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The Cactus Club at the Newhouse Mines, Utah

A Coöperative Organization, Controlled by the Mine Employees,
Which Has Proved to be a Success Both Socially and Financially

BY LAFAYETTE HANCHETT*

The Newhouse Mines and Smelters, owning the Cactus mine and concentrating mill at Newhouse, Utah, in equipping the property, planned to control absolutely the townsite, which was upon the company's land. No lots were sold, and every house erected in the town is owned by the company. This resulted in shutting out from the town saloons and low dives, so usual to mining-camp life. With the realization that intoxicating liquors would find an entrance through devious channels, the experiment of handling this problem by means of an incorporated club, controlled by employees, was made. There was also a desire on the part of the company to

supplies upon credit, payment being guaranteed by the mining company.

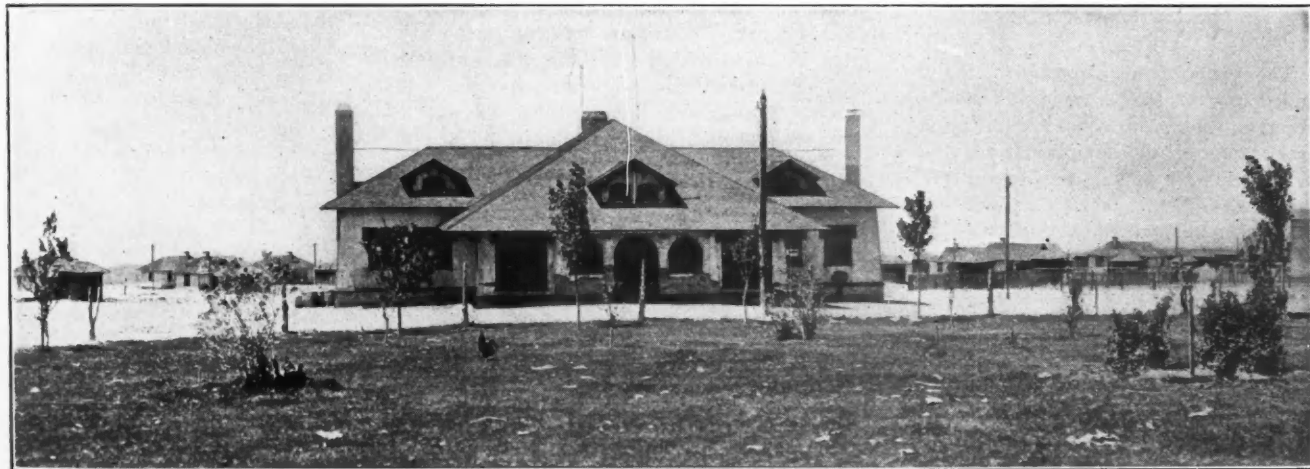
ORGANIZATION AND EQUIPMENT

The organization followed lines similar to those adopted by city clubs. An initiation fee of 50c. and monthly dues of 25c. were charged. The directors instituted a policy of selling best grades of liquors and cigars at about two-thirds the price usually charged in saloons. The club employees were instructed to discourage and prevent excessive drinking. The club was open from 10 a.m. to 10 p.m. to members only. The first requisite for membership was that the applicant be an employee of

directors erecting a small theater for the better handling of public entertainments and dances. At this time the miners' boarding-houses afforded the sole and somewhat unsuitable means of accommodating the theatrical companies; therefore, the club directors decided to erect a small hotel, which was to be conducted in a superior style and to be completed at the same time as the theater building. Both buildings were put in use early in 1908, and served to improve materially the social life of the town.

FINANCIAL SUCCESS

Beyond its charge for monthly rental



HOME OF THE CACTUS CLUB, NEWHOUSE, UTAH

provide pleasant surroundings in which men could spend their idle hours.

On May 27, 1905, the Cactus Club was incorporated, naming as directors nine employees of the company. An attractive and commodious club building of one story and basement was erected. The main floor was divided into general reception room, reading room, billiard room and bar room. This was furnished with one billiard table, one pool table, card tables, reading tables, book cases, lounge, and a plentiful assortment of easy and comfortable chairs. A small bar with usual fixtures was included.

A few days later the club was opened to its members, having obtained its first

the mining company, his election or rejection resting solely with the directors.

From its inception the club has been a success. An average membership of 250 has prevailed, out of 400 employees. Investment was made in a pianola piano, an Edison talking machine and a supply of books. A barber shop was fitted up. The magazine and newspaper list was increased extensively. A ladies' day was established each Wednesday, with dancing as a feature of the evening.

The excessive use of intoxicants, formerly apparent in many individual cases on pay days, almost disappeared, because of the restrictions imposed by the club directors.

As the club prospered it accumulated a considerable fund, which resulted in the

for use of the club building, the mining company refrains from any connection or interference with the affairs of the club. All powers are vested solely in its nine directors. In the three and one-half years of its existence, from a start with no funds and with a stock of goods bought entirely upon credit, it has reached a point where its property, fully paid for, including theater and hotel building, furniture, fixtures and stock of merchandise, shows an inventory value of \$16,131.75. In addition, it has cash in treasury amounting to \$2500. Its directors are now considering carrying their coöperative plans into broader channels by instituting a club general store, for the purpose of furnishing members and their families all commodities directly at cost.

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The financial result obtained by the club tells more clearly than any other argument can of its success, to which must be added the fact that the company has been greatly benefited by the excellent regulation of the liquor traffic and the consequent freedom from petty disturbances usual to pay days in mining camps as a result of excessive drinking by a portion of the employees.

The volume of business is reflected by the secretary's report for the year 1907, showing: Gross receipts, \$24,205.30; expenses, \$15,351.51; gain, \$8,853.79. The profit on money spent in mining camps for liquor usually accrues to a few. In this instance all profit arising therefrom is used for the benefit of the entire community. The club's financial success is eloquent of its material welfare, but the great purpose of its creation is the insurance that the mining camp may be clean, and it is an instrument in the hands of the employees, whereby they preserve a moral and social excellence in the community.

Consolidated Goldfields of South Africa, Ltd.

