicating that it has the monopoly on the processes used by the Geological Survey in investigating the black sands of the Pacific slope are at least rather misleading. The Geological Survey, when directed by Congress to investigate the useful minerals contained in the black sands of the Pacific slope, sent out a circular of invitation to all the placer mines to send us samples of their heavy sands remaining in the sluice boxes, for investigation. We have examined about 4000 of such samples, and in many cases found surprisingly large amounts of gold

being thrown away in these heavy sands by the placer miners, on account of difficulty in extraction.

With the coöperation of Prof. R. H. Richards, of the Massachusetts Institute of Technology, we investigated also the best means for extracting the useful minerals from the black sands. For this purpose we invited manufacturers of concentrating machinery to send their machines to our plant in Portland, Oregon, and there we assembled concentrating machines of various standard types, but we did not test any owned by the Black Sand and Gold Recovery Company; therefore we are not in a position to speak of the value of its apparatus from any actual tests made, nor is it at liberty to state that we are at all conversant with its machinery. I have watched its magnetic separator in operation, and it seems to do very good work as far as one can tell without any actual tests. I happen to know that this company has nearly finished building a dredge of standard type in Portland, Oregon, and has given, thus, evidence of intention to go definitely into black-sand mining, just as any other corporation is at liberty to do with its own machinery, or with such machinery as we have tested at Portland.

Far be it for me to condemn any enterprise tending to make use of these waste materials; but, on the other hand, I must protest against the assumption by this company of any special advantage over any other company except in so far as its machines (which we have not tested) may prove of special value; and it is only common sense to call attention to the fact that this company is offering for sale stock in a five million dollar company at a low rate per share without first having any plant in successful operation.

I should like to take this opportunity to call attention to the extremely fair way in which the results of our work have been reported, not only by the technical press, but by the daily press, and the fair way in which the results have been handled by the placer miners themselves. It seems hardly possible that 4000 results could have been reported to the placer miners, many of them showing considerable value in these waste products, without some booming of properties being the result. But, so far as I know, nothing of the kind has taken place, the miners simply evincing an earnest desire for accurate information concerning this new method of utilizing their waste products. The result has been a new field of usefulness, in cleaning up in placer mining by means of concentrating machines of the shaking-table class.

The only case where an *apparent* effort to boom a property has resulted from this work was rather an amusing incident, about which an effort to make capital to the discredit of the Survey was attempted by a mining paper. It was in the case of a concentrate sent in by our special request from a placer mine in Albany county, Wy-

oming (on account of the fact that Professor Knight found platinum in placers in this region some years ago). The result of the examination of this concentrate showed that it did not contain platinum in appreciable amount, but it did contain over \$800 in gold to the ton of the concentrates, which meant to the owner a reasonably high amount of gold in the original sand. The owner is an engineer on the Union Pacific Railway, and of excellent reputation. He inadvertently showed the result to a newspaper reporter, who, actuated by local pride, multiplied the value of the concentrate by ten and sent out a "booming" press despatch, which, however, did not even serve to turn the head of the owner of the property, who had not, and never has had, any idea of projecting any boom by such means.

On the other hand, it is well to call attention to the fact that very successful commercial enterprises have already begun to reap the benefit of this investigation and to point, for example, to the success of the old mine at Gold Bluff, Humboldt county, California, where, with an entire cost of new installation of \$650 worth of machinery, including freight and expenses of installation, concentrates containing more than \$4000 worth of gold, and, what is more significant, more than this amount of platinum, have been obtained as a result of three months' work.

DAVID T. DAY,

Chief of Division of Mining and Mineral Resources.

Washington, D. C., Oct. 9, 1906.

New Publications

"Wiring a House." By Herbert Pratt. Pp. 21; illustrated. 5½x8 in.; paper, 25c. New York, 1906: Derry-Collard Co.

"Cobalt and Its Silver Mines." By William S. Bullock. Pp. 87; illustrated. 6x9 in.; paper, 25c. New York, 1906; William Starr Bullock, 25 Broad Street.

"Dictionary of Engineering Terms in English and Spanish with Indexes in Both Languages. Containing 3000 Technical Terms." By Andres J. R. V. Garcia. Pp. 150. 4x5½ in.; cloth, \$1. New York, 1906; Spon & Chamberlain.

"Geology and Underground Water Resources of Northern Louisiana and Southern Arkansas." By A. C. Veatch. United States Geological Survey, Professional Paper No. 46. Pp. 422; 51 plates, 33 figures. 9x12 in.; paper. Washington, 1906: Government Printing Office.

"Report of the Chief Inspector of Mines in India, under the Indian Mines Act (VIII of 1901), for the Year Ending 31st December, 1905." By W. H. Pickering. Pp. 67. 9x13 in.; board covers, 1s. 6d. Calcutta, 1906: Office of the Superintendent of Government Printing.

"A Monograph of the Carboniferous and Permo-Carboniferous Invertebrata of New South Wales." By R. Etheridge,

Jr., and W. S. Dun. Memoirs of the Geological Survey of New South Wales, Paleontology, No. 5. Pp. 39 and 16 plates. 10x12 in.; paper, 10s. Sydney, 1906: William Applegate Gullick, Government Printer.

"The Journal of the Iron and Steel Institute, Vol. LXIX." Edited by Bennett H. Brough, Secretary. Pp. 582; illustrated. 5½x8½ in.; cloth. London, 1906: E. & F. N. Spon, Limited.

The papers comprised in this volume, which were read before the annual meeting of the Iron and Steel Institute, May 10, 1906, have already been noted in the "Mining Index."

"Electricity as Applied to Mining." By Arnold Lupton, G. D. Aspinall Parr and Herbert Perkin. Second edition, revised and enlarged. Pp. 320; illustrated. 6x9 in.; cloth, \$4.50 net. New York, 1906: D. Van Nostrand Co. London: Crosby Lockwood & Son.

Contents: Introductory. Dynamic electricity. Driving of the dynamo. The steam turbine. Distribution of electrical energy. Starting and stopping electrical generators and motors. Electric cables, etc. Central electrical plants. Electricity applied to pumping and hauling. Electricity applied to coal-cutting. Typical electric plants recently erected. Electric lighting by arc and glow lamps. Miscellaneous applications of electricity. Electricity as compared with other modes of transmitting power. Dangers of electricity. Appendix.

"Management of Electrical Machinery." By F. B. Crocker and S. S. Wheeler. A thoroughly revised and enlarged edition of "The Practical Management of Dynamos and Motors." Pp. 218; illustrated. 5x6½ in.; cloth, \$1 net. New York, 1906; D. Van Nostrand Company.

Contents: Introduction. Principles of generators and motors. Selection of dynamo-electric machinery. Installation of machines, foundations, and mechanical connections. Installation of generators, electrical connections and auxiliary apparatus. Operation of generators. Connections and operation of electric motors. Adjustment, friction, balance, noise, heating and sparking. Electrical resistance. Voltage and current. Speed and torque. Power and efficiency. Localization and remedy of troubles. Introduction and classification. Sparking at the commutator. Heating of generators and motors. Heating of commutator and brushes. Heating of armature. Heating of field magnets. Heating of bearings. Noisy operation. Speed too high or too low. Motor stops or fails to start. Voltage of generator too low or too high. Generator fails to generate. Constant = current (arc) generators. The brush arc generator. The Fort Wayne (Wood) arc generator. The Thomson-Houston arc generator. Management of railway motors.

Mine Labor in the Transvaal

SPECIAL CORRESPONDENCE

The labor question continues to be the leading one in the Transvaal, politically and economically. Recently an interesting meeting was held in the historic town of Krugersdorp, a little city of the West Rand, when a farewell dinner was given to R. McNally, the deputy mayor, prior to his departure on a six months' holiday. The politicians very cleverly used the occasion for opening the campaign in that place. The leaders of "Het Volk," the Boer party, were present, as also Mr. Solomon, the leader of the Responsibles. J. W. S. Langerman, the mouthpiece of the Robinson group of mines, occupied the chair, and made a most interesting and fighting speech. The text of his dissertation was unskilled labor. He made a scathing indictment of the Witwatersrand Native Labor Association, and claimed that it had utterly failed in its object, to keep the mines supplied with Kafir labor. His group had decided to break from the organization, and would give its patronage to a newly formed labor-recruiting agency. Mr. Langerman, amid much cheering, declared that there was a sufficiency of Kafirs for all requirements, and hinted that the Native Labor Association had made a poor showing in order to have an excuse for the introduction of Chinese. His group, he declared, would have none of Chinese labor, and were determined to run their mines with white and black labor.

Being of his way of thinking, the audience greeted Mr. Langerman's speech with enthusiastic cheers. It was a dangerous speech, however, and the daily press has not been slow to point out where it failed. In the first place, J. B. Robinson—a man who made his fortune in Kimberley and who is one of the leading South African millionaires in London—is proverbial in his changing of his views to suit the party in power. The Robinson group was among the first to employ Chinese labor. Now that the dominant party at home is rabidly anti-Chinese, so is the Robinson group.

In spite of Mr. Langerman's assertion that South Africa can produce all the labor required, the facts are dead against him. A trustworthy commission decided that there was not sufficient Kafir labor to supply constantly all requirements. In the past there have been continual complaints of unreliability of Kafir labor, and today the gold industry of Rhodesia, which is of very meager dimensions compared with the Rand, is suffering from the unsatisfactory work of the Kafir. As is well known, the Kafir is an excellent laborer while he works, but he will not stick on the mines for more than six months or a year. Had not the Chinese been imported, the output of gold would

never have reached the high-water mark we have attained.

The Chinamen were not imported because the capitalists loved them. It was the only way to save a desperate situation. The coolie is more expensive than the Kafir, and it is absurd to state that the celestials would have been imported had there been as abundant a supply of Kafir labor as Mr. Langerman tried to make us believe.

One statement of Mr. Langerman's speech gives relief, namely, the assertion that his party, which no doubt will control the first parliament, does not intend to insist on immediate repatriation of the coolies. It demands the adoption of the general idea that the Chinese must be sent out of the Transvaal. As to the ways and means, this can be arranged later on.

Fan-Blower Design

The velocity with which air escapes into the atmosphere from a reservoir is dependent upon the pressure therein maintained and upon the density of the air. The pressure per unit of area divided by the density per unit of volume gives the head, usually designated as the "head due to the velocity." The velocity produced is that which would result if a body should fall freely through a distance equal to this head. In the case of air, however, an actual homogeneous head never exists, but in its stead we have to deal with an ideal head which can only be determined by dividing the pressure by the density. As the density of air is so much less than that of water it is evident that for a given pressure the head will be far greater in the case of air. But the velocity of discharge is dependent only on the distance fallen, which is represented by the head, whether real or ideal. As a consequence, air under a stated pressure escapes at vastly higher velocity than water under the same conditions.

From the preceding discussion, it is evident that the pressure created by a given fan varies as the square of its speed. That is, doubling the speed increases the pressure fourfold. The volume of air delivered is, however, practically constant per revolution, and therefore is directly proportional to the speed.

The work done by a fan in moving air is represented by the distance through which the total pressure is exerted in a given time. As ordinarily expressed in foot-pounds, the work per second would, therefore, be the product of the velocity of the air in feet per second, the pressure in pounds per square foot, and the effective area in square feet over which the pressure is exerted.

From this it is evident that the work done varies as the cube of the velocity, or as the cube of the revolutions of the fan. That is, eight times the power is required at twice the speed. The reason is evident in the fact that the pressure increases as

the square of the velocity, while the velocity itself coincidentally increases; hence, the product of these two factors of the power required is indicated by the cube of the velocity.

The actual work which a fan may accomplish must depend not only on its proportions, but upon the conditions of its operation and the resistances which are to be overcome. Evidently, it is improper to compare fans when operating under such conditions that these resistances cannot be definitely determined. The simplest and most natural condition of operation is that in which the fan is operated without other resistance than that of the case, i.e., with open inlet and outlet. For proper comparison of different fans, the areas through which the air is charged should bear some constant relation to the dimensions of the wheels themselves.

It has been determined experimentally that a peripheral discharge fan, if enclosed in a case, has the ability, if driven at a certain speed, to maintain the pressure corresponding to its tip velocity over an effective area which is usually denominated the "square inches of blast." This area is the limit of its capacity to maintain the given pressure. If it be increased the pressure will be reduced, but if decreased the pressure will remain the same. As fan housings are usually constructed, this area is considerably less than that of either the regular inlet or outlet. It, therefore, becomes necessary, in comparing fans upon this basis, to provide either the inlet or the outlet with a special temporary orifice of the requisite area and the proper shape, and make proper correction for the contracted vein.

According to the B. F. Sturtevant Company, the square inches of blast, or, as it may be termed, the capacity of a cased fan, may be approximately expressed by the empirical formula: $DW \div X = \text{capacity area}$, in which $D = \text{diameter of fan wheel, in inches}$; $W = \text{width of fan wheel at circumference, in inches}$; $X = \text{a constant, dependent upon the type of fan and casing}$. The value of X has been carefully determined for different types of fans; but these values must be applied with great discretion, acquired through experience and a thorough knowledge of all the conditions liable to affect the fan in operation.

The average composition of pewter of former times was as follows: Tin, 84; lead, 10; antimony, 5; copper, 1. By far the greatest quantity of pewter which is now bought and sold is "britannia metal" and contains no lead. Old britannia metal and old pewter cannot be distinguished by appearance. The reason that britannia metal has practically replaced true pewter is because it has been found unsafe to use cooking utensils of an alloy which contains 10 per cent. of lead.

Abstracts of Official Reports

CONSOLIDATED MERCUR GOLD MINES COMPANY

The report of this Utah gold-mining company covers the year ending June 30, 1906. In general the results of the year's work have been to economize in working expenses, to reduce the loss of gold in the tailings, and to restore the mine to much of its original productiveness.

Development during the year was largely confined to re-opening abandoned and caved stopes, in which ore, not then economically workable, had been left by the earlier operators. Development in new ground has resulted in proving orebodies, the boundaries of which had previously been determined. Much excellent ore was located in this way.

The amount of ore mined and sent to mill was 302,806 tons, of which 126,538 tons, or 42 per cent., was base ore, needing to be roasted, and the remainder, 58 per cent., was oxidized ore which required no treatment before cyaniding. The average value of all the ore treated was \$3.76 per ton, which was 19c. lower than during the previous year. This is explained by the larger proportion of ore contributed by the Magazine vein, which is of low grade, but so easily mined and treated as to be profitable, although on a narrow margin. The cost of mining and prospecting amounted to \$1.41 per ton, or 10c. less than during the previous year.

The average recovery from both Golden Gate and Manning mills was \$2.88 per ton. The average value of the tailings during the year was \$0.956 per ton, or a somewhat lower average than during the previous year. Exhaustive experiments are under way, looking to a still further reduction in loss of gold in the tailings. Milling at the Golden Gate mill cost \$1.07 per ton, a reduction of 5c. from the previous year. The Manning mill was run for only a short time, after a lease, given to outside parties, had been abandoned. The roasting plant now includes six roasters, the average output of which per day was 68 tons. Roasting cost \$1 per ton; the fuel is slack coal, which costs \$5.25 delivered.

The company's income account for the past year, both in totals and in dollars per ton, may be given as follows:

	Total.	Per Ton.
Gold produced.....	\$870,887	\$2.88
Other income.....	9,495	0.03
Total revenue.....	\$880,382	\$2.91
Mining.....	428,464	1.41
Milling.....	339,692	1.12
Construction.....	8,104	0.02
Total expenses.....	\$776,260	\$2.55
Net income.....	\$104,122	\$0.36
Balance brought forward.....	123,073	
Available for dividends.....	\$227,195	

Out of this balance, \$100,000 was distributed in four dividends, and the remainder was carried forward. The company's total dividends since its organiza-

tion have been \$1,155,000 on a \$1,000,000 capital stock. Adding the dividends paid by the old Mercur and De Lamar companies previous to their consolidation into the present company makes a total of \$3,335,313 distributed from the earnings of these mines.

Experiments in the leaching department have led to the conclusion that lime can be more economically and satisfactorily used than caustic soda; accordingly a lime kiln has been built, and lime has been used almost alone for several months. One result of its use has been the reduction in the consumption of cyanide from 0.88 lb. to 0.59 lb. per ton of ore. Zinc dust, to the amount of 0.34 lb. per ton of ore, is used for precipitating.

Patents Relating to Mining and Metallurgy

UNITED STATES

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

Published Week Ended Oct. 16, 1906.

- MAGNETIC ORE SEPARATOR**—Camden E. Knowles, Joplin, Mo., assignor of three-fourths to G. B. Young, George T. Cooley and Guy H. Elmore, Joplin, Mo., and W. E. Brinkerhoff, E. O'Keefe and Joseph Herrin, Carthage, Mo. No. 833,169. Filed Dec. 5, 1901.
- WELL-SINKING APPARATUS**—Matthew T. Chapman, Aurora, Ill. No. 833,200. Filed July 15, 1901.
- WELL-SINKING APPARATUS**—Matthew T. Chapman, Aurora, Ill. No. 833,201. Original application filed Sept. 25, 1899, Serial No. 731,507. Divided and this application filed Dec. 15, 1903.
- ORE SEPARATOR**—John G. Kirksey, Carthage, Mo. No. 833,223. Filed Sept. 23, 1903.
- CONVEYER**—Martin C. Schwab, Baltimore, Md., assignor to Gravity Conveyor Company, New York, N. Y. Nos. 833,249, 833,250, 833,251, 833,344. Filed Feb. 10, 1904; Jan. 23, 1905; May 29, 1905; July 13, 1905.
- APPARATUS FOR ANALYSIS OF GASES**—Henry J. Westover, Mount Vernon, N. Y. No. 833,274. Filed April 4, 1906.
- SYSTEM OF HANDLING MATERIAL**—Hiram W. Blaisdell, Los Angeles, Cal. No. 833,293. Filed Jan. 18, 1905.
- CONVEYER**—John H. Gillman, Ottawa, Ill., assignor to King & Hamilton Company, Ottawa, Ill. No. 833,319. Filed Sept. 9, 1905.
- COKE-OVEN**—Mathew E. Rothberg and Alfred Ernst, Cleveland, Ohio. No. 833,340. Filed March 10, 1906.
- METHOD OF SMELTING ORES**—Arthur J. Mason, Chicago, Ill., assignor of one-half to Frank K. Hoover, Chicago, Ill. No. 833,406. Filed May 1, 1903.
- ORE CONCENTRATOR**—Frank E. Pearson, San Francisco, Cal. No. 833,415. Filed Feb. 16, 1906.
- MINERS' LAMP**—Charles Powell, Coal Creek, British Columbia, Canada. No. 833,416. Filed Feb. 9, 1906.
- BUCKET ELEVATOR**—John Ross, San Francisco, Cal. No. 833,417. Filed Feb. 28, 1906.
- HOSE FOR SUCKING AND DREDGING ENGINES**—Johann Taube, Riga, Russia. No. 833,426. Filed May 23, 1905.
- MANUFACTURE OF SILICIDES AND SILICON ALLOYS**—Frank J. Tone, Niagara Falls, N. Y. No. 833,427. Filed May 18, 1905.
- APPARATUS FOR PURIFYING AND REHEATING FURNACE GASES**—David Lamond, Pittsburg, and David D. Lamond, Allegheny, Pa. No. 833,467. Filed April 9, 1904.