SPECIAL CORRESPONDENCE

The report of this company for the year ended June 30, 1908, contains, as in former years, interesting information on the general position of the mining industry of the Witwatersrand, and its publication is, for this reason, looked forward to by a wider circle than the actual shareholders. Both of the joint managers, R. G. Fricker and F. D. P. Chaplin, have a knowledge of the Rand extending over many years, and their views on the industrial and political situation deserve attention. Drummond Chaplin, in particular, on account of his being a member of the Transvaal legislative assembly, is able to speak with special authority on the influence of recent legislation on the progress of the mining industry. It is satisfactory to find that these gentlemen raise no complaint against the Transvaal government. The new gold law, it is true, is not entirely to their liking, but they report that it is a measure which "is undoubtedly capable of being administered in a manner in no way prejudicial to the rights of property holders and investors." It is also satisfactory to find that, on account of the flourishing condition of the finances of the colony, there appears to be no danger of any increase in the profits tax. All parties are alive to the fact that the prosperity of the colony is at present wholly dependent on the prosperity of the mining industry, and while this is so, the miner can count on sympathetic treatment from the government.

The managers refer to the extraordinary reduction in working costs and the

consequent increase in profits that have taken place during the year under review, and the three following months, their report being dated Sept. 28. The causes of the reduction in costs are not expressly explained, but it is evident from the report that the increased scale of operations has a good deal to do with it. Attention is called to the necessity of watching the profits as well as the working costs, and the managers state that they are satisfied that the returns made by the mines under the control of the company are fair and legitimate. During the last six months the Goldfields mines show costs of 52c. per ton less than the average of the Rand, due, no doubt, largely to the fact that the group controls some of the larger mines, such as the Simmer & Jack, the Knights Deep and the Robinson Deep. The improvement made since last year is the more remarkable when one remembers that in some of the mines there has been a transition from Chinese to Kafir labor, owing to the expatriation of the Chinese.

Not less interesting than the report of the managers is that of the superintending engineer, Leslie Simson. In his report the reduction in costs is more fully explained. It is chiefly due, in his opinion, to the marked improvement in the efficiency of both white and colored laborer in underground work. In support of this statement he says that in the three principal producing mines under his direction the average tonnage mined per skilled white man underground during August, 1908 was 356.7 tons and per colored laborer 27.3 tons; while for the corresponding month in 1907 the figures were 245.2 tons and 22.7 tons respectively.

Economy is also obtained in the consumption of stores, as the efficiency of the underground labor increases. The greatest savings have been made in the mine, but there has also been a reduction of costs on the surface. While there is not so much room for improvement in the reduction works, it is pointed out that small economies, when the scale of operations is large, run into big figures in the aggregate, and that a penny a ton saved on the ore at present being milled by the producing mines of the Goldfields Company amounts to about £13,000 per annum. The total cost of ore treatment—including surface transport, breaking, sorting, stamp-milling, tube-milling and cyaniding—in most of the Goldfields companies is under the value of 1 dwt. of gold.

The reduction in costs is further largely explained by the statement that a new standard for the daily task has been set up. Instead of a 3-ft. hole a 4-ft. hole has been fixed as the standard task for hammer boys, both in stoping and development; and in the case of machine drills an 8-ft. instead of a 6-ft. hole.

As regards mechanical and metallurgical improvements, Mr. Simson reports that a compressed-air system of hoisting un-

derground has been installed by H. C. Behr, the consulting mechanical engineer of the company at the Simmer Deep. The system consists in the operation of a hoisting engine by means of air delivered from a specially designed compressor at a very high pressure; the exhaust from this engine being delivered into the air-drill main for the operation of the rock drills. The employment of heavier stamps has effected a large initial economy in battery construction and likewise a reduction in operating cost, owing to the smaller number of units requiring attention and maintenance. The electrical driving of stamp batteries also meets with Mr. Simson's approval, this being the system adopted at the new Simmer Deep—Jupiter joint plant. In metallurgical work a new plan designed by W. A. Caldecott for increasing the capacity of sand plants has been experimented on with promising results. This method is to be adopted for regular operations.

The Rhodesian properties in which the Goldfields company is interested are reported on by H. A. Piper, consulting engineer. The Giant is now the most promising mine belonging to this group. During the year ended June, 1908, the profits earned with a 15-stamp mill and one tube mill amounted to £70,650. The orebody has recently widened out considerably, and the future of the mine looks promising. Operations have been put back owing to the caving of the main shaft, which has had to be abandoned.

The directors' report refers to investments in other countries besides South Africa, but no detailed information is given. The net profit for the year amounted to £662,799, largely derived from dividends, the company holding 1,600,176 shares in the Simmer & Jack mine, capital, £3,000,000, dividend and bonus for the year, 20 per cent.; 293,361 shares in the Knights Deep, capital, £643,526, dividend, 25 per cent., and 431,985 shares in the Robinson Deep, capital, £980,000, dividend, 35 per cent. After paying the dividend on the preference shares and French Government taxes, and writing off £200,526 for depreciation of securities, there is a balance of £468,260, out of which it is proposed to pay a dividend of 20 per cent. on Goldfields ordinary shares involving £400,000, and to carry forward £68,260 to this year's accounts.

West African Gold Mines

The West African Chamber of Mines reports the gold output of Ashanti and the Gold Coast in October at 23,781 oz. bullion, being 1342 oz. less than in September. For the 10 months ended Oct. 31 the total production was 243,693 oz. bullion in 1907, and 248,305 oz. in 1908; an increase of 4612 oz. The bullion reported this year was equal to \$4,817,349, or 233,060 oz. fine gold.

Ore Occurrence at Fortuna Mine, Bingham

The Shattered Quartzite in Close Proximity to the Veins Often Shows Sufficient Mineralization to be Classed as a Low-grade Copper Ore

BY EDWARD R. ZALINSKI*

Bingham is attracting attention on account of its large deposits of copper-bearing porphyry. Within the last year it has been shown that quartzite in various parts of the camp is also impregnated with copper sulphides and can be worked at a profit. The quartzite footwall of a vein in the Ohio Copper Company's property is impregnated and yields good milling ore. A similar occurrence is found in the Fortuna mine. It is intended to describe this latter occurrence and also to give a brief description of the other orebodies in the mine.

The Fortuna mine is situated in Keystone gulch on the eastern slope of the Oquirrh range at an altitude of 6500 ft. The mine buildings lie half way down the gulch at a point where the steep drop from the main ridge changes into a gradual slope to Salt Lake valley. The sides

rounded. Keystone gulch exposes a series of sedimentary rocks. Quartzite is the principal country rock and contains interbedded limestone. The extent of the latter is not great, and so far has proved of little economic interest. Porphyry sills and dikes are intruded into the sediments, being probably contemporaneous with the main monzonite stock of Bingham. These intrusive bodies vary from a few feet up to 70 or 80 ft. in thickness, and are mostly in the form of sills. They are genetically connected with the ores, and in some cases the mineral-bearing solutions have risen along their contacts.

The most prominent of these intrusives is the Fortuna sill, about 70 ft. thick, which forms the hanging wall of a number of important orebodies. It can be traced westerly across Fortuna ground to the Bingham cañon divide and across

porphyry occur on or near the Fortuna property. An irregular intrusive stock connecting with the main porphyry at upper Bingham covers the southwest portion of the claims. The pass to Bingham looking west toward the porphyry stock is shown in one of the illustrations.

THE VEIN SYSTEM

The ore occurs in a system of nearly parallel veins. These are well defined, and follow the strike and dip of the quartzite bedding, though in some places they cut across it. The vein formation appears to have been accompanied by more or less fracturing and crushing. This is especially noticeable in the footwall of the Mayflower vein. Movement has occurred at successive periods and is known to have taken place during and after ore deposition.



THE FORTUNA MINE, SHOWING MAIN ADIT ENTRANCES

of the gulch are still steep here as it is about three-quarters of a mile farther down to where the gulch merges among the rolling foothills of the range. An accompanying photograph shows the Fortuna mill and buildings, as well as the dump from the main working levels.

The ground covered by the property takes in the summit of two ridges and includes the area between Keystone and Dalton and Lark gulches. On the west it extends to the summit of the main ridge above Bingham cañon. An accompanying illustration looking north across Dalton and Lark gulch shows the topography on the Fortuna claims. Six veins outcrop on the hillslope and dip into the hill. The Dalton and Lark mine and Salt Lake valley are shown on the right.

GEOLOGY

The surface of the Fortuna property is

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Ohio Copper Company's ground into the property of the Utah Copper Company where it joins the main Bingham eruptive. An accompanying illustration taken from the Fortuna claims shows the topography of Bingham with the great mineralized porphyry stock in the center. Across the cañon in the foreground is shown part of the Boston Consolidated and Utah Copper steam-shovel workings.

Another porphyry sill occurs in the quartzite to the north and west of the Fortuna sill. It can be followed from the bottom of Keystone gulch southwesterly, and is in a general way parallel to the Fortuna sill. This intrusive is the one on which the Congor, Illinois and Blaine tunnels have been driven. Northwest of the Congor sill is a third porphyry sill which outcrops about 20 ft. wide near the northwest corner of the Youcan claim. It can be traced southerly across Keystone gulch and is exposed in workings on the south slope. Two other bodies of

Six veins apex on Fortuna ground. The Abe Lincoln vein is the farthest north. About 600 ft. south of this is the Winnebago vein which outcrops below the Congor porphyry. This quartzite is fractured and iron-stained, and on the Congor Mining Company's ground bordering the Fortuna on the north the outcrop is prominently exposed. South of the Winnebago is the Sierra Grande vein, which outcrops along the hanging wall of the Fortuna sill. On the lower or footwall contact of this sill with the quartzite is the Fortuna vein. The Mayflower vein outcrops about 200 ft. south of the Fortuna and runs nearly parallel with it. The Weasel vein outcrops from 300 to 400 ft. south of the Mayflower; on the eastern part of the property it is known as the Superior vein.

The general strike of the veins varies between north 30 and north 70 deg. east, and the dip is from 25 to 40 deg. to the northwest. The veins strike a few de-

gresses east of north on the eastern portion of the property and gradually curve so that they approach an east-west strike on the western end of the claims.

Numerous tunnels and inclines develop the upper part of the veins. On the Fortuna vein, above the Freedom and Fortuna tunnels, old stopes, from which considerable lead ore was mined, extend to the surface. The Portland incline, 360 ft. long, connects with the Freedom tunnel; it follows the contact of the porphyry. The Mayflower incline is driven on the Mayflower vein to the Keystone tunnel level, which is also called the Mayflower 800-ft. level. The inclination varies from 30 to 40 deg. The ore is silicious; being oxidized, it carries more gold and silver than copper. Along the incline, the hanging is the soft, altered quartzite, characteristic of the Mayflower vein. The footwall is relatively fresh and hard. In the Winnebago and Weasel veins sulphide ore, 2 to 3 ft. wide and containing mainly pyrite, was developed.

The sulphide ore in all the upper workings is low in copper. The surface show-

was followed on its dip a distance of 400 to 500 ft. Another shoot opened by the big raise is 12 ft. thick on the Keystone level. The oreshoots pitch from 25 to 35 deg. to the southwest toward the main Bingham porphyry, which is the center of the mineralized area of the camp.

In the upper workings lead ore occurs. As in some other mines of this district the lead ore has changed with depth to copper ore. The boundary between the lead and copper is, as a rule, well defined. Near the surface in the northeast portion of the mine, there are separate lead shoots. Farther to the west, these are intermingled with shoots of copper ore, but at greater depth the lead disappears and the ore consists almost entirely of copper. The lead orebodies form the highest portion of the shoots previously mentioned. Galena occurs up to 7 ft. in thickness.

THE ORE

Pyrite is the chief vein mineral, and it often impregnates the walls for some distance. The pyrite occurs both fine grained and massive; also as pentagonal dode-

cahedron crystals in vugs and along the veins. Movement has taken place after the formation of the ore so that sometimes the massive pyrite is seamed and fractured; in a few places the angular fragments have been recemented by secondary pyrite. The fractured zones contain much chalcocite. The ore, as a rule, is solid and compact, consisting almost entirely of sulphides. Quartz is the principal gangue mineral.

FORTUNA VEIN

The orebodies on the Fortuna vein occur along the lower contact of the Fortuna sill. Movement occurred between the quartzite and the sill, and a tough, clay-like gouge from a few inches up to several feet in thickness has resulted. Along this contact the mineral-bearing solutions have risen, and the ore was deposited in lenticular bodies having their greatest length apparently in the direction from which the solutions came.

In the Fortuna vein there are two main shoots, each composed of several separate lenses of ore. The lenses vary from a few inches to several feet in thickness. The shoot exposed along the Keystone incline and adjoining workings was about 150 ft. wide on the Freedom level, and

strikes north 30 deg. east and dips 25 deg. to the northwest. Several thin lenses of pyritic ore were found on that level, and some stoping done. Lenses of dark rock resembling a limestone or a banded, calcareous shale are found between the porphyry and the quartzite and often overlying the ore.