- BUCKET**—Edwin H. Lea, Richmond, Va. No. 833,469. Filed Aug. 15, 1905.
- PROCESS OF PRODUCING COKE AND GAS**—Ferdinand Logan, Phenixville, Pa. No. 833,471. Original application filed May 20, 1902; divided and this application filed Aug. 25, 1904.
- PROCESS OF OBTAINING METALS AND COMPOUNDS THEREOF**—Hermann Meher, Berlin, Germany. No. 833,472. Filed Feb. 18, 1904.
- BLOWING-ENGINE VALVE**—George Mesta, Pittsburg, Pa., assignor to Mesta Machine Company, a corporation of Pennsylvania. No. 833,473. Filed March 6, 1903.
- DUST COLLECTOR**—Sylvanus H. Stoltzfus and Arthur S. Wolf, Chambersburg, Pa. No. 833,490. Filed Dec. 12, 1905.
- MINE DOOR**—Robert J. Good and George E. Hall, Canton, Ohio, assignors to The Alliance Mine Equipment Company. No. 833,519. Filed Nov. 14, 1904.
- APPARATUS FOR MAKING COKE AND GAS**—Ferdinand Logan, Phenixville, Pa. No. 833,611. Filed Aug. 9, 1906.
- MUFFLE OR FURNACE FOR ANNEALING**—Alfred Smallwood, London, England, assignor to The Incandescent Heat Company, Limited, London, England. Nos. 833,640, 833,641. Filed Jan. 19, 1905.
- PROCESS OF TREATING SUBSTANCES BY THE AID OF HEAT**—William B. Dennis, Blackbutte, Oreg. Nos. 833,679, 833,680. Filed Jan. 4, 1906.

GREAT BRITAIN

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

Published Week Ended Oct. 6, 1906.

- BRIQUET**—R. A. le Maitre, Brussels, Belgium. Making an agglutinant for briquetting purposes by acting on heavy hydrocarbons under heat and pressure by a compound made by the action of acids on animal fat and other matters. No. 15,818 of 1905.
- BRIQUET**—R. Bock, Prag, Austria. In making coal briquets, the use of a lower temperature so that not too much gas is driven off, thus producing a briquet that burns with a brighter flame. No. 23,902, of 1905.
- CAM**—G. R. Bonnard and G. H. McKillop, London. Improvements in the shape of the cams used in the inventors' stamp mill, with the object of making the upward lift and the subsequent downward blow smoother. No. 25,601 of 1905.
- ELECTRIC FURNACE**—O. Friek, Stockholm, Sweden. In electric furnaces of the annular type an arrangement for moving the cover round, so that the charging shall not always take place at the same spot, thus distributing the wear. No. 25,771 of 1905.
- ROASTING FURNACE**—T. C. King, New York, U. S. A. Improvements in roasting furnaces for refining spent pyrites and nodulizing them and also other fine iron ores, consisting introducing sufficient moisture to help to mass the fine particles together. No. 60 of 1906.
- ELECTRIC FURNACE**—G. Gln, Paris, France. In induction electric furnaces using a channel in the form of a grid instead of a simple circle or square, so as to increase the resistance in greater proportion than the induction. No. 1019 of 1906.
- ORE TREATMENT**—A. Hodgkinson, Stoke-on-Trent. Treatment of smalls from ironstone mines so as to make them available in the puddling furnace. No. 4999 of 1906.
- METALLURGICAL PROCESS**—M. A. Hunter, Philadelphia, U. S. A. A process for converting iron castings into steel by heating in a muffle furnace and subjecting to the action of sulphuric-acid gas. No. 8507 of 1906.
- INGOT IRON**—Rheinische Metallfabrik, Dusseldorf, Germany. A method of casting ingot iron with the object of preventing the retention of bubbles in the iron. No. 9344 of 1906.
- ROCK DRILL**—Ingersoll-Rand Company, New York, U. S. A. In rock drills providing means for accurately adjusting the air pressure in the tall-rod chamber. No. 9599 of 1906.
- HAMMER DRILL**—Ingersoll-Rand Company, New York. In hammer drills making the walls of the protective casing spaced from the tool cylinder. No. 9613 of 1906.
- FILTERS**—G. Ridgway, Boulder, West Australia. A continuous filtering apparatus for slimes, consisting of a series of filtering chambers arranged to form a circular shape, filtering trays arranged round a central hollow vertical shaft. No. 11,623 of 1906.

Personal

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

Dr. Mohr, of the Mond Nickel Company, is in Sudbury, Ontario.

R. B. Brinsmade is examining mines in southern New Mexico for Ohio clients.

Percy B. McCoy, of New York City, has gone to Arizona on mining business.

Walter Harvey Weed was in New York this week, having returned from Mexico.

Frank Nicholson, of Joplin, Mo., has gone to New Mexico on professional business.

F. Augustus Heinze is again in Butte, after an absence of several weeks in the East.

G. Doveton, of Doveton & Purington, Denver, Colo., is in Mexico on professional business.

J. T. Glidden, recently at Portland, Oregon, is now at the Massachusetts Institute of Technology in Boston.

A. P. Low, director of the Canadian Geological Survey, has returned to Ottawa after a visit to British Columbia.

President L. Melvin Jones, of the Massey-Harris Company, Toronto, Ont., has returned from an extended trip through the West.

J. H. Black, late superintendent of the Timiskaming & Ontario Railway, has been appointed chairman of the Timiskaming & Ontario Railway Commission.

Robert H. Richards has just returned to Boston from a visit to New York State, where he has been consulted in regard to a Pacific coast concentrating proposition.

Prof. C. A. Doremus, of New York, is in Butte, having been called there to testify as an expert chemist in behalf of the smelting companies in the Bliss smoke case.

Arthur C. Carson has returned to Butte from San Jose, Cal., where he was called by the death of his mother. Mr. Carson is manager of the North Butte and Coalition properties.

F. H. Clergue, of the Lake Superior Corporation, left Sault Ste. Marie for New York this week to arrange for the repayment of the balance of the loan due to the Ontario Government.

H. J. Connor, of Superior, Wis., is in the Platteville zinc district looking over the mining situation generally, with the view of deciding as to the type of compressor to install at his plant.

Frank S. Cronk has resigned from the publicity department of the Hendrie & Bolthoff Mining and Smelting Company, to become secretary and manager of the Precious Metals Recovery Company.

J. W. Vandemoer, for many years representative of the ENGINEERING AND MINING JOURNAL in Colorado, attended the

American Mining Congress as delegate from the city of Denver, appointed by the mayor of the city.

W. W. Adams, a well known Western mining engineer and an expert, has returned to Butte from the Greenwater district of Inyo county, Cal., where he was sent to inspect properties in which Butte men are interested.

A. L. Queneau, of Brussels, Belgium, is in Australia examining the zinc resources of Broken Hill, Newcastle and Dapto, New South Wales, for the benefit of the Zinc Corporation. He expects to remain there for most of the remainder of the year.

William Weir, for several years head mining captain of the South Hecla branch of the Calumet & Hecla, has resigned and will retire from active work Nov. 1. He is a member of the old school of Lake Superior mining captains and has been with the Calumet & Hecla since 1872.

J. M. Boutwell, geologist United States Geological Survey, who has recently been placed in charge of statistics on the production of zinc, lead and quicksilver in the United States, was confined during the summer to St. Luke's Hospital in Denver by typhoid fever. He is now visiting various points in the West in connection with this work, but will be obliged to postpone some of his itinerary for the field investigation of resources of these minerals until the next field season.

Obituary

H. G. Eldridge, of the firm of Bangs & Horton, Boston, Mass., died Oct. 3, aged 72 years. He was well known in the New England coal trade, having been intimately associated with it for nearly 40 years.

John H. Meyers, of Victor, Colo., died in Denver, Oct. 12, of appendicitis. He was 45 years old. For some time a miner, he went into the book business, first in Colorado Springs and afterwards in Victor, where he was well known to all mining men.

William J. Irelan died in San Francisco, Oct. 8, aged 66 years. He was born in Pennsylvania, but went to California while a young man, and passed his whole working life in mining in that State. He acquired a wide and thorough knowledge of his profession, and was well known throughout the State, his opinions as a mining and consulting engineer being highly valued. He served for a number of years as State mineralogist, with credit to himself and the State.

Societies and Technical Schools

University of Illinois—By invitation of the State Geological Survey, the district mine inspectors of the State recently vis-

ited the University at Urbana, and made a special inspection of the boiler and coal-testing plant in operation.

W. G. Bagley and E. C. Savage have been appointed assistant professors of geology at the university.

California Miners' Association—The California Miners' Association intends holding a convention in San Francisco in November and trying to resuscitate the old organization, adding to its members and its strength. Both the president and secretary are active, energetic men and are working hard on the preliminaries in order to make the convention a success. No definite plans have as yet been prepared, but it is desired to get the assistance of the more prominent mining men of the State and to bring the association to the front again.

California has so many prominent industries, that the mining feature has been put somewhat in the background of late. The output of gold continues about the same each year, but the other mining industries are increasing in importance. The total mineral output of the State is now over \$43,000,000 per annum, the gold being about \$19,000,000 of this. Judging from the developments in the newer camps of Nevada, that State is apt, before long, to exceed California in gold output, if it does not do so this year. It will be long, however, before the Silver State exceeds the Golden State in total values of output from mining sources.

Industrial

The Blair & Gazzam Manufacturing Company, Pittsburg, Penn., has just completed a stamp mill of extraordinary size. It has 312 stamps, of 1500 lb. weight each.

Ed. Sweeney, until recently manager of the Litchfield Foundry and Machine Company, Litchfield, Ill., has severed his connection with that company to engage in the same line of manufacturing at Litchfield, Ill.

On October 5 headquarters of the gas-producer department of the Morgan Construction Company were moved from New York, to Worcester, Mass., where the main office and works of the company are located. This change was necessitated by the large volume of work now on hand. Mr. E. A. W. Jefferies continues in charge of the department.

On account of the rapidly increasing popularity of Franklin compressors, manufactured by the Chicago Pneumatic Tool Company, notwithstanding the fact that extensive improvements and additions were made to their Franklin plant the current year, the business has grown beyond its capacity, and it is now adding another 150 ft. to the machine shop, which will increase the present capacity from 55 to 70 compressors per month.

The eight steel steamers for which orders were placed with the American Ship-building Company last week by the Lackawanna Steamship Company are for 1907 delivery, the last of the eight being promised for Aug. 1. Five of the steamers will be of the 7000-ton class, being 440 ft. over all, 52 ft. beam and 28 ft. deep. The remaining three will be of the 8000-ton class, being 500 ft. over all, 52 ft. beam and 30 ft. deep. The Lackawanna Steamship Company is closely allied to the Lackawanna Steel Company, which will thus control the transportation of its Lake ores.

Two induced-draft fans of exceptional dimensions are being built for the power station of the East St. Louis & Suburban Railway Company by the Green Fuel Economizer Company, of Matteawan, N. Y. The wheels of the fans, which are overhung, that is, are supported from one side only, measure 19 ft. 6 in. in diameter and 7 ft. wide at the tips of the blades. They are believed to be the largest overhung induced-draft wheels ever built and will be driven by Corliss engines. They are carried upon 10-in. steel shafts and have specially designed two-part spool hubs which occupy comparatively little space on the shafts and permit the bearings to be set in close to the centers of gravity of the wheels.

Trade Catalogs

Receipt is acknowledged of the following catalogs and circulars:

Dings Electro-Magnetic Separator Company, Milwaukee, Wis. Bulletin No. 18, Magnetic Separators, Type MM; Pp. 16, illustrated; paper, 3x8 in.; 1906.

Blaisdell Company, Los Angeles, Cal. Catalog F, The Blaisdell System of Automatic Cyaniding Machinery; Pp. 32, illustrated; paper, 5x8 in.; 1906.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1053, Allis-Chalmers' Railway Motors and Controllers; Pp. 24, illustrated; paper, 8x10 in.; Aug., 1906.

American Locomotive Company, New York City. Consolidation type freight locomotives, weighing less than 175,000 lb.; Pp. 72, illustrated; paper, 8x5 in.; 1906.

Construction News

Park City, Utah—The Nelson-Queen Mining Company is preparing to put in a power plant, and will need mill equipment later. W. H. Wilkins, Herald Building, Salt Lake City, Utah, is manager.

Bingham, Utah—The Markham Gulch Mining Company, a new organization, is preparing to build a large concentrating mill. It will treat ore from the Utah Apex and the Red Wing mines. Walter C. Orem, Salt Lake City, Utah, is manager.

Special Correspondence

San Francisco Oct. 17

The extensive auriferous gravel deposits owned by Patrick Campbell, of Smartsville, in Yuba county, are again being examined by intending purchasers. These deposits were worked for many years by hydraulic process, but work had finally to be stopped, and they have long been idle. The present plan is to work the gravel by batteries of arrastras. There are 28 miles of ditch and flumes built to convey water to the ground, and these will all be put in order though no scheme for hydraulic operations is contemplated. Campbell fought the Anti-Debris Association harder than any hydraulic miner in California, but had finally to capitulate and give up the idea of hydraulicking on that ground.

Numbers of California men have joined the rush of prospectors who are waiting on the borders of the Walker river reservation, in Nevada, until 12 noon, Oct. 29, when almost the entire reservation will be thrown open in accordance with the Presidential proclamation. For many years it has been known that there was a gold and silver mineral zone in the Walker river country, and in spite of the vigilance of the Indian police, hundreds of miners have worked in the mountains, noting the position of valuable ledges which they expected to locate as soon as the land should be thrown open to entry. As there is no law limiting the number of mineral locations that persons can make, it is anticipated that there will be trouble on the day of the opening unless some system of allotment is enforced. The Walker river reservation is 60 miles long and varies in width from 12 to 20 miles, lying in the western part of Nevada, reaching from Hawthorne on the south, northward to Cleaver peak.

The Oakdale Ore Purchasing Company, which purchases ores and concentrates, is seeking a location for the establishment of a cyanide plant. The secretary, H. R. McGinn, of Oakdale, is examining land at Point Richmond on the bay shore of Contra Costa county.

Nevada county has received its gold medal awarded at St. Louis, for the best exhibit of gold ores at the exposition. Through the courtesy of James D. Hague, the medal was made from pure gold from the North Star mine of Grass Valley.

The Dairy Farm mine, a few miles from Lincoln, Placer county, is one of the improving copper mines of this State. While a producer last year, it is a much larger one this year. Buildings are being erected, and the mine is being thoroughly developed in a scientific manner. A branch railroad is shortly to be built from Lincoln to Van Trent, where the mine is situated.

The Trents, who developed the Dairy Farm mine, have now found copper ore

in Yuba county, near Camptonville, and are opening the deposit. The younger Trent found some croppings which he thought showed evidence of a large vein, which opinion was later confirmed by his father on investigation. The vein as far as opened is a large one.

The Western Power Company is engaged in the development of a large plant on the upper part of Feather river, and intends making large investments in Butte county. The present work is being carried on upon the north fork of the river, along which the Western Pacific railroad is being built.

The finding of copper in the Silver Lake region, 50 miles from Ludlow, San Bernardino county, has drawn some hundreds of prospectors to the locality. The croppings of the ledge have been traced for some distance and already numbers of prospects have been bonded or sold. In the same county silver-ore discoveries have been made in the vicinity of Cima.

The Balaklala Consolidated Copper Company of Shasta county has received United States patents for three of its claims on Section 20, which includes the smelter site and townsite of Coram. There has been a great contest to secure ownership of this particular section.

The sheriff of Placer county will, on Nov. 5, sell the mining claims, ditches and similar property of the Gold Run Gravels, Ltd. This is a famous gravel property from which much was expected, but it is now to be sold to satisfy a judgment for a very small amount. The corporation is an English one.

It turns out that the so-called diamond discoveries recently made at Mesa Grande, San Diego county, were only sapphires after all.

The sale of the South Yuba Mining Company's copper claims, two miles from French Corral, Nevada county, is regarded as an important matter for the copper interests of that county. It is proposed to build a smelter near the South Yuba and a railroad there from Marysville.

The new smelter at Keeler, Inyo county, is now turning out bullion. Slag from Cerro Gordo is being smelted. Sixty-two men are at work, and there is room for more. President McGrath, of the Great Western Ore Purchasing Company, is in charge of the mining and slag-gathering work on Cerro Gordo hill, and Vice-president Winstrom is managing the smelter.

Salt Lake City Oct. 19

The ore and bullion settlements in Salt Lake last week were \$827,300 in all.

The Markham Gulch Milling Company was organized last week and has begun breaking ground for a concentrating mill to be erected in Bingham on the site of

the old Red Wing mill. The organizers are parties prominently identified with the management of the Utah Apex and Utah Development companies, operating mines in that camp. The initial capacity will be for the treatment of 200 tons of ore daily from the Utah Apex and Red Wing mines, the latter being the property of the Utah Development Company. Walter C. Orem, of Salt Lake, is manager.

The management of the Bingham Consolidated is making some important changes in its smelter at Bingham Junction, the work being done under the direction of H. L. Charles, general manager. Ground has been broken for some additional furnaces; one of the old blast furnaces has been torn out to make room for the new reverberatories and the foundation for the new stack has been finished. The latter is to be 250 ft. high, and will be built of reinforced concrete.

The directors of the Uncle Sam Consolidated Mining Company, operating in the Tintic district have decided to pass the October dividend.

A representative of a Colorado syndicate is endeavoring to secure an option on the Utah mine at Fish Springs. This property has been making a good account of itself. The ore is hauled across the desert 60 miles to the nearest railroad station and carries high lead-silver values. The company will pay a regular dividend of \$3000 and an extra of \$2000 this month.

The directors of the Standard Copper Company of Bingham have been asked to name a price for a control of that property.

Important developments have been made in the Cactus mine of the Newhouse Mines and Smelters Corporation in Beaver county and during the past two weeks there has been a demand for the stock. President Samuel Newhouse, who inspected the mine last week, returned with the report that the values in the new strike are better than any found in other parts of the mine. What was supposed to be the footwall has turned out to be the real orebody of the mine. On the 400 it has been crosscut for 175 ft., on the 500, 225 ft. and on the 600 the crosscut has been driven for nearly 75 ft., and in the latter has been disclosed ore good enough to ship to the smelters direct.

Owing to the shortage of coal, the mill of the Consolidated Mercur Gold Mines Company has been running considerably under its capacity.

Bisbee, Arizona Oct. 19

There has been a short strike among the men sinking the Globe Consolidated shaft, but it has been settled. The management expects to cut a vein at about 200 ft. and will then drift and crosscut, continuing the sinking meanwhile to the depth before decided upon. The ore cut in the tunnel to the Taylor fault is now widening out and looking very well.

As the Rock Island road has been unwilling to sell to the El Paso & Southwestern the Phelps, Dodge & Co. line, a short stretch of track from Tucumcari to Santa Rosa, the Southwestern will build from Corona, N. M., to its coalfields at Dawson, where Phelps, Dodge & Co. are now adding to their coal-mining equipment and preparing to coke 1000 tons per day. The coke will be shipped to the southern Arizona copper regions. The new road will be about 150 miles long.

Daily shipments of ore from the Twin Buttes to El Paso smelters will be increased to 300 tons; they now run from 125 to 150 tons. A considerable amount of new machinery is on the way and when this arrives the product will be much more easily secured. The railway to the Southern Pacific is running regular trains.

The New England & Clifton Copper Company is sinking a development shaft in the Antietam claim at Metcalf. The company is now shipping 45 tons of copper ore per day to the Shannon smelter at Clifton. This ore averages well in copper with some silver and comes from the company's Old King property, which has been extensively developed.

The Western Mining Company has recently bonded claims in the Dos Cabezas district, north of here, to the amount of \$140,000 and is actively pushing development operations. The district is regarded as exclusively gold, but this company has found copper indications, and is working along that theory. Several other concerns have come into the Dos Cabezas for the same work.

Water has temporarily increased in the Briggs and Hoatson shafts of the Superior & Pittsburg, and is coming up at the rate of about 2000 gal. a minute. Some of the large pumps ordered last spring for the Briggs are here and will be installed when need exists; in case they are not needed now they will be left for installation at greater depths. The ore found a few days ago in the drifts between Hoatson and Briggs, and in the short crosscut from Hoatson, is widening out and coming up in the drifts, growing richer and better and looking more and more permanent and strong.

Since Oct. 1 the Shattuck has been gaining in production and will soon be hoisting 200 tons a day of ore, which gives at the smelter a net return of about 36,000 lb. of blister copper daily. At the mine, development continues chiefly on the 700-ft. and 800-ft. levels, and the ore deposits there, both sulphides and oxides, are improving. Sinking the shaft, which is now 800 ft. deep, is resumed this week, and it will be pushed to the 900, where a plat will be cut and drifting once more undertaken.

Denver Oct. 20

An important strike has just been made in the Cripple Creek district, this time

in the Chance of '94 claim, owned by El Paso Company, but at present worked under lease. At a depth of about 400 ft., a large body of ore carrying high values was opened up.

Former President James F. Burns, of the Portland company, has filed in the local district court a petition asking for an alternate writ of mandamus to allow him to make an examination of the accounts and the mines, accompanied by documents, containing an attack on the present management.

At the annual meeting of the stockholders of the Colorado Fuel and Iron Company, held in Denver, the following gentlemen were elected directors: Geo. J. Gould, Edwin Gould, Ed. Jeffery, E. H. Harriman, Edwin Hawley, John H. McClemment, W. S. Perce, E. W. Ogleby, A. W. Krech, Benjamin Nicoll, Willard P. Ward, and F. J. Hearne.

When Commissioner Prouty submits his report, as a member of the Interstate Commerce Commission, sensational disclosures of great land frauds on the part of some of the Western railroads may be expected, and remarkable developments involving the looting of a great deal of public land may be proven. Careful inspections of coal lands are being made by a number of parties of geologists, since President Roosevelt ordered the withdrawal of a large amount of land from entry.

It is commonly reported that a deal has been made in New York involving the Northern Colorado Power Company and the Tri-County Electric Company by which plants in 15 cities and towns are acquired. It is probable that the Colorado & Southern Railroad Company, if it should electrify its lines, would derive its power from the plants of these companies.

Calumet, Mich. Oct. 21

Steady progress is being made in watering the old shaft on the Hancock Consolidated and it will be completely drained by Nov. 1. There remains only one more lift to be pumped out. As soon as all the water is out the workings will be cleaned out and drills put to work stopping immediately, as it is planned to secure production as rapidly as possible on the present metal market. The mine is controlled by Thomas F. Cole, of Duluth; John D. Ryan, of Butte; and the St. Mary's Mineral Land Company, of Boston. The exact location of the new vertical shaft, which will reach at depth the Hancock, Pewabic, West and other lodes traversing the property, has not been determined upon.

Negotiations are pending between the Quincy and the Arcadian companies for the purchase by the former from the latter of a tract of 800 acres of mineral land adjoining the Quincy's Mesnard tract. A special meeting of the Arcadian stock-

holders has been called, to be held in Jersey City, N. J., on Nov. 19, to authorize the sale of the property. Some time ago the stockholders of the Quincy authorized the directors to issue 50,000 additional shares at par, \$25, in payment for mineral lands which they might deem it judicious to acquire. The Arcadian lands, which may be purchased, adjoin the ground tributary to No. 8 shaft and would prove of value. No. 8 is opening good ground in its bottom openings and the acquisition of the Arcadian's lands would permit considerable expansion in a southerly direction.

An old abandoned shaft, known as No. 6, caved in at the Quincy mine and a watchman, who was walking across the surface at that place at that time, was buried in the debris. His body was found 400 ft. underground. The cave-in did not affect operations, as it was in a portion of the mines abandoned many years ago.

Winona rock shipments to the Adventure mill, where one head has been leased, began this week. They will be continued at the rate of 250 to 300 tons a day. The air compressor now in use at the mine is capable of furnishing power to only 12 drills, but as soon as the new 40-drill compressor is installed, which it is expected will be around Jan. 1, operations will be enlarged. Rock shipments will come entirely from No. 3 shaft, which is centrally located in the copper shoot, and which is in good copper ground in both its north and south drifts.

London Oct. 15

About a year ago I mentioned that German capital had become interested in South Wales coal lands, and had, through English intermediaries, acquired the Whitworth estate. As your readers are aware, the South Wales coal is the highest-class smokeless steam coal and is much sought after by the navies of the world. It is bought in the open market by potential political enemies of England, without let or hindrance, and little notice is taken by the public of the settlement of a German syndicate right in the heart of England's coal assets. At first, the shares were allotted to English nominees, so as to disarm public opinion, but during the past week, the real German owners have acquired the shares by transfer and it may now be said that the Whitworth coal estate is really owned in Germany. During the past year many trial borings have been made, and the existence of three seams has been proved, the middle one of which promises to be of first-class quality. It is now reported that the French authorities are also on the lookout for properties in South Wales and are about to acquire a group of fine collieries. It is quite a common thing to hear nowadays that continental buyers are negotiating for coal lands in South Wales, and most of the rumors are founded on very trifling evidence. In the present case, however, there is no doubt

about the intention of the French syndicate, and in a week or two a final settlement of terms will be made. The French navy has always economized in the question of fuel and during ordinary maneuvers has used domestic coal, the discharge of smoke from their battleships being a national characteristic. It is no doubt with the object of obtaining a regular supply of smokeless coal for current use, that this move has been made for acquiring mines in South Wales.

It is so long since a new mining company was floated in London that readers of this column will have obtained an idea that public flotations have passed out of fashion, or that the London mining market is dead. It certainly is somewhat remarkable that with copper and tin at their present high level so little has been done in connection with new properties. About a year ago several new copper propositions were taken up, and since then, money has been put into old tin mines in various parts of the world. Money has also gone to Australia to exploit the zinc tailings. Otherwise, the present year has been singularly uninteresting from this point of view. With the coming of autumn some effort is being made to interest the public in new mining propositions, so perhaps we shall hear of flotations before long. At the time of writing two companies are before the public, one called the Burma Development Syndicate, Ltd., and the other the Barranca Mines, Ltd. The former is not an absolutely new company, having been originally formed in 1903, but this is its first public appearance. It owns tin lands at Maliwun, Lower Burma, of which more may be heard later on. The other company, the Barranca Mines, Ltd., has been formed to acquire the Consuelo and other properties in the Hermosillo district of Sonora, Mexico. These properties have been opened up by the Benson Investment Company, of Los Angeles, Cal., and they have been reported on for the English promoters by K. Dunbar Anderson. The ore is of high grade, the assays running from \$20 to \$150, and an average of \$45. It is intended at first to ship the ore to the smelters, and to postpone the question of erecting a reduction plant at the mine.

Johannesburg Oct. 3

Some interesting figures have just been published by *South African Mines* for the operations during July. The values per ton milled are as follows: The Rand, \$8.11 per ton; outside districts, \$9.77 per ton; Transvaal, \$8.16. Working costs are not yet down to \$5 per ton, and judging from appearances it will be a long time before this figure is reached. Just now the average working costs of the Rand are about \$5.32 per ton. About 16 per cent. of the ore mined is being sorted out as waste rock. The amount of rock sorted on different mines varies from 3 to 28 per cent. On mines which are being run to show

low working costs, little sorting is done. The influence of tube mills is being felt, as far as crushing goes, for the duty per stamp per day is now 5.34 tons.

Detailed returns of the September gold output give the following figures: Witwatersrand, 486,522 oz.; outside districts, 18,589 oz.; total, 505,111 oz. This is 4004 oz. less than in August, but 88,624 oz. more than in September, 1905. For the nine months ending Sept. 30, the total output was 3,625,343 oz. in 1905, and 4,162,468 oz. in 1906; an increase of 537,125 oz. The total value this year was \$86,034,214.

Rhodesian gold in September is reported at 48,410 oz. bullion, being 1717 oz. less than in August, but 12,272 oz. more than in September, 1905. For the nine months ending Sept. 30 the total was 305,630 oz. bullion in 1905, and 410,482 oz. in 1906; an increase of 104,852 oz. The bullion reported this year was equal to 365,329 oz. fine gold, or \$7,551,350 in value.

Perth, W. A. Sept. 5.

The continued high price of tin is causing great activity at Greenbushes, as well as on the northwest fields. At Greenbushes nearly all work done so far has been confined to alluvial or deep leads. Some shafts have, however, been sunk on the lodes, but no systematic development has yet been done to prove the formations.

The July gold yield of this State was 149,862 fine oz., making a total for the seven months of 1,054,723 oz. fine gold.

The old Menzies district is looking up again and local capital is now being employed with good results. It is astonishing the number of mines that were worked very profitably for years by companies, both here and at many other parts of these fields, and which were abandoned owing to, in most cases, the development not being kept ahead of the battery.

The seven principal mines, all situated in a small area around the township of Menzies, have yielded 316,263 oz. of gold.

Copper is attracting much attention; the old Anaconda mine, on the Mount Margaret goldfield, has been reopened, and a new company been floated; the plant is being put in order and will soon be at work. Ore has been struck, said to run high in copper. The Ravensthorpe gold and copper field at Phillips river is looking well. New finds of both gold and copper are being made.

W. Klug, who has just retired from the management of the Boulder Perseverance, has the credit of having brought the mine to a sound position. From a formerly hand-to-mouth rich mine, it is now regarded as a solid low-grade proposition. The working costs have been brought down to about 19s. per ton. As soon as alterations and additions now in progress to the reduction plant are complete, the ore treated will be from 16,000 to 17,000 tons per month. The main ore-bodies are looking well.

General Mining News

Petroleum Exports—Exports of mineral oils from the United States for the nine months ending Sept. 30 were, in gallons:

	1905.	1906.
Crude.....	75,761,830	85,244,957
Naphthas.....	22,696,139	21,392,404
Illuminating.....	655,007,098	612,614,342
Lubricating.....	76,334,399	110,473,565
Residuum.....	48,809,704	44,918,258
Total.....	878,609,170	874,643,526

Paraffin is included in lubricating oils. The total shows a decrease this year of 3,965,644 gal., or 0.4 per cent.

ALABAMA

JEFFERSON COUNTY

Potter Iron Lands—Negotiations have been concluded, by which the Tennessee Coal, Iron and Railroad Company and the Republic Iron and Steel Company acquire the extensive Red Mountain iron mines and lands owned by M. L. Potter, of Brooklyn, N. Y. The Potter properties are from 12 to 14 miles south of Birmingham, and consist of 1800 acres, underlaid by red ores to an amount exceeding 60,000,000 tons. The Tennessee and Republic companies have been taking ore from leased mines on these lands for some time, the former from mines known as Potter No. 1 and Potter No. 2, and the latter from the Raimund mine, between the Potter mines and the Muscoda mines of the Tennessee company. The Potter tract lies between important Red Mountain fee properties which the Tennessee company has been operating for some years. The first work to be done on the newly acquired lands will be the driving of another slope at Raimund to increase the ore supply of the Republic company. The purchase price is reported to be \$800,000, of which \$700,000 is in 5 per cent. bonds and \$100,000 in cash.

The ores from the Potter mines are considered among the most desirable in the Red Mountain district, carrying sufficient lime to be practically self-fluxing. They are also lower in silica than the ores taken from the Tennessee Company's mines nearer Birmingham. They run about 38 per cent. in iron and from 14 to 16 per cent. in lime.

The acquisition of the Potter lands in fee gives the two companies a large supply of desirable ores working well in furnace mixtures which heretofore have had considerable percentages of red fossil ores higher in silica and lower in iron and lime.

ALASKA

PRINCE WILLIAM SOUND

A great deal of prospecting and of actual work has been done this season on the copper claims in this district. On Glacier island, at Mummy bay and Herring bay, a number of claims have been located, and some surface work done.

In Dryer bay the Knight's Island Copper Company is driving a tunnel on what

promises to be a large vein of copper ore. The Knight's Island Consolidated Copper Company has acquired several claims, and has begun the work of exploration.

On Latouche island, Beatson's Bonanza has shipped several hundred tons of picked high-grade ore to the smelter, getting good returns. This ore was from an open cutting. The Black Bird mine, owned by George Barrack and others, has a tunnel in 700 ft., and has opened a larger ore-body. At the Latouche Iron Mountain group, 50 men are employed; a tunnel and crosscuts have exposed good ore. An electric power plant is being installed.

At Landlock bay the Standard Copper Company has developed copper ore, and is now putting up an aerial tramway and building a dock, so as to be ready to ship ore.

The Putz mine, on Copper mountain, has been sold by Putz & Egan to the Reynolds-Alaska Development Company, which is getting ready to begin extensive development work.

At Galena bay, B. F. Willard is working on the Vesuvius group, which promises well.

At Boulder bay, work on the Ellamar mine has been carried down to the sixth level, and some good orebodies are being opened up. This season nearly 2000 tons of ore have been shipped monthly. J. D. Meenach is manager, and William Page, formerly of Butte, Mon., is mine foreman.

ARIZONA

COCHISE COUNTY

Cochise Consolidated—This company, at Paradise, is pushing work on its concentrating mill, which will be completed in November.

Paradise Development—This company, organized about six months ago, has put down an inclined shaft 240 ft. and has crosscut at that level, showing good ore. Work has been stopped by water; but will be resumed as soon as a pump, which has been ordered, can be installed.

Savage Gold and Copper—This company is putting up a 50-ton water-jacket smelting furnace, under charge of Lewis Roberts. It is also putting in a hoisting plant and air compressor at its mine in the Paradise district.

Scanlon Group—This property, operated by F. S. Douglas, in the Paradise district, is showing some ore in the crosscut tunnel, which is now 300 ft. in.

Calumet & Arizona—This company has secured two new mining properties in Arizona. These will be paid for out of the company's treasury surplus, which on Oct. 1 amounted to \$4,280,000; in this, surplus copper on hand, amounting to about a third of the year's production, was figured at 14c. only. It is interesting to note, in passing, that the earnings since Nov. 15, 1902, when its first 300-ton furnace was blown in, have been sufficient to

pay \$5,000,000 dividends and accumulate this surplus, as well as to make betterments that have cost at least \$1,000,000 more. One of the properties that has been taken under bond by the Calumet & Arizona is the Mammoth, of Clark & Scanlon, about 60 miles north of Benson and 30 miles from the present terminus of the Florence & Eastern Railway. This road is to be extended to connect Benson and Phoenix. At Benson the road will connect with El Paso & Southwestern, and at Phoenix with the Santa Fé, which is, indeed, owner of the new line.