A sub-level between the Freedom and the Fortuna tunnels recently opened a body of galena which at present is exposed for more than 100 ft. along the strike and about 40 ft. on the dip. This orebody pitches toward the southwest. The ore is a fine-grained galena; its average thickness is 4 ft. and its maximum thickness about 7 ft. Some oxidized portions were found carrying anglesite and cerussite associated with limonite and iron-stained chert. Small quantities of pyrite are mixed with the galena, and the ore carries 0.08 to 0.10 oz. gold per ton. The ore assays 30 to 50 per cent. lead and about 12 oz. silver per ton. The rock in the hanging wall between the ore and the porphyry intrusion is calcareous. Several

ing was not particularly promising and gave little valuable orebodies since developed at a depth of 300 to 900 ft. Up to the present time the Fortuna and Mayflower veins have been the most productive.

SECONDARY ENRICHMENT

Secondary enrichment is constantly taking place. This is especially noticeable along both the foot and the hanging walls of the veins, and also in the vein wherever vugs and cavities have permitted the circulation of surface water. Some quartz is occasionally deposited along with the reprecipitated copper sulphides.

The depth at which the zone of secondary enrichment is found varies; in the large orebody opened by the Mayflower drift it reached a maximum on the 800-ft. level. Below this, the percentage of copper in the ore decreases. This orebody is 700 to 900 ft. from the surface measured along the vein, but it is probable that enrichment extends to a greater depth in other parts of the mine.

On the Contention level about 1050 ft. from the entrance, the Fortuna vein



THE FORTUNA CLAIMS; DALTON AND LARK MINE ON RIGHT

occurrences of this character suggest that the quartzite is calcareous in places and that these points proved especially favorable to ore deposition.

At points on the Freedom, the highest level being worked, high-grade copper ore, largely chalcocite, was cut. In most cases lead ore has been developed above these high-grade streaks. Whether this is simply a coincidence or a genetic relation between the galena and chalcocite, I am not prepared to say.

MAYFLOWER VEIN

The Mayflower vein is formed by a bedding fissure in the quartzite; it strikes north 40 to 70 deg. east, and dips 30 to 48 deg. northwest. This vein, which is in the footwall of the Fortuna, is roughly parallel to the Fortuna sill, though the dip is steeper. Some of the orebodies in this vein are of special interest owing to the fact that the footwall is impregnated with copper sulphide.

The vein is opened by the Mayflower crosscut which is driven northeast from

about 175 ft. along this level and has been followed approximately 200 ft. on the dip. The ore is principally pyrite, and is fractured and porous; it contains considerable black sulphides of copper. These are evidently the result of secondary enrichment, which is well illustrated in this orebody. The copper content varies from 3 to 12 per cent., ore carrying 5, 6 and 7 per cent. copper being common. The amount of gold in the ore is nearly uniform, being about 0.07 oz. per ton. This ore also carries a few ounces of silver; the iron content is high and the silica low.

The direction of the Mayflower footwall, and its relation to this orebody is worth noting. Near the shaft on the 800-ft. level the strike of the footwall is north 60 deg. east, and a little to the southwest it changes to north 70 deg. east. Still farther southwest it varies from north 70 deg. east to due east, and then swings back to north 70 deg. east. The ore occurs between the two normal directions of north 70 deg. east. The difference in direction of the footwall ap-

faces. On the 925-ft. level where the orebody ends the footwall swings in the same manner as noted on the 850-ft. level, and strikes north 75 deg. east, dipping 45 deg. northwest.

The porphyry is intimately associated with the ore, and in part forms the hanging wall. As shown in the shaft near the 850-ft. level the porphyry tongue is of irregular outline and here spreads along the footwall of the Mayflower vein. It crosses the shaft diagonally and passes up into the stopes on the southwest side. The dike above in the Mayflower crosscut connects with this body of porphyry though not in the plane of the shaft, the connection being somewhat to the north. An accompanying section through the Mayflower incline shows this porphyry, the Fortuna sill, and the relative position of the Mayflower, Fortuna, and Sierra Grande veins.

Near the 850-ft. level the porphyry incloses angular fragments of soft grayish quartzite, showing from the sharpness of the fragments that the alteration of the



TOPOGRAPHY OF BINGHAM; PORPHYRY STOCK IN CENTER

the Keystone tunnel, and reaches the Mayflower vein 83 ft. from the Fortuna. A short distance from the Keystone tunnel a small dike or stringer of porphyry is cut. At this point the bedding dips 30 deg. west, but gradually becomes steeper, and at the Mayflower vein reaches 40 deg. The last part of the crosscut is driven through soft black rock which forms the hanging wall of a large portion of the Mayflower vein.

A dike-like tongue of porphyry, starting from the Fortuna sill near the Winnebago drift, forms the footwall of the Fortuna vein at this point. This tongue dips 70 deg. west and appears below in the Mayflower inclined shaft near the 850-ft. level. This porphyry is connected with one of the richest orebodies. The Mayflower drift, or 800-ft. level, extends southwest from the crosscut over 1000 ft. on the vein. The shaft is sunk on the vein to the 1025-ft. level.

THE MAYFLOWER LENS-SHAPED OREBODY

The Mayflower drift cut an irregular lens-shaped body of ore, which extends

appears to have formed an opening or widening, as it were, between the strata, in which the mineral was deposited and which determined the size of the orebody. It seems probable that this local variation of the walls was caused by the porphyry intrusion. The variations as compared with the strike on the 1025-ft. and main level to the east and west are clearly marked on the 850-ft. and 925-ft. levels. The general direction of the vein near here is north 60 to north 70 deg. east and at raise seven, 425 ft. southwest of the shaft, it has the same strike.

The width of the ore varies; where the footwall strikes east and west the width reaches a maximum, in some places 7 ft. between the walls. The width of the ore gradually decreases as the direction of the footwall changes, and on the southwest where the ore ends the strike is again the normal north 70 deg. east. Between the 800- and 850-ft. levels, 3 ft. of solid sulphides is exposed in the stopes; over this is 2 to 3 ft. of ground-up quartzite impregnated with pyrite and containing numerous slips with black gouge and smooth

Mayflower hanging wall took place after the intrusion of the porphyry.