YAVAPAI COUNTY

Arizona-Utah Copper Company—This company has been organized at Salt Lake City, Utah, to operate the Exchange group of five claims near Jerome, Arizona. The officers are W. H. Jones, president; S. S. Pond, vice-president; H. C. Weaver, secretary and treasurer; who, with Geo. B. Weaver, J. F. Harding and H. H. Cornforth, all of Salt Lake, constitute the board of directors. The capital stock is \$1,000,000, in \$1 shares.

CALIFORNIA

AMADOR COUNTY

Burlington—After work had been temporarily suspended a few weeks the men were paid and the work resumed under the direction of Mr. Bernardi.

BUTTE COUNTY

Golden Nugget—This mine, near Pentz, has been bonded to W. P. Lynch, R. E. Robinson and A. M. Wilson for \$100,000, they representing Pittsburg capital.

CALAVERAS COUNTY

Lightner Mining Company—This company, at Angels, has declared its forty-fifth dividend. All fire losses, amounting to \$80,000, have been paid and the mill replaced, so the entire plant of the company is again in working order.

Benson—This mine, at Angels, owned by Stockton men, has its new stamp mill in operation. A wide ledge has recently been uncovered.

EL DORADO COUNTY

Claiborne—The tunnel on which R. K. Claiborne has been working for many years has been completed on the extension of the Grouse Gulch claim, Grizzly Flat.

INYO COUNTY

Great Western Ore and Reduction Company—The new 150-ton smelter of this company, recently blown in, will have quite a beneficial effect in the Cerro Gordo district. Owners of small mines can now have their ore treated at this smelter.

NEVADA COUNTY

Black Bear—This mine, near Grass valley, has been sold to a Sacramento company and will be thoroughly developed and equipped. There is an 800-ft. tunnel on the property.

Republic—The mill at this mine, Graniteville, is now in full operation. More stamps are to be added.

Ironclad—This mine has finally been unwatered and work on the 400 level has been commenced.

Asbestos—A deposit of asbestos has been found near Washington on the north side of the South Yuba by J. T. Dillon and F. T. Smith, of Nevada City.

PLACER COUNTY

Hathaway—At this place an electrically driven hoist will be installed.

Eclipse—This old mine is being unwatered in order that an underground inspection may be made.

Hidden Treasure Mining Company—This company at Bullion, Harold T. Power, manager, has let a contract to complete the air shaft to connect with the long tunnel for ventilating purposes. This is the largest and most productive drift mine in the State.

PLUMAS COUNTY

Riverdale—This mine, formerly the Kellogg, is being opened under superintendence of L. P. Cornell. It is on the same channel as the old Loring and Seaveatt claim, which was a large producer.

RIVERSIDE COUNTY

Magnesite—Work on the newly discovered magnesite mine near Hemet has been discontinued, and it is proposed to explore the deposit by means of a diamond drill.

Corona Copper Company—This company has brought 160 acres of the old tin property and has an option of 2500 adjoining acres. A shaft is to be sunk to explore the copper deposit supposed to exist on the land.

SAN DIEGO COUNTY

Blue Bell—This mine, near Warner's, in Grapevine district, has been sold by W. Volk to L. Honnie. Better milling facilities are to be provided.

SAN LUIS OBISPO COUNTY

Eagle Mining Company—This company has been organized to prospect a mine in Van Ness valley, 10 miles southwest of Templeton, where indications of lead and copper have been found.

SHASTA COUNTY

Mad Ox—The first clean-up of the new 10-stamp mill has been made at this mine, near Stella. About 20 men are at work on the mine, which is under bond to the Caribou Gold Mining Company, N. W. Keith, superintendent.

SIERRA COUNTY

South Fork—The main tunnel of this mine at Forest City, F. W. Kuhfield, superintendent, is in 4360 ft. and it is now known that the channel is not far off.

California Associated Mining Company—this company, which purchased the old

Gold Ball, or Yreka Mining and Milling Company claim, at Rollin, has some 12 or 14 men employed in development work, to open the claim for extensive operations.

Rich Ore—G. W. Brown and John Flynn of Graniteville, Nevada county, have made a very rich strike in their tunnel in the Middle Yuba. The ore is of the "candle-box" variety, where it was struck.

SISKIYOU COUNTY

Yreka Dredge—This dredge has closed down after working up to the McNulty ranch line. More ground will have to be purchased before operations are resumed.

SONOMA COUNTY

Socrates Quicksilver Company—The vein recently found is 22 ft. wide and carries a high percentage of cinnabar.

Eureka & Rattlesnake—At these quicksilver mines, Pine Flat, retorts are being put in.

TRINITY COUNTY

Layman Bros. Group—A company is being formed to operate the mines of this group near Hayfork. Some development work has already been done and the ore has been worked in an arrastra.

Trinity River Mining Company—Peter Nelson is now superintendent of this company, which is cutting a tunnel to change the course of Trinity river so as to get at the bed. A new air compressor has been purchased.

Utica—At this mine, New river, the new tunnel is running on a 14-in. ledge that prospects well. The tunnel takes the ledge 250 ft. below the croppings.

Union Hill Mining Company—This company, near Lewiston, has completed the steel bridge across Trinity river. The 120-ft. span was built primarily to carry the pipe line, but it will serve also as a wagon bridge. Pipe laying will begin at once. There are 44 carloads of 36-in. pipe to be laid.

TUOLUMNE COUNTY

Arbona—The Calmas company, of Boston, Mass., has secured a bond on this mine at Tuttle town, the first payment having been made. The property will be started up shortly.

Big Oak—W. A. Nevils has sold an interest in the Big Oak mines and mill at Big Oak Flat, to T. W. Patterson of Fresno.

Imperial—John D. Smithers and associates have secured a bond on this mine near Jacksonville, formerly the Stanley, the property of C. A. Fitzgerald. The 10-stamp mill on the property will be overhauled.

Big Oak No. 1—This mine at Big Oak Flat has been sold by Capt. Wm. Nevills to the Central Trust Company.

COLORADO

LAKE COUNTY—LEADVILLE

Buckeye Gulch—Situated about four

miles north of the city is the latest section to open the Leadville formation and to find ore. The Zion Mining Company, with Major Hook, manager, has for several months past been operating in the gulch, prospecting with a diamond drill. During the week the drill reached a depth of 620 ft. and the last 18 ft. passed through dolomite sand and mineral. The manager will not give out the values, but states that they are good enough to warrant the company sinking a working shaft from the surface to develop the orebody. Major Hook is at present making arrangements to install machinery, and when this is completed, the work of sinking will be started.

Only Chance—This property, Rock Hill, has been in litigation for nearly 20 years. During the week the United States Court of Appeals remanded the case to the Circuit Court, with instructions to find for the appellants, the heirs of John T. Stewart, the original owner. Work will be at once started on the property. The main shaft is down 578 ft., but fully 278 ft. from the bottom up has caved in, so that it is more than probable that a new shaft will be started from the surface. The mine in early days was a heavy shipper of high-grade ore, and a number of old miners who worked the property at that time state that there is considerable ore left in the old stopes. The property is now controlled by James Harrington. The Only Chance is located 475 ft. north of the Reindeer, and it is claimed that the orebody from the latter property trends through the southern portion of the Only Chance.

El Paso—On this property, Fryer hill, a good body of ore has been opened in one of the many crosscut drifts that are being run to prospect the new country to the north and south. The oreshoot at present is fully 10 ft. thick, and as work progresses it widens. From other parts of the mine 50 tons daily are being shipped, and the ore carries fair values, consisting of sulphides and silicious ores. The pumps still continue to lift 750 gal. of water per minute. The opening of this new ore channel will materially add to the monthly output from the property.

Winnie—One of the properties on Big Evans gulch, owned by the new Monarch Mining Company, continues to send to the smelter at Salida some of the richest ore taken from this section of the district. A streak of ore 1 ft. wide, in one of the main stopes, runs from 15 to 57 oz. gold per ton, and free gold is liberally spattered through the ore. To the west of this a body of sulphide 10 ft. thick is being opened and by carload lots the ore runs 5 oz. gold per ton, with fair values in silver. The opening of this oreshoot and its high value has astonished the mining men of the district. The New Monarch Mining Company is producing in the neighborhood of 1500 tons per month.

Robert E. Lee—Twenty-five years ago

this property, Fryer hill, produced the richest silver ore ever taken from the camp. Recently Jones and associates got a lease on it, and after doing the necessary repair work, are now breaking ore in the old workings. The ore is a clean, argenteriferous iron on which a good profit is being realized.

Sugar Loaf Tunnel—A new company has taken hold in the Dinero property in this section of the camp, and it is the intention to drive a tunnel from the base of the mountain into the hill a distance of 3200 ft. This will cut the Dinero veins at a depth of 950 ft., drain the hill, making it possible to work the upper portion of the ground without the owners having to buck water, the great drawback to the district in the past.

Leadville District Mining and Milling Company—This company has started to erect its new mill, located east of the Arkansas Valley smelter. The mill will be supplied with modern concentrating machinery, with a capacity of 100 tons daily. The company has secured a lease on the dumps of Little Jonny mine, and this will be the first ore treated. The work is in charge of Frank Graham, an experienced millman.

INDIANA

VERMILION COUNTY

Klondike—This coal mine, formerly operated by the Keller Coal Company, has been sold to the Dering Coal Company, of Terre Haute, which now controls nearly all the mines in the Clinton district. The Klondike employs about 300 men.

KENTUCKY

BELL COUNTY

North Jellico Coal Company—This company has closed a contract for 5000 acres of coal and timber lands on the line of the new Louisville & Nashville branch into the Straight creek country. The price is reported to be \$150,000. The company has its headquarters in Louisville.

Straight Creek Coal Company—This Louisville company is preparing to begin work on the land recently acquired in the Straight creek district.

LOUISIANA

CALCASIEU PARISH

Annie Bess Oil Company—This company has a drilling outfit at Castor springs, 29 miles north of Jennings. The springs resemble those at Sour lake, Texas, and the indications are considered favorable for petroleum.

Jennings-Heywood Oil Syndicate—This concern is installing one of the largest compressed-air plants ever used in America. It will consist of 18 compressors, of various makes, having a total capacity of 11,500 cu. ft. per minute. Power will be supplied by a battery of 20 boilers

of 40-h.p. each. Compressed air is being extensively used to force the crude oil from the wells. Only one well in the field—the Crowley Oil and Mineral Company No. 20—is gushing naturally at the present time.

New Wells—Eight wells were completed during September, of which six, credited with an initial output of 2150 bbl., were producers.

MONTANA

BUTTE DISTRICT

According to Ben B. Thayer, who represents the interests of H. H. Rogers in Amalgamated, the production of copper by Amalgamated this year will not exceed by 2 per cent. that of last year and may not be any greater. Mr. Thayer is now in Butte and is making an inspection of Amalgamated properties. He bases his statement upon the fact that only the same mines are in operation this year that were worked last year. He says that next year the output of Butte will be increased by reason of the working of mines that are now in course of preparation, and that fully a year and a half will elapse before contemplated additions to the Great Falls plant of the Boston & Montana are finished. As for the Washoe, it can treat a much larger tonnage than it is receiving.

La France Copper Company—A special meeting of the stockholders is called for Nov. 2, at the office in New York, to vote on the question of issuing 6 per cent. mortgage bonds to the amount of \$2,000,000; such bonds to be convertible into stock on terms to be arranged hereafter.

Clark Properties—A shortage of ore from the Stewart mine is curtailing the copper production at the plant. How long the shortage will continue is problematical. Although credited with a production of 4,206,425 lb. of copper during August and September, the total output was only 2,504,084 lb., and at the present rate it will not exceed 1,200,000 lb. this month.

Butte & London—The shaft is 675 ft. deep and has cut a lead which, at the present depth, does not carry mineral in commercial quantity, the average in copper being less than 1 per cent. When first cut it was only 1 ft. wide; it is now 10.

North Butte—This company is shipping between 1000 and 1100 tons of ore a day, no increase in the former production having been made; none will be until the skip pockets in the levels and shaft are finished, which will be in about a month. The company is developing ore continuously and has 2500 ft. of reserve bodies in the Edith May and Miners' Union, Jessie and Speculator veins. It is crosscutting the country north of the Jessie, and it is estimated that about a year will be required to reach the northern limits of the property.

East Butte—This company produced

about 100,000 lb. of copper in September. Its main shaft is 450 ft. deep and its secondary one 200.

Bullwhacker—This company has cut a vein of silicate of copper ore southeast of the main shaft on the 200 and is driving for it on the 400. The ore averages about 3½ per cent. This vein is 18 ft. wide at 50 ft., old shaft; its width below has not been determined.

Butte Central & Boston Copper Corporation—The shaft is 500 ft. deep and crosscutting north and south at that depth is in progress with a view of intersecting the three veins traversing the property. On the 200- and 30-ft. levels these veins show a good grade of silver ore containing some gold and copper, the latter in spots. The company has ordered a new engine.

LEWIS & CLARKE COUNTY

Considerable activity is apparent in the gold-silver-lead district around Helena. The present high price of silver, improved metallurgical methods and cheaper transportation should tempt capital to a field large in area and immensely profitable.

Porphyry Dike—Here can be seen a thorough, systematic effort to determine the value of the much talked of belt of low-grade ore. This is only one place in miles of promising country where an honest effort is being made.

Marysville—The suits between the famous Drumlummon and its neighbor, the St. Louis, are so far settled that injunctions are being removed, and it is now possible for the latter to resume operations in sections of its property.

Bald Butte—Mine and mill were closed down the first of last December for lack of funds, but operations have been resumed, with 40 stamps dropping, and the vein that was then being worked is yielding extremely rich ore. It is not expected to keep the mill going full time during the winter, for its capacity is much beyond that of the mine.

Piegan—A few miles from Bald Butte a lead not worked in the old days has been discovered in the Piegan property. Twenty miles from Marysville, the old Jay Gould is being prospected, and its neighbor, the Hubbard, is being developed on its own resources.

NEVADA

ESMERALDA COUNTY—GOLDFIELD

At the present time the town of Goldfield is experiencing one of the greatest booms that any mining camp ever went through. Over 150 buildings are in course of construction and there is not an idle man in town. The lumber yards are completely out of material and orders for building and mining material are filed for weeks ahead. Fifty-six mining properties are now in operation and every one of them gives indications that further development and the installation of proper equipment will make mines of all of them.

At the present writing upward of 2250 men are employed in the camp.

Mohawk—This mine still maintains its reputation and during the past week has made the biggest shipments to date. Twenty-seven leases are in active operation, and 12 of them are making shipments.

Hayes-Monnette Lease, Mohawk—This lease has been shipping ore ranging in value from \$80 up and has just encountered a streak 1 ft. wide carrying very high value. Upward of 200 tons of high-grade ore are in the drifts waiting to be brought to the surface. The double-compartment shaft with its 25- and 50-h.p. hoists is worked to the utmost capacity.

Frances-Mohawk Lease—This lease is shipping ore ranging in value from \$300 to \$1000 per ton without sorting. The company controlling this lease has only been in existence four months and is now paying a dividend of 5c. a share. Shipments are averaging 100 tons per day.

Rickard-Mohawk Lease—A new three-compartment shaft is being lowered at the rate of 5 ft. per day and a gasolene hoist has been installed. The original shaft is 150 ft. down.

Pollard Lease, Florence—This lease has abandoned the whim and this week installed a 40-h.p. gasolene hoist. They are now down 160 ft. and are encountering shipping ore.

Florence Mining Company—This company has been experimenting with its ore for some time and has now decided to put in a large stamp-mill, the plans for which have already been drawn.

Lucky Swede Lease, Silver Pick—A drift 145 ft. long from the 100-ft. level in this lease has come into ore which assays well. Another drift is about to be run from the 100-ft. level of the new shaft; at the same time the shaft will be sunk to a depth of 200 ft. Machinery has been ordered.

Price Lease, Silver Pick—This lease has a shaft down 105 ft. and has passed through ore running from \$30 to \$60 to the ton. A drift has been started from the 100-ft. level toward the strike on the Lucky Swede lease.

Combination—The twenty-third consecutive monthly dividend of this company has been paid. This was at the rate of 15c. per share and amounted to \$48,000, making a total to date of \$688,000 distributed among the shareholders. Enough ore is now blocked out on this property to run the stamp-mill three years.

Columbia—This mine has been purchased by Hayes & Monnette of the Hayes-Monnette lease on the Mohawk. This property covers about 50 acres. The deepest shaft is down 70 ft. and the entire bottom is in low-grade ore that averages \$6.

January—This mine has put in a large pumping plant and is making all arrangements to sink immediately to a depth of

about 800 ft. When this depth is attained it will make this the deepest mine in camp.

Diamondfield Triangle—The Daisy people now have control. It is believed that Triangle has the extension of the rich ledge in the Daisy. A new 25-h.p. electric hoist is now being installed.

Wonder—The new camp of Wonder seems to have good mines beneath the surface. The Wonder mine has been bonded for \$300,000 by Tonopah interests, while the Jack Pot has 200 sacks of new ore ready for shipment. The town is growing fast.

NYE COUNTY

Reese River—There has been quite an excitement in the Reese river country, where large, well defined ledges carrying high values have been discovered. The district has an abundance of water and timber, and is an ideal one for milling purposes. The formation is quartzite and porphyry. Every available claim in the district has been taken and development work has begun.

NYE COUNTY—TONOPAH

Tonopah Mine—During the past month the plant has been overhauled and improved. The Midway mill has been refitted and enlarged, new compressors have been installed on the mine, and arrangements have been made for providing all the company's property in Tonopah with a fire service, independent of the town service. The company's new 100-stamp mill, at Miller's siding, 18 miles west of Tonopah, is expected to be ready for crushing at the end of the month. Its capacity will be 400 tons per day, and it will be equipped with concentrators and a cyanide plant.

West Tonopah—A good deal of attention is being given by local mining men to the developments in this mine, which is situated about six miles due west of the Tonopah and Tonopah Extension mines. The shaft has been sunk to a depth of 850 ft., and during the past month quartz stringers of a promising nature were met with in a crosscut running south from the bottom level. Should the Extension vein be cut in this property the intervening ground, which is chiefly owned by the Schwab group, will become of great possible value.

Standard—It is proposed to resume shaft sinking before doing any further crosscutting in this mine. The shaft is now down 600 ft.; it will be continued to 800 ft.

NYE COUNTY—MANHATTAN

Pine Hill—A force of five men is engaged in prospecting this property, which has a good position north of the Chipmunk, and adjoining the Broncho mine. A shaft is being sunk on a 5-ft. ledge, but is now down 35 ft. only.

Stray Dog—A large amount of milling ore is being blocked out in this property.

It is reported that efforts are being made to amalgamate with the Indian Camp and Jumping Jack companies, and work the three properties as one large mine.

Bonanza—The 4-ft. ledge in this claim is developing well. Assays taken from the first 18 inches run into three figures. The ledge has been sunk on to 40 ft., and is exposed on the surface for 800 ft.

NYE COUNTY—BULLFROG

Eclipse—Development operations have defined an ore deposit 495 ft. in length and from 10 to 40 ft. in width. Ore of shipping grade has been cut in both the Tramp and Eclipse shafts, and the whole of the deposit carries milling ore.

Shoshone—The official report just issued states that seven distinct veins have been developed in the workings. The main quartz vein is from 15 to 20 ft. in width, and more than 2000 ft. in length. It is being developed from the main tunnel on No. 3 claim. The value of the ore is not given, but it is understood to be of milling grade. Some of the talc found next to the vein assays high in gold.

Jumper—The incline shaft is now down 200 ft., and will be continued 100 ft. as soon as additional cable arrives. The shaft is following a well mineralized lead.

West Extension—Some rich ore is exposed in the workings in this mine, and has induced the company to hurry development operations. A new hoisting plant has been ordered and the shaft is being enlarged.

Golden Sceptre—Talc resembling that found in the Shoshone mine has been cut in the Golden Sceptre. The quartz vein is 3 ft. wide and averages \$30 per ton. The mine is being carefully developed.

NEW MEXICO

GRANT COUNTY

Santa Rita District—The Wild Cat mine has been dismantled by the Hermosa company. The Santa Rita company is shipping concentrates from its 100-ton mill to El Paso, but may soon increase the capacity to 500 tons daily. It is also sinking five small shafts for the development of new ore and has 40 lessees at work.

Colorado Fuel and Iron Company—This company has a fine iron mine at Sierra. Its output of 750 tons daily will be shortly increased to 1000. The same company has also bought the Brockman iron mine, in Hanover cañon.

Hermosa—This company has been running as an experimental plant, after considerable alteration, the concentrator built at Hanover, some years ago, by J. W. Bible and associates for custom work.

Empire Zinc—This company has been shipping from Hanover some high-grade zinc ore to the Prime Western smelter at Iola, Kansas.

Carpenter Camp—The Monarch Mining Company, of Wisconsin, has optioned the Grand Central and neighboring claims with the object of securing zinc ore. It has repaired the road over the range from Lake Valley, has erected a sawmill and hopes to complete soon a 100-ton concentrator for the large bodies of zinc-lead ore in the mine. Three miles northward, the Grand View mine shows a lead-zinc body 22 ft. wide and the owners wish to bond the property, but only to financially strong parties.

Granite Gap District—S. A. Torrance, of Worcester, Mass., has been visiting the mine of the United States & Mexico Development Company with the object of devising means to increase the shipments from 4 to 25 cars of lead ore monthly.

SIERRA COUNTY.

Philadelphia—On Sept. 19, there were offered for sale the assets of the Philadelphia Mining Company, Los Animas district, consisting of 10 claims and completely equipped reduction works. Gloin & Nelson have secured a lease and bond on the Iron King and Miners' Dream claims on the lead-zinc belt, and will ship a car of zinc ore to the smelter for a test.

OREGON

BAKER COUNTY

Bonanza—Albert Geiser, who is now operating this old mine at Geiser, above Sumpter, 30 miles west of Baker City, under a bond and lease, reports that he has made a rich strike on the 200 level in the old workings, and is running the mill day and night on ore that is paying good returns. Some eight years ago Geiser developed this property, which was sold to a Philadelphia syndicate, and which was a producer for several years, but was later abandoned as worked out. Last year Geiser bonded and leased it, and began work above the water level.

Bonanza—At this mine the workmen in one of the upper levels have just opened another vein, which has created considerable excitement in the mining camps above Sumpter and 30 miles west of Baker City. Albert Geiser is operating it.

Tallmadge Placers—A. W. Bahlke, vice-president of the Oregon Mining and Irrigation Company, which took over the Tallmadge placer claims in the Sparta district, states that they expect in another season to begin making clean-ups from the ground.

Black Sands—A Portland syndicate, operating near Durkee, 20 miles southeast of Baker City, in the bottoms of Burnt river, is taking some gold out of the black sands, which come off as waste from other workings.

PENNSYLVANIA

ANTHRACITE COAL

Hazle Mountain Coal Company—This

company, at Black Ridge, near Hazleton, has awarded a contract for the sinking of an additional slope. When this is completed, coal will be hoisted and run overland to the breaker.

Lehigh Valley Coal Company—This company will abandon the Lawrence breaker, near Pittston, in connection with the plan for centralizing operations at this point. No more coal is to be hoisted through the Babylon or Lawrence shafts, but all the output from the three collieries will be hoisted from the William A. colliery, being taken to that colliery from the two others, by means of tunnels. The coal will then be prepared for market in the William A. breaker. The shafts in the two other collieries will be used, in part, to hoist the coal from one vein to the other. By the change and by abandoning the breaker the services of about 200 men will be dispensed with. It is probable that the Lawrence breaker will be converted into a washery to handle the culm that has accumulated from the two breakers.

M. E. Smith Coal Company—This company, recently organized in Wilkes-Barre, has commenced operations on the coal land purchased at Beaver Meadow. The workings are on the site of the old Evans operations, abandoned by A. S. Van Wickle & Co., several years ago.

Nottingham—Through the carelessness of a miner, some old timbers in this mine at Wilkes-Barre were set on fire last week, and the fire was not discovered until the following day. Workmen have since been at work fighting the flames. It is expected that this will be extinguished without serious loss.

Warrior Run—The Lehigh Valley Coal Company has discontinued pumping water into the Warrior Run colliery, where the disastrous fire took place recently.

BITUMINOUS COAL

Jones & Laughlin Steel Company—It is reported from Pittsburg that this company has closed the purchase of 5000 acres of coal land in Washington county, at a price of \$1000 per acre.

Marietta-Connellsville Coke Company—This company has bought 370 acres of coal land in the Ligonier valley, three miles from Ligonier. A mine is to be opened at once, and a contract has been let to build a block of 50 coke ovens. R. Marietta is president of the company; C. Stillwagon, secretary and treasurer.

SOUTH DAKOTA

CUSTER COUNTY

New York Mica—About 25 men are now employed at this property, grading for the foundations for the new hoist and sinking the shaft. It has reached a depth of 75 ft. and will be sunk to 100 ft. before crosscutting is begun. The mica is found for a distance of from 4 to 5 ft. along both

walls of the vein which is a well defined vertical.

LAWRENCE COUNTY

Mogul—General Manager N. L. McLaughlin writes as follows: "For your information I will say, that the Mogul Mining Company took over the property of the Horseshoe Mining Company on May 26, this year. The new company has 750,000 shares of preferred stock, and 750,000 shares of common, par value \$1 per share. It also has a bond issue of \$300,000, and no floating indebtedness. The Kildonan mill has been remodeled into a modern wet crushing plant, of 300-tons per day capacity, and will be ready to run very shortly."

Eleventh Hour—Plans are being made to dispose of the bonds voted by the company at its last meeting. The amount is \$60,000, and they will be in denominations of \$50 and \$100, running five years and bearing interest at the rate of 6 per cent. There is an indebtedness of \$29,000 against the company and a number of the creditors have subscribed for bonds to the amount of \$21,000. The work of patenting the ground will begin at once. At the meeting the number of directors was increased to seven.

Pluma—This company is preparing to resume operations after several months of idleness. Men are at work overhauling the hoist. This ground lies near Lead City and adjoins the Homestake.

Reliance—The large filter-press for the mill has arrived, and the Huntington mills will be on hand soon. With no unexpected delays, the mill should be in running order within a month.

Victoria—A consolidation of this company with the Victoria Extension is pending. This would make a strong organization with good ore reserves and an excellent mill.

PENNINGTON COUNTY

Myboy—This placer property, owned and operated by N. N. Davin, is being developed rapidly. Several large nuggets have been found and the dirt pans well. At present it is being taken from a shaft 16 ft. deep and 12x16 ft. in size.

Egyptian—Work has been commenced in the shaft with three shifts of men. For the present the shaft will be sunk with hand drills, but an eight-drill air compressor will be in operation soon.

TEXAS

The anti-trust case of the State of Texas against the Waters Pierce Oil Company has been entered for trial in the 26th district court opening on Nov. 26. The State, in addition to asking the forfeiture of the company's charter, seeks a judgment of over \$5,000,000 in penalties.

The continued decline in production of the Coastal oilfield has brought another advance in the credit balance rates of 5c. per barrel for Jennings crude, and 3c. for

other fields. The September consumption exceeded the production of 1,480,000 bbl. by 900,000 bbl. On Sept. 30, the Coastal field was producing 48,800 bbl. daily, as against 51,700 bbl. on Aug. 31, the Texas fields showing a decline of 1000 and Jennings about 2000 bbl. daily. Contract oil is scarce and prices are tending higher, as no new fields have been located and wild-cat operations do not look promising. How much higher crude will go is problematical. It is fast approaching a point which will permit shipments from the mid-continent fields. The extensive Texas refineries are drawing on their stored oil, and their plants at tide-water represent such a large investment that it is almost certain that they will take action to insure a supply of crude from sources other than the Coastal fields.

Fifty wells were completed in Coastal fields during September, of which 35 were producers, and 48 wells were drilling on Sept. 30.

The daily output and contract prices of the various fields on Sept. 30 were as follows. Humble, 7300 bbl.; 60c. Saratoga, 7300 bbl.; 58c. Spindletop, 2600 bbl.; 66c. Dayton, 200 bbl. Batson, 6800 bbl.; 58c. Sour Lake, 6140 bbl.; 63c. Jennings, 18,200 bbl.; 61c. Welch, 225 barrels.

UTAH

JUAB COUNTY

Tintic Ore Shipments—Shipments to the Salt Lake smelters last week amounted to 134 carloads, the contributing mines being: Ajax, 5; Beck Tunnel, 9; Bullion Beck, 1; Carisa, 8; Centennial Eureka, 49; Eagle & Blue Bell, 3; Eureka Hill, 2; Gemini, 12; Godiva, 2; Grand Central, 3; Laclede, 1; Mammoth, 4; May Day, 3; Star Consolidated, 2; Swansea, 3; South Swansea, 2; Tintic Iron, 11; Uncle Sam, 5; Yankee Consolidated, 6 cars.

Little Chief—This company has purchased a hoisting plant formerly operated at the Silver King, at Park City, and is preparing to sink a deeper shaft.

Scranton—This Tintic mine is one of the largest zinc properties in the State. A lot of 300 tons has been shipped to New York for testing purposes. A large tonnage of this ore has been developed.

Emerald—The management has decided to sink the shaft to the 1200 level. It is now 900 ft. deep.

GARFIELD COUNTY

Utah Antimony Company—This corporation has begun development of its property. Thompson Campbell, of Butte, the manager, is on the ground looking after preliminaries preparatory to putting up a plant for the treatment of the ore.

IRON COUNTY

Jenny Gold—This company has found a body of good gold ore in a drift from the 115 level of the shaft. Preparations for

the erection of a mill have been practically completed.

SALT LAKE COUNTY

Bingham Central—Ore has been opened in the Apex fissure about 500 ft. from where a large body was found recently in the Whitley tunnel.

South Columbus—Under the new management this company has undertaken a very active campaign at its Alta property.

SUMMIT COUNTY

Park City Ore Shipments—Shipments last week aggregated 4,677,400 lb., the contributing mines being: Daly Judge, 1,625,000; Silver King, 1,482,700; Daly West, 1,200,000; Little Bell, 26,000; Ontario, 273,600; Jupiter, 26,000; other mines, 44,000 pounds.

Magnolia and St. Louis—The new hoisting equipment for this property is being installed.

Scottish Chief—This property, at the head of Big Cottonwood cañon, is showing up with some good shipping ore. The property has been under development for several years and has produced some ore.

VIRGINIA

BOTETOURT COUNTY

Alleghany Ore and Iron Company—This company is erecting an ore-washer at its plant near Oriskany. The building will be 55x150 ft., and the machinery of the latest types. J. W. Stull is superintendent, and James P. Crist is in charge of the construction work.

WASHINGTON

FERRY COUNTY

Reservation—This company has given a bond to the Dominion Copper Company, which has put on a force of 10 men sinking a shaft and raising on the vein from the tunnel. The latter company has also bonded several claims on La Fleur mountain, in the north end of the county, near the international boundary line.

Viola Copper-Gold Mining Company—On the Jupiter claim of the Americanetta group, an open cut has been driven 125 ft. across the vein, exposing lead sulphide, galena and lead-carbonate ore, 15 ft. deep at the face. The open cut is 5 ft. wide, and shows ore on both sides. In the floor is quartzite, which assays in gold, silver, copper and lead.

Minnehaha—The installation of the compressor plant has been completed, and the new tunnel is under way.

Faithful Surprise—The yearly assessment work has been finished. The Surprise tunnel is faced up in unusually good ore.

Belcher—Men have been put back to work on the upraise between Nos. 2 and 3 tunnel levels, but the blower having been removed to No. 4 tunnel, the air is bad, and only one shift can work.

WEST VIRGINIA

MINGO COUNTY

Mingo Block Coal Company—This company has been organized and has secured control of a large tract of coal lands, on which work is to be begun at once. Henry M. Payne is chief engineer and superintendent, with office at Williamson.

WISCONSIN

ZINC DISTRICT

Dall Lead and Zinc Company—One of the most interesting bits of news of the week is the report of the opening of a large vein of zinc and lead at the Dall. Since Chas. Burroughs took the management his energies have been spent along the line of development. The annual meeting was held last Monday, at which it was voted to increase the capital stock from \$35,000 to \$60,000; present stockholders of record to have the option of purchasing pro rata at \$1 per share. Preparations are now being made to erect a suitable boarding house on the ground to accommodate the miners, who have been forced heretofore to walk 5 to 7 miles.

Longbotham Lease—Joe Longbotham reports a sheet of zinc and lead ore on his lease adjoining the Dall. This strike in connection with the one made by the Dall shows the possibility of a continuous range clear across both properties.

Looney Mining Company—The concentrating plant at the Looney is near completion. In addition to a good body of ore developed, there is a dump consisting of several thousand tons of rich mill dirt that will be put through the mill first. The mine is owned by Messrs. McIlhon, Snow, Spensley, W. A. Jones and Allen, all of Mineral point.

Hazel Green—Calvert Spensley, of Mineral Point, who is the active head of the Hazel Green, states that the force of underground men has been increased and that as soon as possible work will be pushed in the lower workings. The grade of the ore is said to be higher than formerly.

Blewitt Lease—A company has been formed called the Blewitt Mining Company, including several prominent Chicago men. Henry A. Allen, of Chicago, the consulting engineer, is getting up plans for a 200-ton concentrating mill, and has started to develop the property. Mr. Allen examined and reported on the property.

Kennedy—C. W. McIlhon states that a test was made last week at the Kennedy roaster. It was conclusively shown that the efficiency of the separator ran a little over 86 per cent., the product assaying 61 per cent. zinc and better. The amount handled in 24 hours was a little more than 22 tons.

Homesite—An Ingersoll compressor is being installed at the Homesite. It is expected that all the other machinery will be in place in October.

Foreign Mining News

CANADA

ONTARIO—COBALT DISTRICT.

McKinley-Darragh-Savage—A new vein 6 to 8 in. in width has been found in the 75-ft. cross-cut, No. 1 shaft. It carries good values in plate and leaf silver. The stripping of No. 2 vein has been continued for over 400 ft. The value of the ore from No. 3 vein shows improvement with downward working. The mine is near Cobalt.

Nipissing—What is either a new vein, or a continuation of ledge 49, has been discovered 250 ft. south of that ledge. It is 10 in. wide on the surface and has been stripped for over 50 ft., and runs high in silver.

Kerr Lake—Shipments from this mine for August amounted to over 60 tons, valued at about \$90,000. There are seven veins now being worked.

Wabi Cobalt—At this company's property, Lorraine township, a vug, or cavity, was struck at a depth of 12 ft. in the course of sinking the shaft. The dirt in the cavity was found to yield native silver when panned out.

Gillies Timber Limit—The work of sinking the shaft is being steadily prosecuted and good progress made. It has been decided to conduct mining operations by the Provincial Government direct and not to entrust the work to a commission. Money will probably be obtained by the sale of the ore, as the work may require it, instead of drawing on the public treasury.

ONTARIO—NORTHWESTERN AREA.

Laurentian—Recent development work has disclosed deposits better than all previous discoveries. The raise from the first level is now 50 ft. up, the ore being found all the way.

Viking—A recently organized Toledo, Ohio, company, incorporated as the Viking Gold Mining Company, has acquired this property, situated in the Eagle lake district. Active operations are being resumed under the superintendence of W. R. Mowery, of Toledo.

Coal Trade Review

NEW YORK, Oct. 24

Coal trade in the East is generally quiet and uninteresting. The demand for steam coal is steady, but supplies are abundant, and there is no hurry about buying. The far New England ports, which are ice-bound in winter, are making a little stir in the coastwise trade. In the domestic trade, continued mild weather has kept people from thinking about winter supplies.