Above the 850-ft. level in the stopes the ore extends several feet below the porphyry and widens and spreads along the hanging. The same porphyry swings southwest, and appears on the Mayflower 800-ft. level continuing into the raises above this level. Where the porphyry crosses the main drift it forms the footwall to about 4 ft. of solid pyritic ore, the hanging wall being soft black quartzite. This is the only place so far as noted on the Mayflower vein where porphyry forms the footwall. In the stopes the porphyry again changes to the hanging wall and swings southwest; the porphyry forms the limit of the orebody in that direction, although vein matter extends beyond. The ore in this part of the mine was 2 to 6 ft. wide; it carried secondary chalcocite and ran high in copper. Several winzes were sunk from the main drift. A sample from winze No. 2 taken at a depth of 30 ft., and representing 3 ft. 5 in. of ore assayed 0.08 oz. gold, 10.5 oz. silver per ton, 6.7 per cent. copper

41 per cent. iron and 3 per cent. silica. This is perhaps a typical assay for this orebody, though at many points the ore runs higher in copper.

A short crosscut in the hanging wall passes through granular quartzite impregnated with pyrite, but no trace of porphyry was to be seen. From this it appears that the porphyry tongue turns before it reaches the crosscut and does not extend along the entire length of the orebody.

MAYFLOWER 800-FT. LEVEL

The Mayflower vein is exposed along the Mayflower drift from the orebody above described southwest for a distance of about 1300 ft. In places the vein is tight, and shows little sulphides. The footwall is hard quartzite and contains slips parallel to the vein; it is much fractured and carries copper. The hanging wall is the soft black Mayflower quartzite, but southwest of raise 7, it changes to a white granular quartzite, carrying small

IMPREGNATED QUARTZITE

Southwest from raise 7 the footwall of the Mayflower vein carries copper. The quartzite is crushed and fractured. Along the fractures, sulphides of iron and copper have been deposited; this is spoken of as impregnated quartzite. This quartzite has been exposed for a distance of more than 1000 ft. in the direction of the strike. How far it extends into the footwall is not fully determined. It appears from developments that the country between the Mayflower and Weasel veins is shattered, and carries copper over a wide area. It is possible that some of this impregnation, though in the footwall of the Mayflower, owes its origin to parallel fissures between the Mayflower and Weasel veins.

Near raise 6A, southwest of the Mayflower orebody above described, the footwall begins to be mineralized, and shows black sulphides. It assays a few tenths of a per cent. in copper, and carries small amounts of gold and silver. Southwest-erly more black-copper coatings appear and the copper content gradually increases.

Mayflower crosscut, the ore assayed 45 per cent. across the 6-ft. face of the drift. Southwest for 139 ft. to raise 8 the footwall averaged better than 1.7 per cent. copper. Two crosscuts were driven into the hanging wall. Assays showed that the disseminated pyrite crystals carry small amounts of gold and silver with but little or no copper.

Around raise 8 is a zone of strong fracturing and shearing. This raise opened 3 ft. of pyrite with secondary chalcocite, and in a sublevel driven southwest from the raise the ore, 4 ft. thick, assayed from 3 to 5 per cent. copper. In the face of this sublevel the quartzite footwall is heavily impregnated with sulphides; streaks of chalcocite $\frac{1}{4}$ to $\frac{1}{2}$ -in. thick occur, and assays of 4 to 5 per cent. copper are common across the face. There is no predominating set of fissures to give the idea of one definite movement, but instead shearing and crushing appear to have taken place.

Southwest of raises 8 and 9, the footwall is developed by crosscuts from the



LOOKING EAST ACROSS BINGHAM CANYON AT PROPERTY OF OHIO COPPER COMPANY

disseminated pyrite crystals; southwest of raise 8, for some distance the hanging wall is almost unaltered, being but slightly inferior in hardness to the footwall.

Raise 6A developed pyritic ore, a foot thick, carrying black copper sulphides along the walls. Raise 7 started on a mineralized streak a few inches wide; this ore widened to three feet a short distance above the drift. From this point up to the breast, a distance of about 250 ft., solid sulphides, 3 to 4 ft. wide, were developed, with secondary chalcocite specially noticeable along the hanging and footwall and where much fracturing occurred. Part of the ore here runs 6 and 7 per cent. copper. Near the breast traces of oxidation occur, and the amount of copper is smaller than in the ore deeper in the vein. The average dip of the vein in this raise is 40 degrees.

Recently the footwall of the Mayflower vein was found to carry iron and copper sulphides. The copper varies from 0.5 to 4 per cent.; a large tonnage of milling ore is being blocked out.

The Mayflower drift near raise 7 is in the footwall of the vein, and samples from across a 6-ft. face assay from 0.3 to 3.3 per cent. copper. The amount of gold is small and nearly constant. From assays in the crosscuts, silver appears to be present close to the vein, and to diminish on going farther into the footwall; the amount is small.

Southwest of raise 7 the footwall is heavily mineralized, and in places runs 3 to 4 per cent. copper. For every 2 per cent. of copper, the quartzite carries approximately 0.015 oz. of gold and 1.5 oz. of silver. The Mayflower vein is north of the drift, but parallel slips in the footwall are mineralized with coatings and veinlets of chalcocite. The quartzite is shattered by cross fractures; it is mineralized chiefly along the cracks and parting planes, but some sulphide occurs in the quartzite itself. Close examination shows it to be porous and to contain grains of both pyrite and chalcocite.

Between raises 7 and 8 the copper content increases, and at 516 ft. from the

Mayflower vein, and through it copper is widely disseminated. Crosscut No. 3 south is driven into the footwall at right angles to the bedding. Beginning at the vein the footwall is mineralized for some distance, but the amount of mineralization gradually decreases; finally the footwall changes into a hard, relatively unfractured quartzite containing little copper. Farther in, other fractured and altered zones occur. Where the quartzite is relatively little fractured the copper content is low, and pyrite when present is fresh and yellow; in the more fractured zones the pyrite is often covered with a black coating of copper sulphide. Along this crosscut the copper content gradually decreases and increases, showing that mineralization took place also from fissures in the footwall of the Mayflower vein.

Near raise 9 the vein is 4 to 6 ft. wide, and carries appreciable quantities of chalcocite; the black walls are polished. Rough fragments of quartzite with soft gouge comprise the vein filling. The sulphides are not as massive here as in

raises 7 and 8, though they carry a larger percentage of copper. The ore is especially rich along the footwall. It is worth noting that while the vein at this point contains very little massive sulphides, the footwall is much fractured and highly mineralized. It seems probable that the sulphides, instead of filling the vein as in other places, were deposited in the more open and fractured footwall.

NATIVE COPPER

Along the drift in this part of the mine native copper occurs. This is found in films and veinlets in the fractured quartzite near the vein, both in the foot and in the hanging wall. Where recently exposed it is bright and fresh, but gradually on exposure to the air and mine water it becomes covered with a coating of oxide, possibly also of sulphide. The copper frequently forms a network around quartzite fragments, holding them together. Some crystals of native copper were observed. Stringers of chalcocite also occur at this

and consist of quartz with concentric layers of sulphide. An assay of one of these concretions gave 0.5 per cent. copper. The hanging is leached and porous, in this part of the mine, and contains vugs partially filled with sulphide. The copper, however, in the hanging wall is negligible as compared with that in the footwall.

Northeast of raise 9 for 100 ft. the footwall gave assays of 3 and 4 per cent. copper across the face of the drift; in some places it assayed between 5 and 6 per cent. copper. The ore contains open cavities lined with pyrite crystals coated with chalcocite. The quartzite is porous, and in a measure is refilled with white, translucent, vein quartz. This often carries disseminated chalcocite grains, loosely imbedded in it.

GENESIS OF THE ORE

It appears that the mineralized quartzite is due largely to an original impregnation of a crushed and fractured zone, from the Mayflower vein; but the present orebodies

24 per cent. total sulphides. A large tonnage of milling ore has been exposed, but the extent of the impregnated quartzite is not fully determined, and no milling has been attempted.

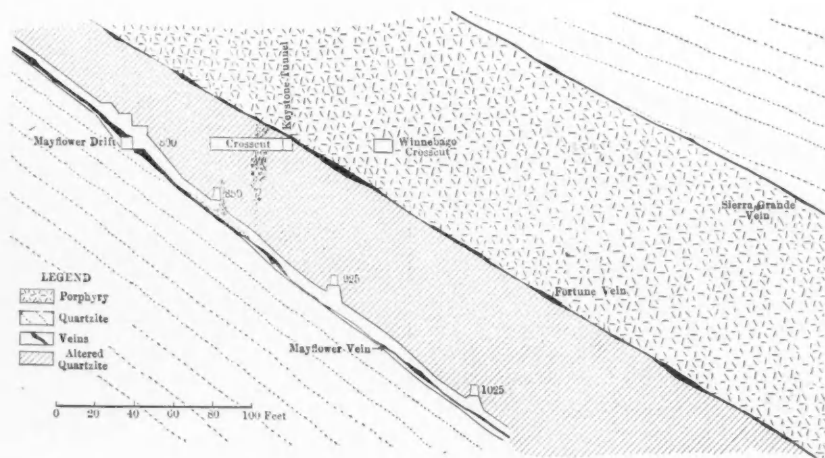
Ontario Mining Flotations

The attention of the provincial government of Ontario having been drawn to the large number of Cobalt and Montreal river flotations now being made, in which the provisions of the Ontario Companies act, designed for the protection of investors, are entirely disregarded, a statement was issued on November 20 by the Provincial Secretary's Department warning offenders that the law would be strictly enforced. The document, after calling attention to the flagrant disregard of the law in regard to information required to be set forth in prospectuses, stated that steps are being taken to bring before the courts a number of cases unless those interested proceed at once to comply with the law. The requirements of the "prospectus clauses" of the act are recapitulated as follows: Advertisements must set out the names, addresses and descriptions of directors, their qualification and remuneration; the minimum subscription on which directors may proceed to allotment; the amount payable on subscription and allotment; the times when further calls may be made, amount of shares or debentures agreed to be issued otherwise than in cash, that is for property or services; names and addresses of vendors of property to be paid for out of the shares offered for sale and the amounts to be paid; amount paid in commissions and to promoters; dates and parties to all material contracts and places where such contracts may be inspected; and the interest of every director in the promotion. These clauses apply not only to advertisements published by companies, but also to those of brokers interested in the promotion and to Dominion and foreign companies, as well as to those incorporated under the Ontario act.

A New Oilfield in California

SPECIAL CORRESPONDENCE

It is expected that a new productive oilfield will be developed in the southern portion of San Joaquin county, California. Several rigs are now sinking wells. A third stratum of sand is being bored through by the pioneer company at work there, and this is below 1500 ft. depth. Some oil was met at 1200 ft. and the new wells will be sunk to the depth of those in Kern and Coalinga districts. The new field is within easy reach of tidewater, so that oil can be shipped cheaply. One company has bonded a strip of land two miles wide and 15 miles long.



SECTION THROUGH MAYFLOWER INCLINE

point, and the quartzite is thoroughly impregnated with sulphides coating the cracks and fractures. The native copper is found for a distance of about 200 ft. along the vein and occurs particularly at points where water flows into the drift from fractured zones in the quartzite. The native copper probably resulted from chemical reactions.

Southwest of raise 9 the footwall contains veinlets of black sulphides, and carries much copper at various points. Ground-up quartzite and gouge form part of the vein filling. Bunches of sulphides occur, and in places translucent vein quartz; the footwall quartzite is sometimes entirely replaced by this translucent quartz.

The hanging wall is soft and does not ring when struck with a hammer. It contains slips with curved faces coated with shiny black gouge. Occasional nodules or silicious concretions are found in the hanging wall; these are lens-shaped having a maximum dimension of 1 in.,

may also be due in part to reprecipitation as chalcocite of copper leached from the upper part of the vein. To support the former view the impregnated quartzite occurs where the footwall is crushed and fractured, and the Mayflower vein at points where the best ore occurs in the footwall generally contains little solid sulphides, indicating that the sulphides were in part deposited in the fractured footwall instead of in the vein. If this is the case the ore will probably extend to some depth. In the mine of the Ohio Copper Company the mineralized quartzite is worked 400 to 600 ft. deeper than at present in the Fortuna mine; in both cases the impregnation is very similar. An accompanying illustration, looking east across Bingham cañon, shows the property of the Ohio Copper Company, which adjoins the Fortuna on the west.