In the West railroad transportation continues to be the main topic of discussion. Few mines are able to ship all their coal; nevertheless supplies at the chief

consuming points are fair. The Lake trade is suffering from delays on the railroads and at the docks. Shipments, however, have shown a considerable gain over last season, and there is still a month to make up any shortage in contracts.

COAL TRAFFIC NOTES

Shipments of anthracite coal by companies for the nine months ending Sept. 30 are reported as below, in long tons:

	1905.		1906.	
	Tons.	Per Ct.	Tons.	Per Ct.
Reading.....	9,301,724	20.5	8,083,782	20.1
Lehigh Valley....	7,446,881	16.4	6,281,591	15.6
N. J. Central.....	5,869,574	12.9	4,960,418	12.3
Lackawanna.....	6,939,033	15.3	6,744,923	16.7
Del. & Hudson..	4,253,367	9.4	3,742,158	9.8
Pennsylvania....	3,593,210	7.9	3,427,876	8.5
Erle.....	4,669,415	10.3	4,010,537	10.0
N. Y., Ont. & W....	2,113,527	4.7	1,791,020	4.4
Del., Sus. & Schu'l	1,196,079	2.6	1,053,341	2.6
Total.....	45,377,810	100.0	40,295,646	100.0

The total decrease this year was 5,092,164 tons, or 11.2 per cent., caused by the suspension of work in April and May. Every company showed a loss, the smallest being that of the Lackawanna, 194,110 tons; while the heaviest was that of the Reading, 1,217,942 tons.

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburgh for the year to Oct. 13 were as follows, in short tons:

	1905.	1906.	Changes.
Anthracite.....	3,566,086	3,410,910	D. 155,176
Bituminous.....	22,982,411	24,979,009	I. 1,946,598
Coke.....	8,609,807	9,869,184	I. 1,259,377
Total.....	35,158,304	38,269,103	I. 3,050,799

The total increase this year was 8.7 per cent.

New York

Oct. 24

ANTHRACITE

The slight burst of activity brought out recently by a little cold weather has largely relaxed. It was encouraging, however, in that it proved that the large stocks of coal reported to have been accumulated early in the year, were largely fictitious, and that an active demand may be confidently looked for as soon as winter comes along. Line trade is particularly active; this class of trade always shows returning animation before tidewater, because the line dealers are usually not well provided with storage room. Shortage of cars restricts shipments considerably and would doubtless create some stringency if very cold weather should come on suddenly.

Prices remain at \$4.75 for broken and \$5 for egg, stove and chestnut; for steam sizes, \$2.80@3 for pea; \$2.25@2.50 for buckwheat; \$1.45@1.50 for rice; \$1.30@1.35 for barley; all f.o.b. New York harbor shipping points.

BITUMINOUS

The soft-coal trade along the Atlantic seaboard is very little changed and no great improvement may be looked for until winter. Shortage of cars remains the predominant factor, particularly with the Baltimore & Ohio and the southern roads. Lack of boats in the coastwise trade is

likewise becoming serious; it is principally due to severe weather. Many vessels have been tied up for several weeks, and the want of them at shipping ports is urgent. This gives rise to some accumulation of coal at the tidewater ports.

The far East shows an active demand with which the Virginia loading ports have not been able to keep up. The Sound also is active, showing a particular demand for the better grades. Consumers are universally calling for their full monthly contract deliveries. Trade in New York harbor shows a little strength, although the lack of boats has resulted in the holding of great numbers of loaded cars, waiting to be discharged.

All-rail trade is fairly active and prices are a little stronger. Transportation from mines to tide is fairly good. Cars are in short supply, amounting, on some roads, to not more than one-quarter the requirements. Boats in the coastwise-vessel market are scarce but freights remain the same as quoted last week.

Birmingham Oct. 22.

The railroad-car shortage is again interfering with coal production in Alabama. While coal cars are not used in the handling of cotton, still that is given as an excuse by some of the transportation companies. There is an active demand for coal that can be mined, and the best prices obtain. Inquiries are being received by the producers daily as to capacities and the prospects during the winter. There is no change in the coke situation. Every ton is in strong demand, too, and efforts are being made to increase the production. Labor is needed at the coal mines in Alabama, and while there is a small stream of workmen being brought in, more places appear to show up for the labor.

Chicago Oct. 22

The local market for coal is active, for the first time since last winter, in anthracite and eastern coals. Western coals are still somewhat dull, but the demand is improving and will probably be active with the first prolonged cold weather.

Car shortage continues to be blamed for the lack of eastern coals and high prices. Hocking has advanced 25c. in the local market and 30@40c. at northern lake ports. The supply of Hocking is very small compared with the demand and speculation in the coal is active. Eastern gas coals are also in great demand, Youghioghny bringing \$3.40 for three-quarters. Hocking is quoted at \$3.30 for run-of-mine and \$3.65 for 1¼-in. lump. Smokeless also is scarce and firm in price. Pocahontas and New River brings \$3.30 @3.40 for run-of-mine and delays are general in obtaining shipments.

Illinois and Indiana coals are somewhat weak as to screenings, but prepared sizes are firm and advancing. Lump and egg

are quoted, at \$2.50@2.85; run-of-mine \$1.75@2.25, and screenings, \$1@1.50. In general, country trade in western coals is better than city trade.

Cleveland Oct. 23

The coke market is growing stronger, on account of the shortage of cars. The car situation seems to be growing more aggravated all the while, with no relief in sight. Many of the ovens have given notice to their consumers it would be safest to lay in a reserve supply. Prices have not changed under this strain, holding firm at \$3 at the oven for furnace coke, and \$3.75 at the oven for the best grades of 72-hour foundry coke.

The Lake market for coal is slow, cars being so short it is almost impossible to get enough coal to the Lakes to take care of the contract vessels, to say nothing of loading wild boats. The result promises to be that many of the shippers will end the season even further behind their contracts than they are at the present time. The demand for steam coal is strong, largely due to the restriction of the supply. Prices have moved up steadily, and the best grades of mine-run are now selling at \$1.30@1.35 at the mines. The slack market is also stronger, partly because the supply is being restricted through a smaller movement up the Lakes of three-quarter coal, but partly because consumers are willing to pay good prices for almost anything that will burn. Slack is worth \$1 at the mines in either Ohio or Pennsylvania.

Pittsburg Oct. 23

Coal—The car shortage continues and the railroad coal mines are not being operated to more than one-half their capacity. Prices are strong and range from \$1.35 to \$1.55 a ton for mine-run at the mines, according to delivery. The river mines are in full operation and operators took advantage of a rise to send out several tows, the shipments amounting to about 1,000,000 bu. The boats were rushed out, as it is not believed the rivers will be navigable long enough to permit large shipments. An important transaction of the week was the sale of 4000 acres of coal land in Washington county, which is included in the Pittsburg district, by the Pittsburg-Buffalo Company to the Jones & Laughlin Steel Company at \$350 an acre. The steel company will use the coal for coking purposes.

Connellsville Coke—The feature of the coke market was the extensive buying of coke by the United States Steel Corporation, which caused considerable surprise, as some contracts extend through the year. Contracting for coke a year ahead has never been known in the history of the industry. The purchases so far as made public are as follows: 20,000 tons a month for the entire year at prices ranging from \$3 to \$3.15 a ton; two contracts,

one of 14,000 tons and the other of 7500 tons a month, for the first half at \$2.90@3 a ton. Some of the coke will come from West Virginia ovens, and the prices agreed upon are according to quality. It is reported, but not confirmed, that other contracts have been made that will swell the tonnage of outside coke secured by the corporation to fully 500,000 tons. For delivery this year furnace coke is selling at \$3@3.15 and foundry at \$3.75. Quotations for furnace coke for next year range from \$2.90 to \$3.15 and for foundry from \$3.50 to \$3.75. The production for the week according to the *Courier* was 280,832 tons. The shipments aggregated 15,811 cars distributed as follows: To Pittsburg, 5082 cars; to points west of Pittsburg, 8894 cars; to points east of Connellsville, 1835 cars. The production in the Lower Connellsville region amounted to 111,899 tons.

Foreign Coal Trade

Oct. 24

Exports of fuel from Great Britain, with coal sent abroad for the use of steamers engaged in foreign trade, were as follows for the nine months ending Sept. 30, in long tons:

	1905.	1906.	Changes.
Coal.....	36,308,656	41,229,705	I. 5,921,049
Coke.....	522,496	570,713	I. 48,217
Briquets....	848,603	1,072,435	I. 223,832
Total exports..	36,679,755	42,872,853	I. 6,193,098
Steamer coal....	13,071,367	13,845,545	I. 774,178
Total.....	49,751,122	56,718,398	I. 6,967,276

This shows a total increase of 14 per cent. in coal sent beyond the limits of the United Kingdom. Exports to the United States, included above, were:

	1905.	1906.	Changes.
Atlantic ports.....	37,331	21,947	D. 15,384
Pacific ports.....	75,160	28,002	D. 47,158
Total.....	112,491	49,949	D. 62,542

The more important exports this year were to France, 6,816,216 tons; Italy, 6,044,580; Germany, 5,582,183; Sweden, 2,652,900; Russia, 2,336,017; Spain, 2,022,879; Egypt, 1,954,424; Argentine Republic, 1,788,300; Denmark, 1,809,667; Holland 1,547,219; Norway, 1,098,735 tons.

Imports of coal into Germany for the eight months ending Aug. 31 were, in metric tons:

	1905.	1906.	Changes.
Coal.....	6,319,220	5,736,765	D. 582,455
Brown coal.....	5,100,811	5,530,600	I. 429,789
Total.....	11,420,031	11,267,365	D. 152,666

Imports of coke for the six months, March-August, this year were 283,965 tons; of briquets, 75,382 tons.

Exports of coal from Germany for the eight months were as follows, in metric tons:

	1905.	1906.	Changes.
Coal.....	11,314,804	12,855,054	I. 1,540,250
Brown coal.....	13,578	11,675	D. 1,903
Total.....	11,328,382	12,866,729	I. 1,538,347

Exports of coke for the six months, March-August, of this year were 1,716,496 tons; of briquets, 486,012 tons.

Iron Trade Review

NEW YORK, Oct. 24

The iron and steel trades are still showing an unbroken front—there are no signs of weakness to be discerned. There is, perhaps, less rush to buy, but that is because many large consumers have covered their probable requirements for some time to come. Orders for railroad equipment and for new buildings are still coming forward, and many mills are so secure of their winter work that they are not looking for more.

The leading interests are doing their best to keep prices level, but the fact is that, while there is little change in nominal quotations for finished steel and iron, most new business is done at premiums, which really mean higher prices. Pig-iron prices are now much higher than they were a month or two ago, and finished material naturally follows.

There is some discussion about ore supplies for the winter, and furnaces which buy their ore are apprehensive that they may not get enough. Lake ore is being rushed down as fast as possible.

A London despatch reports some heavy purchases of pig iron on American account. The iron taken is chiefly in the Middlesboro district, though some purchases of Scotch pig are also mentioned. As the buying is of warrants, however, it is not certain whether it is for immediate shipment or as a precaution against future needs. The price of Middlesboro warrants telegraphed this week is 58s., which is equivalent to about \$20 per ton on dock at New York, duty paid.

Arrivals at Baltimore this week included two cargoes of manganese ore; one of 2004 tons from Russia, and one of 4100 tons from India.

Birmingham Oct. 22.

Pig iron for delivery during the first half of 1906 is showing strength. No. 2 foundry iron for delivery during the first three months of 1906 has been sold in this district above \$16 per ton. Inquiries for spot iron, with a good premium offered, are not meeting with success. There is very little iron to be had for delivery within the next three months, and the sales made for delivery during the first six months of the coming year already aggregate handsomely. The probable make next year will hardly show much improvement over what it has been of late, though preparations are under way for a considerable increase in the output of the furnaces. In the Southern territory there has been some trouble lately as to transportation. Not only are the raw-material movements retarded, but cars cannot be secured as promptly as desired to handle the pig iron. The home consumption is brisk, and shipments to outside territory are large. In more than one instance furnacemen are behind in their orders, and

are asking the trade for consideration. The yards in this district are practically bare.

The Southern Steel Company has taken hold of the properties purchased from the Georgia Coal and Iron Company, including a 200-ton blast furnace, 51,000 acres of ore and coal lands and more than 300 coke ovens. Rumors have prevailed that the Southern Steel is also considering the purchase of the properties of the Lookout Mountain Iron Company at Battelle, in DeKalb county, between Birmingham and Chattanooga. This property is to be sold by the Federal court next month.

Chicago Oct. 22

Firmness continues to characterize the local iron market. Sales are mainly of medium-sized lots for the second and third quarters of 1907, with a liberal admixture of quick-delivery lots for the last quarter of 1906 and first quarter of the coming year. The market is optimistic in tone.

The feature, however, is the growing scarcity of small lots for quick delivery, and the advance in prices. Steadily, both contract lots and small odd lots are advancing in value. The consumer, seeing no check in the steady demand for large and small lots, is not unlikely soon, to all appearances, to jump to the conclusion that now is the time for him to buy heavily, making a lively closing market for the year.

Southern No. 2 has advanced to \$19@19.50 Birmingham, or \$22.90@23.40 Chicago, for deliveries in the last quarter of 1906, subsequent deliveries on contracts being 50c.@\$1 lower. Northern sells at \$21.50@22, for No. 2, and Northern charcoal is very firm at \$21.50. Sales are confined almost wholly to small foundry lots, with here and there a fairly large order for charcoal or Bessemer iron.

The coke market is strong, with Connelville 72-hour in scant supply at \$6.30 per ton.

Cleveland Oct. 23

Iron Ore—Most of the shippers of ore will have completed the movements on contract with boat companies, by Nov. 15. The Steel Corporation expects to complete its contract shipments Nov. 4. The wild movement after that time will be heavy. On this account some of the shippers of ore, expecting a surplus of boats in that trade on wild rates, during the latter part of the season, are refusing to pay the advance recently declared to 80c., from Duluth to Lake Erie ports. No sales of ore have been made for next year's delivery, but it is expected there will be a general advance in prices.

Pig Iron—Although many of the furnaces in this territory have withdrawn from the market for first-half delivery, and a big majority has withdrawn for first-quarter delivery, it is now found that there are many consumers who have not provided

for their needs for even the remaining months of this year. Orders for first quarter are coming in, and show heavy needs yet to be supplied. The market in consequence is stiffened. Spot-delivery iron is worth \$22@22.50 at the furnace; first-quarter iron is selling at \$20@20.50 in the Valleys, while first-half material is selling at \$19.50 in the Valleys. Southern furnaces are selling at \$18@18.50 Birmingham for No. 2 for spot shipment, and \$16.50@17 for future delivery.

Finished Material—There has been a shortage of heavy steel bars all summer. This has extended to the light bars, and consumers are now paying 1.75@1.80c. at the mill. This compares with the association price of 1.50c. Pittsburg. Bar iron is selling at 1.70c. Pittsburg, a premium of \$2. Forging billets are selling at \$36.75@37.50 delivered. Premiums of \$2 a ton are paid on plates and structural shapes for immediate delivery, since the mills are behind on orders. Sheets are strong, but the price has not been advanced.

New York Oct. 24

Pig Iron—The market has been active for next year deliveries. There has also been some buying for short deliveries. Buyers who want iron now have to shop around and pay what is asked. There have been some re-sales, but it is not easy to get prices. There is still a wide range of prices, the lower quotations given being for second-quarter, 1907, the higher for spot or December. There is strong talk of importing pig iron.

Current quotations for pig iron are for New York or parallel delivery:

Northern:	
No. 1 X foundry.....	\$21.50@23
No. 2 X foundry.....	21@22.50
No. 2 plain.....	20.50@22
Forge pig.....	17.75@19
Southern:	
No. 1 foundry.....	21@22.50
No. 2 foundry.....	20@21.75
No. 3 foundry.....	19.50@21
No. 4 foundry.....	19@20.50
No. 1 soft.....	21.50@23
No. 2 soft.....	21@22.50
Gray forge.....	17.75@19
Basic pig:	
Northern.....	19.50@20
Virginia.....	20@21
Alabama.....	20@20.50

City or local deliveries are not included in prices, which are for large lots, on dock or cars.

Bars—Bars are strong at 1.795c. tide-water, for common iron, while refined has sold for 1.845c. Steel bars are quoted at 1.645@1.745c., according to size and conditions of orders. Store trade is steady at 2.50c. delivered. The Eastern Bar Iron Association met on Thursday and decided to continue the base price of 1.50c. at mill; but all actual business is done at premiums.

Structural Material—More work is coming forward. Several large contracts for local buildings are pending. Beams and channels are quoted at 1.845c., tidewater; deck beams, 1.995c. Beams and channels in smaller quantities are 2.25@2.50c. out of stock.

Rails—Standard rails are unchanged at \$28. Light rails are in good demand. More orders for trolley rails are noted.

Old Material—Prices are high, especially for steel scrap, which is growing scarce. No. 1 railroad wrought is \$20.50@21.50; No. 1 yard wrought, \$19.50@20.50; machinery cast, \$16.50@17; heavy steel melting scrap, \$17@18. Prices are for delivery at wharf or railroad terminal.

Philadelphia Oct. 24

Pig Iron—The crude-iron market continues to be in an excited condition and a large amount of business is reported in all kinds of iron, particular emphasis being placed upon basic pig, which is steadily moving upward. The activity at the bar mills is helping gray forge and rumors prevail of recent advances for early deliveries, which make current quotations look cheap. It is impossible to make any positive statements as to quantities of material handled and prices to be paid, because of the reticence maintained by both buyers and sellers. Quotations may be tentatively given at \$23.50 for No. 1 foundry; \$22.50 for No. 2 X; \$21.50 for No. 2 plain; \$19@19.50 for gray forge; \$20 for basic; higher figures have been paid in a number of instances.

Billets—For ordinary billets \$34 has been paid and more has been offered for special accommodation, and for forging billets quotations are given at \$38 to \$40 with a rising tendency.