The Fortuna mineralized quartzite is well adapted to milling. Most of the ore will concentrate better than 12:1. Average assays show it to contain from 8 to

Manganese Deposits of Morro da Mina, Brazil

The Deposits Are Nearly Vertical and Are Easily and Cheaply Mined by Open Cuts; 260,000 Tons of Ore Mined in Five Years

BY JOQUIM LUSTOSA * AND J. C. BRANNER †

BY JOQUIM LUSTOSA

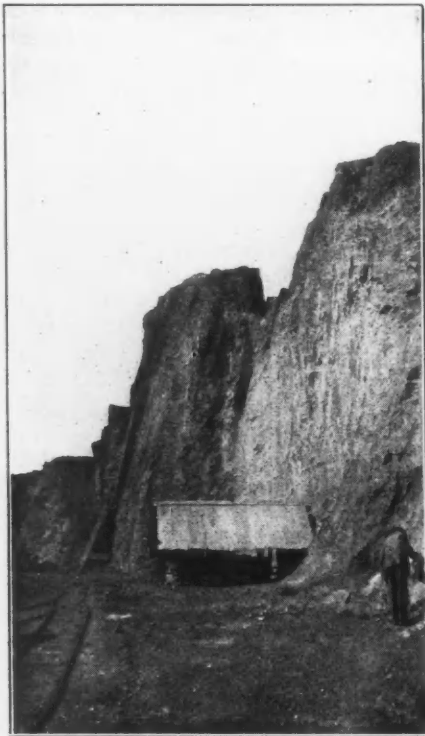
The name Morro da Mina (mine hill) comes from the fact that in colonial times a tunnel was driven into the hill where the deposits occur, probably in the hope of finding gold. The Morro da Mina is 1110 m. above sea level; it is 5 km. east of the city of Queluz and 6 km. east of the Central railway. A branch line, built by the mining company, but operated by the railway, joins the mining property with Lafayette, the nearest railway station. The route selected for this branch line is

attention and its first explorers reported the ore to be of inferior quality, so that it was only about five years ago that it began to be seriously studied. Mining operations began Nov. 12, 1902, when the branch railway was completed.

The deposit belongs to the Morro da Mina Company which is organized as a limited liability company with a paid-up capital of 1,600,000 milreis,¹ in shares of 200 milreis. The equipment in service is worth about 120,000 milreis, of which 80,000 milreis is invested in the railway and the remainder in the mines. The roll-

contact with this rock forming genuine injections is another type of eruptive rock, perhaps a gabbro or other similar type.² The deposit has a lenticular form.

All the workings are open cuts in three terraces. The attack was directed lengthwise along the east side of the hill. For this reason and on account of the topography, it is possible to carry on the work simultaneously along a face 750 m. in length. Owing to length of the face mining operations can be carried on rapidly, and 600 tons of ore have been taken out in 10 hours; it is possible still farther to



OPEN CUTS ON THE MORRO DA MINA AND ADJOINING PROPERTY SHOWING METHOD OF MINING

a difficult one; one of the cuts alone required the moving of 108,000 cu.m. of earth, and in the total length of the branch (6840 m.) the movement of materials amounted to nearly 500,000 cu.m. This branch line reaches an altitude of 1056 m., and has a difference of level of 127 m. between the two ends.

The area of the property, formerly known as the Fazenda da Olaria contains 159 hectares, and of these more than five hectares are mineral bearing. For many years this great deposit attracted no at-

ing stock in service on the branch line belongs to the Central railway with which the company has a contract for the shipment of ore.

GENERAL CHARACTER OF THE DEPOSIT

The general strike of the country rock and of the ore deposits is north 30 deg. west. The dip is nearly vertical, inclining sometimes east and sometimes west at an angle of 10 deg. from the vertical. The outcrop of the ore can be traced for a distance of nearly 1000 m. The country rock is a schistose eruptive deeply altered, but not readily classified. In immediate

increase the output by simply increasing the number of laborers. The workings have a total length of more than 3000 m. The waste is mostly thrown down the west slope of the hill either from the open cuts, or through tunnels. On account of the topographic prominence and the isolation of the deposits this part of the work is easily done, and the open cuts can be driven into the hill for 130 m. below its summit. All the blasting is done with dynamite. Owing to the jointing of the rocks and to the numerous cleavage planes the breaking up is easily done and the consumption of explosives per ton of

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†Professor of geology, Leland Stanford University, California.

¹A milreis is worth about \$0.33. (J. C. B.)

²Opinion of Dr. O. A. Derby.

available ore costs approximately 100 reis (about 3c.).

As soon as the ore is sorted it is hauled in mine cars to the ore bins from which it is loaded automatically on the freight cars of the Central railway. The time occupied in loading a car of 30,000 kg. is 5 min., and only two workmen are required to operate the loading chutes.

The annual output averaged nearly 60,000 tons during 1903, 1904 and 1905. Up to this time the company has exported nearly 200,000 tons. The output depends entirely upon the number of cars the Central railway can furnish.

FUTURE OF THE ENTERPRISE

Careful prospecting of the beds by means of bore holes and tunnels has proved the deposits to a depth of more than 120 m. below the outcrop. In 1904 the company considered that it had an available orebody of 5,000,000 tons. I believe, however, that there should be included the reserves that lie below the

it will do away with the transshipment heretofore required at the Lafayette station.

PROBABILITY OF THE DOWNWARD CONTINUATION OF THE ORE

On this point, so important for the future of the company, the mining work of the two companies, "Mineraçao do Brazil" and "Queluz de Minas" has thrown valuable light. These companies have carried their mining operations to a level of about 200 m. below the culminating point of the Morro da Mina, and in the same general direction of the outcrop, though from one to two kilometers away. It is to be expected, therefore, that in the Morro da Mina there is the same depth of workable ore.

BY J. C. BRANNER

One of the largest mines near Queluz is known as the Morro da Mina. Dr. J. Lustosa, the engineer in charge of that property, has kindly sent me the above

The following items regarding labor were given me by Dr. Lustosa at the time of our visit. Laborers receive from \$2.50@3 a day (Brazilian currency); that is 80c.@\$1 a day (United States currency). Ten hours is a day's work. Seventy per cent. of their workmen are Brazilians, 20 per cent. are Italians, and 10 per cent. Portuguese.

The geology of the deposits is extremely interesting. There are three main beds of manganese ore standing nearly on end; these are respectively 28, 14 and 50 m. thick. The accompanying rocks are profoundly decomposed, and are easily removed.