Bars—Both iron and steel bars are in active demand and there is another batch of requirements before the mill people this week.

Sheets—An advance in sheets is the next thing on the program. For small lots higher prices are already charged.

Pipes and Tubes—Pipe of all kind is higher and orders are pouring in in view of a still further advance that is practically certain.

Plates—The situation in iron and steel plate is very difficult to describe. The steel-car builders are monopolizing the supply apparently, and are bringing in new requirements almost every week.

Structural Material—For the past few days our people have been receiving a good deal of inquiry from a number of local building enterprises which want small quantities of shapes for structures of ordinary size. Quotations for postponed delivery are strong, and for anything like early delivery premiums seem to be the rule.

Scrap—The more urgent requirements of the larger consumers of scrap have been pretty well taken care of for the present and the scrap dealers are having a breathing spell. Quotations are \$18.50 for No. 1 steel scrap; \$22.50 for choice railroad; \$19 for machinery scrap and \$23 for low-phosphorus scrap, which cannot be had. Old iron rails are nominally \$26 per ton.

Pittsburg Oct. 23

No sales of Northern pig iron of any importance were made during the week as none is available. Some sales of Southern iron are recorded at the highest price ever known in this district. One Pittsburg consumer yesterday contracted for 1500 tons of No. 2 foundry for first quarter delivery at \$17@17.25, Birmingham, and a sale of 1000 tons for second quarter was made at \$16.50. A consumer who needed 100 tons badly was able to buy that tonnage which was on the track, at \$18.50, Birmingham, or \$23.10, Pittsburg. It was being shipped to another customer, but the destination was changed. There is no question as to the unprecedented scarcity of pig iron and with only nine of the 185 blast furnaces using Lake Superior ore idle it is not likely that production will be greatly increased. So far no contracts for second half have been made, but the production of the furnaces up to July 1 has been practically sold. There is a difference of opinion as to prices for the second half.

A feature of the steel market was the sale of sheet-bars by the Republic Iron and Steel Company to independent sheet and tin-plate interests for delivery through the first half at about \$30 a ton. The Republic company will produce about 10,000 tons a month and the bulk of this has already been contracted for. The fact that the Carnegie Steel Company is gradually cutting off its outside steel business is responsible for diverting trade to the Republic company and the Youngstown Sheet and Tube Company. It is believed that after Jan. 1, the Carnegie company will not be a seller of crude steel and will use its entire production in its own finishing mills. No new business of any consequence in finished steel products has been placed this week, but specifications continue large and all the mills are busy except when tied up for want of steel, and the Youngstown Sheet and Tube Company was forced to close its plant for a few days recently because it could not get deliveries on pig iron ordered. The merchant-pipe trade is unusually active and despite the recent advance of \$4 a ton in prices, buying will not be checked, some large inquiries having been received within the past few days. The Pure Oil Pipe Company contemplates building a line from its wells in West Virginia to Philadelphia which will require 285 miles of 6-in. pipe. The National Tube Company, the leading producer, is crowded with orders and is increasing its production as rapidly as possible to take care of new business that is expected to be closed shortly. Premiums are being freely paid for tin-plate and range from 10 to 20c. a box. Other finished products command premiums of \$2 and \$3 a ton for prompt delivery.

Pig Iron—Pig iron producers yesterday announced a price of \$21, Valley furnaces,

for bessemer iron for delivery this month, but declare that it is merely nominal, as they have none to offer. For the first half \$20 is named for both bessemer and basic iron. The only important sales noted this week were 800 tons of low phosphorus, at \$27, Valley, and 500 tons at \$27.50. There is an inquiry for 800 tons which may be closed in a few days. Foundry iron is quoted nominally at \$23 for No. 2 grade, but no sales are recorded. About a week ago two carloads of Northern No. 2 foundry sold at \$25 a ton delivered in Pittsburg. Gray forge has advanced, according to an announcement just made about 8000 tons were sold about two weeks ago at \$18.50, Valley, or \$19.35, Pittsburg.

Steel—Inquiries for billets are being turned down and it seems impossible to buy except occasionally in small lots. The price nominally is \$28@29 for bessemer and \$29@30 for open-hearth. Plates remain at 1.60c. and merchant steel bars at 1.50c. to 1.60c.

Sheets—The demand continues heavy and premiums are paid for prompt shipment. Prices remain at 2.50c. for black sheets and 3.55c. for galvanized for No. 28 gage.

Ferro-Manganese—The market is unchanged and \$77@78 is quoted for 80 per cent. for any delivery this year.

London Oct. 15

Iron and Steel Exports—The exports of iron and steel, and of machinery from Great Britain for the nine months ended Sept. 30, are valued by the Board of Trade returns as below:

	1905.	1906.	Changes.
Iron and Steel...	£23,256,759	£28,755,634	I. £5,498,875
Machinery.....	16,888,904	19,497,196	I. 2,608,292
New ships.....	4,421,533	7,381,681	I. 2,960,148
Total.....	£44,567,196	£55,634,511	I. £11,067,315

The total increase was 24.8 per cent. The chief items of the iron and steel exports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	738,624	1,163,053	I. 424,429
Wrought iron.....	135,495	145,973	I. 10,478
Rails.....	414,677	347,501	D. 67,176
Plates.....	147,445	191,602	I. 44,157
Steel shapes, etc.....	155,574	190,404	I. 34,830
Sheets.....	298,419	323,841	I. 25,422
Tin-plates.....	274,588	272,944	D. 1,644
All other kinds.....	588,379	724,112	I. 135,733

The total increase in quantities was 606,229 tons, or 22 per cent. Exports of pig iron to the United States this year were 175,134 tons, an increase of 39,512 tons; of tin-plates, 41,837 tons, a decrease of 10,025 tons.

Iron and Steel Imports—Imports of iron and steel, and of machinery, into Great Britain for the nine months ended Sept. 30, are valued as follows:

	1905.	1906.	Changes.
Iron and steel...	£6,033,260	£6,565,980	I. £532,720
Machinery.....	3,469,453	3,939,544	I. 470,091
Total.....	£9,502,713	£10,505,524	I. £1,002,811

The total increase was 10.6 per cent. The chief items of the iron and steel imports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	87,552	61,542	D. 26,010
Wrought iron.....	67,022	88,594	I. 16,572
Steel billets, etc.....	414,683	399,668	D. 14,915
Bars and shapes.....	37,724	47,843	I. 10,119
Structural steel.....	87,992	115,830	I. 27,838
All other kinds.....	254,092	266,507	I. 12,415

The total increase in quantities this year was 26,019 tons, or 2.7 per cent.

Iron Ore Imports—Imports of iron ore into Great Britain for the nine months ended Sept. 30 were, in long tons:

	1905.	1906.	Changes.
Manganiferous ores.	216,168	242,929	I. 26,761
Iron ores.....	5,261,062	5,804,384	I. 543,322
Total.....	5,477,230	6,047,313	I. 570,083

Of the imports this year 140,114 tons manganiferous ore and 4,130,998 tons iron ore came from Spain.

Cartagena, Spain Oct. 6

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were three cargoes, 9525 tons manganiferous ore, and two cargoes 4620 tons dry ore, to Great Britain; 14,145 tons in all. The ore market is strong and advancing. Tonnage is scarce and freights higher.

Prices are 8s. 10d.@9s. 1d. per ton for ordinary 50 per cent. ore, 9s. 4d.@9s. 7d. for special low phosphorus; 10s. 9d. for S. P. Campanil; 12s. 1d. for specular ore, 58 per cent. Manganiferous ores range from 12s. 9d. for 35 per cent. iron and 12 manganese up to 15s. for 25 per cent. iron and 17 manganese. All prices are f.o.b. shipping port.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur are 10s. 8d. per ton, f.o.b. shipping port.

Chemicals

NEW YORK, Oct. 23

Copper Sulphate—The market continues to have an upward trend. The supply is weak and the demand is good. Prices continue to go up with the increase in price of metallic copper. We quote \$7 for carload lots, spot delivery; and \$7.25@7.37½ for small lots.

Nitrate of Soda—There are no changes to report. The salt remains in its strong position and is likely to continue so. Spot prices and futures are \$2.60 per 100 lb., showing no change.

British Chemical Trade—Exports of heavy chemicals from Great Britain for the nine months ending Sept. 30 were as follows, in cwt. of 112 lb. each:

	1905.	1906.	Changes.
Bleaching powder....	659,702	729,952	I. 70,250
Muriate of ammonia	68,656	90,191	I. 21,535
Soda ash.....	1,068,333	1,218,883	I. 150,550
Bicarbonate of soda.	324,296	292,532	D. 31,764
Caustic soda.....	1,096,581	1,151,308	I. 54,729
Soda crystals.....	142,318	128,389	D. 13,929
Soda sulphate.....	542,688	719,519	I. 176,831
Sulphuric acid.....	59,215	70,604	I. 11,389

Exports of copper sulphate were 53,810 tons in 1905, and 40,281 tons in 1906; a decrease of 13,529 tons.

Imports of chemicals and raw materials into Great Britain for the nine months were, in long tons:

	1905.	1906.	Changes.
Nitrate of potash.....	6,743	8,265 I.	1,522
Nitrate of soda.....	74,779	87,508 I.	12,729
Phosphates.....	317,569	348,073 I.	30,504
Sulphur.....	15,707	21,073 I.	5,766
Pyrites.....	527,508	564,080 I.	36,572

Estimating sulphur contents of pyrites at the usual figure, the total imports of sulphur were 226,710 tons in 1905, and 246,705 tons in 1906; an increase of 19,995 tons.

Metal Market

New York, Oct. 24.

Gold and Silver Exports and Imports.

At all United States Ports in September and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1906.	\$2,278,922	\$31,419,932	mp \$29,141,010
" 1905.	1,412,904	5,543,692	" 4,130,788
Year 1906..	35,790,962	111,764,911	" 75,973,949
" 1905..	42,677,921	30,339,602	Exp. 12,338,319
Silver:			
Sept. 1906..	3,594,311	3,253,586	" 340,725
" 1905..	5,527,459	3,840,005	" 1,687,454
Year 1906..	45,441,339	31,985,096	" 12,456,243
" 1905..	39,443,210	24,506,998	" 14,936,212

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

Gold and Silver Movement, New York.

For week ending Oct. 20 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 5,470	\$4,433,796	\$ 409,295	\$ 90,205
1906.....	5,972,183	90,441,067	44,005,980	1,785,648
1905.....	32,309,728	10,283,854	28,345,351	3,724,215
1904.....	73,177,464	5,397,077	30,924,362	834,656

Exports of gold for the week were to Cuba; of silver to London. Imports of gold for the week were from Great Britain and Germany; of silver from Central and South America.

The foreign commerce of the United States for the nine months ending Sept. 30 is reported as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1905.	1906.
Exports.....	\$1,102,551,375	\$1,238,277,400
Imports.....	872,272,528	947,935,187
Excess, exports...	\$230,278,847	\$290,342,213
Add excess of exports, silver....	12,456,243	
Total.....	\$302,798,456	\$302,798,456
Deduct excess of imports, gold..		75,973,949
Apparent balance.....	\$226,824,507	

The gold and silver movement in detail will be found in the usual place, at the head of this column.

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending Oct. 20, gives the following totals, comparisons being made with the corresponding week of 1905:

	1905.	1906.
Loans and discounts..	\$1,026,690,100	\$1,082,358,500
Deposits.....	1,023,859,400	1,062,332,600
Circulation.....	54,680,500	46,471,700
Specie.....	193,161,300	200,395,700
Legal tenders.....	75,386,700	71,388,400
Total reserve.....	\$268,548,000	\$271,784,100
Legal requirements....	255,964,850	265,583,150
Surplus reserve.....	\$12,583,150	\$ 6,200,950

Changes for the week this year were increases of \$16,700,700 in loans, \$11,886,600 in deposits and \$316,900 in circula-

tion; decrease of \$2,115,500 in specie, \$1,818,800 in legal tenders and \$6,823,450 in surplus reserve.

The following table shows the specie holding, in dollars, of the leading banks of the world:

	Gold.	Silver.	Total.
New York.....			\$200,395,700
England.....	\$145,875,050		145,875,050
France.....	564,258,525	\$207,690,065	771,948,590
Germany.....	135,355,000	45,120,000	180,475,000
Spain.....	76,520,000	120,890,000	197,410,000
Netherlands...	27,652,000	27,732,000	55,384,000
Belgium.....	16,513,335	8,256,665	24,770,000
Italy.....	149,440,000	18,922,000	168,362,000
Russia.....	558,190,000	24,830,000	583,020,000
Austria.....	233,890,000	58,965,000	292,855,000
Sweden.....	19,385,000		19,385,000

The returns of the associated banks of New York are of date Oct. 20, and the others Oct. 19. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Exports of silver from London to the East are given by Messrs. Pixley & Abell's circular as follows, for the year to Oct. 11:

	1905.	1906.	Changes.
India.....	£ 4,755,221	£ 12,637,763	I. £ 7,882,542
China.....	758,888	430,700	D. 327,988
Straits.....	38,299	1,750	D. 36,549
Total.....	£ 5,552,208	£ 13,070,213	I. £ 7,518,005

Imports for the week were £135,000 from New York and £5000 from Bombay, a total of £140,000. Exports were £159,200 to India.

Indian Exchange is slightly weaker, owing to the good supply of money in that country. The Council bills offered in London were taken at an average of 16.03d. per rupee. Silver buying for Indian account continues at a fair rate.

The movement of gold and silver in Great Britain for the nine months ending Sept. 30 is reported as below:

	1905.	1906.
Gold:		
Imports.....	£29,744,792	£33,115,117
Exports.....	22,552,733	28,352,304
Excess, imports.....	£7,192,059	£ 4,762,813
Silver:		
Imports.....	£ 9,784,853	£14,412,499
Exports.....	10,648,137	15,157,178
Excess, exports.....	£ 863,284	£ 744,679

Of the silver imports this year, £12,322,062, or 85.5 per cent. of the total, were from the United States. Gold exports to the United States were £727,000 in 1905, and £11,940,654 this year.

SILVER AND STERLING EXCHANGE.

Oct.	Sterling Exchange.	Silver.		Oct.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
18	4.84	70	32½	22	4.85½	70½	32½
19	4.84½	69½	32½	23	4.85½	70½	32½
20	4.85	70	32½	24	4.86	70½	32½

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

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.54	\$0.55
Peruvian soles and Chilean.....	0.49½	0.50½
Victoria sovereigns.....	4.85½	4.87½
Twenty francs.....	3.87	3.91
Spanish 25 pesetas.....	4.78	4.80

Other Metals

Daily Prices of Metals in New York.

October.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			Cts. per lb.	New York, Cts. per lb.
22	21½	21½	99½	43½	5.75	6.25	6.10
18 @22½	@22	@22	99½	43½	5.75	@6.30	@6.15
22	21½	21½	99½	43½	5.75	6.25	6.10
19 @22½	@22	@22	99½	43½	5.75	@6.30	@6.15
20	22	21½	.....	43½	5.75	6.25	6.10
@22½	@22	@22	.....	43½	5.75	@6.30	@6.15
22	22	21½	99½	43½	5.75	6.25	6.10
@22½	@22	@22	99½	43½	5.75	@6.30	@6.15
23	22	21½	100½	43½	5.75	6.25	6.10
@22½	@22	@22	100½	43½	5.75	@6.30	@6.15
24	22	21½	98½	43½	5.75	6.25	6.10
@22½	@22	@22	98½	43½	5.75	@6.30	@6.15

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

Copper—A much quieter feeling has taken the place of the activity of the last few weeks. Consumers have covered their urgent wants and are inclined to await developments. As a result, there has been practically no business and the market is more or less nominal. Quotations at the close are steady at 22@22½ for Lake copper, 21½@22c. for electrolytic in ingots, cakes and wirebars, while 21@21¼ represents the average at which business in casting, ordinary grades, was done during the past week.

The bull operators in the London market have carried their point and after the shorts had been run in the market broke sharply. It closes weak at £98 2s. 6d. for both spot and three months.

Refined and manufactured sorts we quote: English tough, £100@101; best selected, £103@104; strong sheets, £107@108.

Imports of copper and copper material into Great Britain, with exports of copper, were as follows for the nine months ending Sept. 30; the total imports given being the copper contents of all material:

	1905.	1906.	Changes.
Copper ore.....	72,878	71,475	D. 1,403
Matte and precipitate..	50,888	55,139	I. 4,251
Fine copper.....	53,477	54,811	I. 1,334
Total copper.....	86,209	89,529	I. 3,320
Re-exports.....	9,715	11,563	I. 1,848
Exports.....	36,652	31,366	D. 5,286
Total exports.....	46,367	42,929	D. 3,438
Balance, imports.....	39,842	46,600	I. 6,758

Of the imports the United States furnished 3698 tons matte and 23,279 tons fine copper in 1905; 4589 tons matte and 19,367 tons copper in 1906; showing this year an increase of 891 tons matte, but a decrease of 3912 tons fine copper. The largest imports of matte and precipitate were from Spain, 14,781 tons in 1905 and 15,869 tons in 1906. Imports of fine copper from Chile decreased from 12,977 tons in 1905 to 7799 tons in 1906; but those from Australia increased from 7134 to 7418 tons.

Exports of copper for the week from New York were 2840 long tons. Our special correspondent reports the exports from Baltimore for the week at 370 long tons of fine copper.

Copper Sheets—On Oct. 11 the manufacturers of sheet copper again advanced their prices 2c. per lb., bringing the base price up to 27c. per lb.

Tin—Prices in London have been fairly well maintained throughout the week, but at the close a weaker tone has made itself felt, and the quotations are cabled at £198 for both spot and three months.

The character of the domestic market has not changed in the least, and business is doing at 43@43½, depending upon deliveries.

Imports and exports of tin in Great Britain for the nine months ending Sept. 30 were, in long tons:

	1905.	1906.	Changes.
Straits.....	24,236	26,872	I. 2,636
Australia.....	2,922	3,418	I. 496
Other Countries...	1,775	2,394	I. 619
Total imports..	28,933	32,684	I. 3,751
Re-exports.....	22,070	24,661	I. 2,591
Exports.....	5,820	6,226	I. 406
Total exports....	27,890	30,887	I. 2,997
Balance.....	1,043	1,797	I. 754

The re-exports are largely of Straits tin to the United States.

Lead—The market is unchanged at 5.75 New York.

The London market has fluctuated nervously throughout the week, but the close is steady at £19 10s. for Spanish lead, £19 12s. 6d. for English lead.

Imports and exports of lead in Great Britain for the nine months ending Sept. 30 were as below, in long tons:

	1905.	1906.	Changes.
United States.....	19,887	14,292	D. 5,595
Spain.....	77,152	84,326	I. 7,174
Australia.....	56,140	39,444	D. 16,696
Germany.....	12,874	13,277	I. 403
Other countries.....	2,613	4,627	I. 2,014
Total imports.....	168,666	155,966	D. 12,700
Exports.....	31,998	34,194	I. 2,196
Balance, imports.....	136,668	121,772	D. 14,896

The lead credited to the United States is chiefly Mexican lead, refined here in bond. There was a considerable decline in these imports; also in Australian lead.

St. Louis Lead Market—The John Wahl Commission Company telegraphs as follows, on Oct. 24: Lead is strong, but quiet. Missouri brands are selling from

5.87½ to 6c., according to brand and delivery.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Oct. 6, that the price of pig lead is 86.50 reales per quintal, silver being paid for at 14 reales per ounce. Exchange is 27.80 pesetas to £1. The price of lead, on current exchange, is equal to £17 8s. 4d. per long ton, f.o.b. Cartagena. Shipments were 154 tons argentiferous lead to Marseilles.

Spelter—A steady demand is taking care of supplies as fast as they are being put on the market, and a good business is doing at 6.10@6.15 St. Louis, 6.25@6.30 New York.

The London market is very strong, owing to an increased demand from all sides, both in England and on the Continent. The close is higher at £28 15s. for good ordinaries, £29 for specials.

Imports and exports of spelter in Great Britain for the nine months ending Sept. 30 were, in long tons:

	1905.	1906.	Changes.
Spelter.....	63,149	66,678	I. 3,529
Zinc sheets, etc.....	15,408	14,053	D. 1,355
Total imports.....	78,557	80,731	I. 2,174
Exports.....	6,179	5,779	D. 400
Balance, imports..	72,378	74,952	I. 2,574

Imports of zinc ores are not reported.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Oct. 6, that the market remains quiet. Shipments for the week were 1200 tons blende to Antwerp, 1900 tons blende to Stettin and 536 tons calamine to Hamburg; 3636 tons in all.

Zinc Sheets—The price of zinc sheets is \$7.75 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at LaSalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in. both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since Jan. 1, 1906, have been small, the highest price having been \$8 on Jan. 6, the lowest \$7.65 on May 18.

Antimony—The market remains firm, with demand good and supply limited. Ordinary brands bring 24¼@24½, while 25@25½c. is asked and obtained for imported grades.

Nickel—Quotations for large lots, New York or other parallel delivery, as made by the chief producer, are 45@50c. per lb. for large orders, according to size of order and terms. For small lots, 50@65c. is charged.

Platinum—The price continues \$33 per oz. unmanufactured, while \$25@27 is paid for scrap metal.

Quicksilver—The metal is firm and New York prices are still \$41 per flask of 75 lb. for lots of 100 flasks or over, and \$42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to about \$43 per flask. San Francisco prices are firm at \$39.50 for domestic orders and \$38 for export. The London price is £7 per flask, while jobbers are asking £16 18s. 9d.

Imports of quicksilver into Great Britain for the nine months ending Sept. 30 were 2,534,106 lb. in 1905, and 2,822,701 lb. in 1906; an increase of 288,595 lb. Re-exports of imported metal were 1,291,267 lb. in 1905, and 1,538,858 lb. in 1906; an increase of 247,591 lb. this year.

Aluminum—The chief producer gives list prices for ton lots and over as follows: No. 1, over 99 per cent. pure, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are from 1 to 3c. higher. Granulated metal is 2c. per lb. over price of ingots; rods, 1c. per lb. over ingots. Rolled sheets are 45c. per lb. up, according to size.

Wisconsin Ore Market

PLATTEVILLE, Oct. 20

The selling conditions of the Wisconsin zinc-ore market were not characterized by anything unusual this week; although a few of the buyers showed a disposition to cut the price of ore a little, the majority of the producers report the same price as last week. Quite a bit of ore is piling up at several places throughout the district. The prices of ore generally show a slightly better condition than that existing in the Joplin district. There is a ready market for the ore; nearly all of the regular ore buyers have certain mines, but if it should happen that a buyer is filled up, there is always one of the others ready to take the ore. It is reported that the Platte is under a limited contract to dispose of its ore at a satisfactory price without roasting.

Good clean lead is bringing \$40 per thousand. It is claimed by the principal buyer that the lead of the northern part of the district is usually cleaned better than that of the southern part.

The camps of the Platteville district loaded ore as follows for the week ending Oct. 20:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville.....	189,570	.....	.....
Buncombe & Hazel Green	183,800	60,000	.....
Cuba City.....	148,450	.....	.....
Benton.....	112,800	.....	.....
Galena.....	83,000	35,000	.....
Rewey.....	66,000	.....	.....
Livingston.....	40,000	.....	.....
Total for week.....	823,620	95,000	.....
Year to Oct. 20..	61,124,161	2,927,590	3,453,910

Owing to an accident to the wires the report of ore loaded at the northern camps was not received in time to forward today; thus the reported tonnage appears to be small.

Missouri Ore Market

JOPLIN, Oct. 20

The highest offering of the week is reported at \$47, but the highest selling price was \$46, the former price having been offered after the ore had been sold. The assay basis price was stronger, with quotations from \$41 to \$44 per ton of 60 per cent. zinc. The average price was \$41.46.

The highest price paid for lead was \$84.50 per ton, with medium grades selling at \$80@83, and the average price \$80.12.

Zinc-market conditions were very commonplace up to Thursday night, but on Friday some heavy buying was done for next week's delivery on an advance of the assay basis price. However, there is little, if any, real advance in price, as all smelters have united on purchasing on an absolute dry product; heretofore the deduction for moisture has been 2 per cent., no matter what the condition of the ore. By the dry method there will be a saving of 1 to 3 per cent. in weight, or 75c. to \$2.50 per ton, in price to the smelters.

Following are the shipments of zinc and lead from the various camps for the week ending Oct. 20:

	Zinc, lb.	Lead, lb.	Value.
Joplin.....	2,857,040	306,820	\$ 73,699
Webb City-Carterville.	2,244,920	540,160	68,749
Alba.....	1,143,320	.....	25,724
Galena-Empire.....	962,690	114,240	24,203
Neck City.....	455,190	.....	10,240
Oronogo.....	388,720	39,200	9,790
Duenweg.....	167,650	147,980	9,226
Aurora.....	491,410	22,940	8,853
Granby.....	400,000	40,000	7,800
Spurgeon.....	350,690	42,840	7,453
Prosperity.....	134,180	84,220	6,185
Sherwood.....	159,900	34,010	4,797
Badger.....	120,710	3,950	2,814
Totals.....	9,861,220	1,376,360	\$259,633

42 weeks..... 444,040,670 62,836,030 \$12,006,409
 Zinc value, the week, \$204,488; 42 weeks, \$9,591,707.
 Lead value, the week, 55,145; 42 weeks, 2,414,702.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc.

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January...	52.00	47.38	January....	61.50	75.20
February...	52.77	47.37	February...	57.62	72.83
March.....	47.40	42.68	March.....	57.20	73.73
April.....	42.88	44.63	April.....	58.00	75.13
May.....	43.31	40.61	May.....	58.27	78.40
June.....	40.75	43.83	June.....	57.80	80.96
July.....	43.00	43.25	July.....	58.00	74.31
August....	48.83	43.56	August....	58.00	75.36
September.	46.75	42.58	September.	63.50	79.64
October...	47.60	.....	October....	63.86	.....
November..	49.55	.....	November..	68.67	.....
December..	49.00	.....	December..	76.25	.....

Mining Stocks

NEW YORK, Oct. 24

The market had a good upward tendency during the early part of the week and trading was active among the mining and allied stocks. On Thursday, the directors of Amalgamated declared a divi-

dend of 2 per cent. instead of 1 3/4 per cent., and the stock sold up to \$117 3/4, but was later beaten down, closing at \$116 3/8. Everything pointed to a good bull movement when, out of a clear sky, came the reports, on Friday morning that the Bank of England had raised its discount rate from 5 to 6 per cent. Thereupon there was a scramble to sell, on the prospect of a cessation of gold imports and consequent dear money.

Amalgamated broke to \$111 1/2, American Smelting to \$153. Federal Mining and Smelting held strong, gaining \$10 over the previous week; this was the only appreciable gain recorded. U. S. Steel opened at \$48 7/8, sold down to \$46 and closed at \$47 3/8.

Later in the week the market stiffened and prices recovered somewhat. Closing prices were as follows: Amalgamated, \$114 1/2; American Smelting common, \$156, and preferred \$117 1/4; Colorado Fuel and Iron, \$53; National Lead, \$76; Republic Iron and Steel, \$36 1/4; U. S. Steel preferred, \$106 1/2. On the curb, the same activity prevailed. The coppers lost quite heavily, averaging from \$1.50 to \$2.50.

British Columbia sold off to \$12 5/8, closing at \$13 1/2; Butte Coalition closed at \$37 after selling at \$35 1/2; Cumberland Ely sold down from \$14 3/8 to \$11 3/4, and closed at \$12 3/4. Nipissing sold high at \$25 3/4, but on the break went to \$21 5/8, recovering later and closing at \$25 3/8 per share.

On the Exchange 89 shares of Homestake sold at \$100, an increase of \$13 over the last sale recorded. The close on both the Exchange and curb was fairly strong.

Boston Oct. 23

Copper-mining shares had quite a sharp setback, making their lowest prices Saturday, in sympathy with the slump in the New York market. It is considered that the reaction was needed, and as a result, the situation is much improved. Prices are recovering, but in most cases they are off from those of a week back. Old Dominion has again been the most conspicuous stock. After advancing \$1.62 1/2 to \$61.12 1/2, it fell back to \$55.87 1/2, but today it rose sharply to \$63.50, and held this price at the close, which is its record. Some disappointment was manifest that at the recent directors' meeting no action was taken relative to a stock issue, and the immediate payment of dividends. The interests in this city were known to be favorable to such action. The sudden spurt in the stock today from \$58.75 to \$63.50 was due to the fact that a big strike of sulphide ore is reported on the 13th level.

Shannon has again been active and firm. After touching \$13.75 Friday, it advanced to \$15.75 today, which is fractionally above a week back. The directors meet in New York this week, and it is

now anticipated that dividend payments will be started. The annual meeting occurs Nov. 21. Amalgamated touched \$111.62 1/2 Saturday, but is back to \$114.62 1/2 today.

Butte Coalition has been particularly weak, breaking from \$40 to \$35.87 1/2, with the close \$37.25 tonight. North Butte, after sliding off \$3.75 to \$110, recovered to \$112 today. Mohawk touched \$69, Michigan \$18.25. Utah Consolidated fell \$3.25 to \$65, but is back to \$67.25. Isle Royale on heavy trading sold up \$2.50 to \$25, but fell back to \$22.50 again, with recovery to \$25.25 today. With the issue of additional United States Mining and Smelting stock the company will undoubtedly commence the payment of dividends on the common stock.

Curb stocks moved in sympathy with the Stock Exchange market. Superior & Pittsburg is off \$2.87 1/2 to \$25 on free profit taking, and Nipissing fell from \$25.50 to \$22.25, with recovery to \$25.75 today. It is likely that early application will be made to list this company's 1,200,000 shares on the Stock Exchange. Mexico Consolidated rose sharply to \$13.75 today on the curb, and Arizona Commercial closed at \$40 today.

Colorado Springs Oct. 19

The local mining exchange has been unusually active, and the Cripple Creek mines list has held strong and with a tendency to higher prices, in several instances. The Portland mill near this city has decided to change the method of treatment from chlorination to the cyanide process, and will spend about \$50,000 on the change.

The production of the Cripple Creek district for three-quarters of the year amounts to \$14,118,975 in all.

San Francisco Oct. 18

The spurt in the Comstock shares last week was quite noticeable, but it seems to have passed over. Today they are rather dull, with a general softening of prices.

Interest centers in the southern Nevada stocks, though trading has not been quite so active as it was last week. The chief interest was in Tonopahs and Goldfields, the Bullfrog and Manhattan shares being quieter.

The relative degree of interest is shown by the fact that the San Francisco papers now publish daily one or two columns of Nevada mining news, but only once a week do they have a few paragraphs about California mines. The reason for this is that many of the Nevada mines are listed on the stock boards and these stocks are dealt in by the public, while few if any of the California mines are the subject of mining-stock speculations.

Oil stocks continue quiet, and dealings in them are light.

STOCK QUOTATIONS

NEW YORK. Week Oct. 20. Table with columns: Name of Company, High, Low, Clg., Sales. Includes Amalgamated, Anaconda, British Col. Copper, etc.

NEW YORK INDUSTRIALS. Table with columns: Name of Company, High, Low, Clg., Sales. Includes Am. Smelting & Ref., Am. Smelt. & Ref., Pl., Bethlehem Steel, etc.

BOSTON. Oct. 20. Table with columns: Name of Company, High, Low, Clg., Sales. Includes Adventure, Allouez, Atlantic, Bingham, Boston Consolidated, etc.

*Ex. Div. †Ex. Rights.

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Am. Agri. Chem., 20 1/2-26; Comstock, 20; Davis-Daly Est., 13 1/2-12 1/2; Gold Hill, 4 7/8-4 1/2; Gugg. Exp., 3 1/2; Rich. Eureka, 8 1/2-8 1/4; Standard Oil, 50c-59 1/2; (Boston) Ahmeek, 1 1/2-1 1/4; Am. Zinc, 12 1/2-12; Arcadian, 6 1/2-5 1/2; Ariz. Com'l, 3 1/2-3 1/4; Black Mt., 10-9; Cananea, 26-23 1/2; East Butte, 11 1/2; Keweenaw, 12-11; Majestic, 3 1/2-2 1/2; Raven, 87-80; Shawmut, 1 1/4; Superior Cop., 17-18; Superior & Pitts., 27 1/2-25 1/2; Troy, 3-2 1/2.

PHILADELPHIA. Oct. 20. Table with columns: Name of Company, High, Low, Clg., Sales. Includes American Cement, Cambria Steel, General Asphalt, etc.

PITTSBURGH. Oct. 20. Table with columns: Name of Company, High, Low, Clg., Sales. Includes Crucible Steel, Crucible Steel, Pf., Harbison-Walker Ref., etc.

COLORADO SPRINGS. Oct. 20.

Table with columns: Name of Company, High, Low, Clg., Sales. Includes Acacia, C. C. Con., Dante, Doctor Jack Pot., etc.

SAN FRANCISCO. Oct. 17.

Table with columns: Name of Company, High, Low, Clg., Sales. Includes Best & Belcher, Caledonia, Chollar, Con. Cal. & Va., etc.

Tonopah Stocks Oct. 24.

Table with columns: Name of Company, High, Low, Last. Includes Tonopah Mine of Nevada, Tonopah Montana, etc.

St. Louis Oct. 20.

Adams, \$0.40 - \$0.25; American Nettle, \$0.08-\$0.06; Center Creek, \$2.50-\$2.25; Central Coal and Coke, \$64.50-\$62.75; Central Coal and Coke, pfd., \$80.00-\$79.00; Central Oil, \$60.00-\$55.00; Columbia, \$1.00-\$0.90; Con. Coal, \$22.00-\$20.50; Doe Run, \$130.00-\$125.00; Granite Bimetallic, \$0.22-\$0.20; St. Joe, \$13.00-\$12.00.

LONDON. (By Cable.) Oct. 24

Dolores, £1 13s. 6d.; Stratton's Independence, £0 3s. 6d.; Camp Bird, £1 7s. 6d.; Esperanza, £3 5s. 0d.; Tomboy, £1 8s. 9d.; El Oro, £1 7s. 6d.; Oroville, £1 1s. 0d.; Somera, £0 6s. 3d.; Utah, Apex, £1 12s. 6d.; Ariz. Copper, pref., £3 15s. 0d.; Ariz. Copper, def., £3 12s. 3d.

New Dividends

Table with columns: Company, Payable, Rate, Amt. Includes Amalgamated Copper, Bethlehem Steel, Consolidation Coal, etc.

Assessments

Table with columns: Company, Delinq., Sale, Amt. Includes Alpha Con., Nev., Confidence, Nev., Con. California & Va., etc.

Monthly Average Prices of Metals

SILVER. Table with columns: Month, New York, London. Includes January, February, March, April, May, June, July, August, September, October, November, December, Year.

The New York prices are in cents per fine ounces; the London quotation is in pence per standard ounce, 0.925 fine.

COPPER.

Table with columns: Month, New York, London. Includes Electrolytic, Lake. Includes Jan., Feb., March, April, May, June, July, August, September, October, November, December, Year.

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2240 lb., standard copper.

TIN IN NEW YORK.

Table with columns: Month, 1905, 1906. Includes Jan., Feb., March, April, May, June, Av. year.

Prices are in cents per pound.

LEAD IN NEW YORK.

Table with columns: Month, 1905, 1906. Includes Jan., Feb., March, April, May, June, Av. year.

Prices are in cents per pound. The London average for January, 1906, was £16,850 per long ton; February, £16,031; March, £15,922; April, £16,959; May, £16,725; June, £16,813; July, £16,525; August, £17,109; September, £18,266.

SPELTER.

Table with columns: Month, New York, St. Louis, London. Includes Jan., Feb., Mar., April, May, June, July, August, September, October, November, December, Year.

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2240 lb.) good ordinary brands.