At the Sao Gonçalo mines west of Queluz the ores are also nearly on end and are close to granites. Here also the lenticular bedded deposits follow the strike of the deeply decomposed country rocks. At Miguel Burnier a few miles further on the Central railway are the older Usina mines. Here too the manganese is interbedded with other rocks, some of which



OPEN CUT OF THE USINA MINE. THE BEDDED ROCKS AT RIGHT ARE SCHISTOSE SPECULAR IRON



GENERAL VIEW OF THE GONCALO MINES NEAR QUELUZ MINED BY OPEN PITS AND TUNNELS

lowest plane reached by the prospect holes, and which are still 60 m. above the floor of the valley of the Corrego do Gigante that runs along the base of the hill.

The analyses made in Europe and in the United States of carload lots of the ore have shown an average of 50 per cent. of metallic manganese, from 1 to 2 per cent. of silica and 0.06 to 0.08 per cent. of phosphorus.

SUPPLEMENTARY STATEMENT

The foregoing was written nearly two years ago; since then mining operations have gone on regularly and up to the end of 1907 there have been mined 260,198,800 kg. of ore. It is expected that there will be an increased output during the present year, not only on account of the promise of a larger number of cars, but also because the mining company has ordered cars of its own. The change of the gage of the branch line from one meter to 1.6 m., the gage of the Central railway, will also facilitate this increased output, for

short paper which I have translated into English.

The statistics of the production of manganese ore as given in the last volume of "The Mineral Industry" show that in 1906 Brazil was one of the first four largest manganese producers in the world. The total output for the year 1906 was 201,500 metric tons, which was considerably less than that for the years immediately preceding. This falling off seems to have been due to a temporary lack of railway facilities, and is not likely to occur again. Indeed it seems probable that there will be a marked increase in the Brazilian output for 1908.

During 1907, in company with Dr. R. A. F. Penrose, Jr., of Philadelphia, Dr. Derby, director of the Geological Survey of Brazil and J. H. Means, of London, I visited the most important of the Brazilian manganese mines, which are those at and near Miguel Burnier and several in the vicinity of Queluz in the State of Minas Geraes. The accompanying photographs were made at the time of that visit.

are the *itabirites* or schistose specular iron ores. The manganese beds are here visible for miles along the strike of the rocks.

It is to be hoped that Dr. Penrose, who is our leading authority on manganese, and who saw all of these and several other Brazilian manganese deposits, will soon give the geologists and mining engineers of this country the benefit of his observations on these remarkable deposits.

The *Wall Street Journal* says: In the United States alone the water power is estimated at 21,000,000 h.p., of which only a fraction has yet been utilized. To harness that power and develop collateral resources might easily absorb all of that fearsome gold production we can well lay hands on for the next 20 years. By that time other uses will be found for the precious product. There would appear to be no immediate occasion for alarm over the prospect of being obliged to pay 10 lb. in gold for 5 lb. of potatoes.

The Hennig Testing Plant and Metallurgical Laboratory

Near East Thirty-fifth street and the Long Island Railroad tracks in Flatbush, Brooklyn, N. Y., is a large, well equipped testing plant which, although little known, is of more than passing interest. Here Charles T. Hennig, Ph. D., with his corps of assistants, carries on experimental work in ore concentration and investigates metallurgical and chemical processes. The clientele includes both American and European individuals and corporations. The equipment of the plant, much of which is interchangeable to allow for variations in processes, provides for work in the following lines: Crushing and sizing, including crushers, stamp mills, rolls, etc.; concentration, wet and dry; amalgamation; cyaniding; magnetic separation; roasting; blast-furnace smelting; electric smelting; electrolysis; leaching; and chlorination.

furnaces; on the other side is the laboratory. Power is furnished to the plant by six gas engines of different makes, ranging from 3 to 75 h.p., and having a total capacity of 130 h.p.

Doctor Hennig has in his collection 53 elements, many of which were isolated in this plant. Among other interesting objects of the collection is a piece of praseodymium which was prepared in this plant.

THE HENNIG ORE CONCENTRATOR

The Hennig concentrating table was described in part in the JOURNAL of July 18, 1908. Since that time, however, several improvements have been made in the foundation, driving gear and feed trough.

The foundation consists of three 5-ft. cross-pieces made of 8x8-in. timbers. Resting on these cross-pieces are two 8-in. channel bars as shown in Fig. 3. The table proper rests upon two cross-pieces (see Fig. 3), the four corners of which

from 0 to 15/16 in., at a speed of from 150 to 180 per minute. To drive the table requires 3/4 horsepower.

The table, which is 16 ft. long by 7 ft. wide, is covered with canvas coated with asphalt. The riffles are made of lead strips of semi-circular section, there being required a total length of 1256 ft. of these strips to supply each table. They are 5/16 in. wide and 3/16 in. high, except when flattened, as will be explained later. The distance between riffles at the feed end of the table is 3 in.; at the discharge end 3/4 in. These figures, however, may vary according to the quality of the ore under treatment. As the discharge end of the table is approached the riffles are flattened; this is accomplished by passing the lead strips through a hand-power rolling machine. The arrangement of the riffles in sinuous curves is one of the special features of this machine. The lead strips are shaped in a wooden mold.

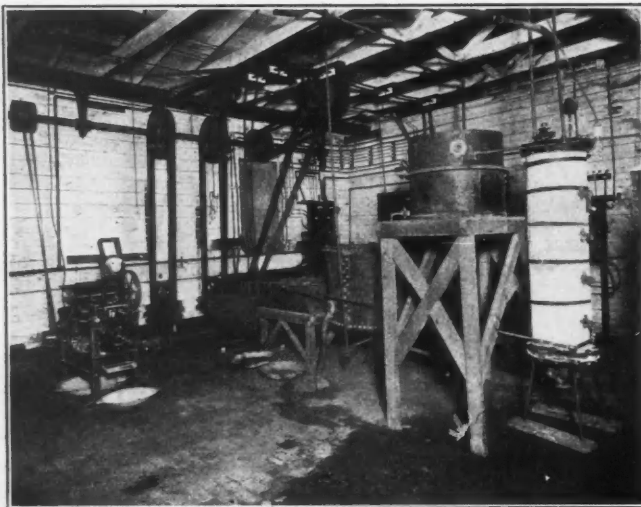


FIG. 1. EXPERIMENTAL PLANT FOR LEACHING AND PRECIPITATING COMPLEX ZINC-LEAD ORE

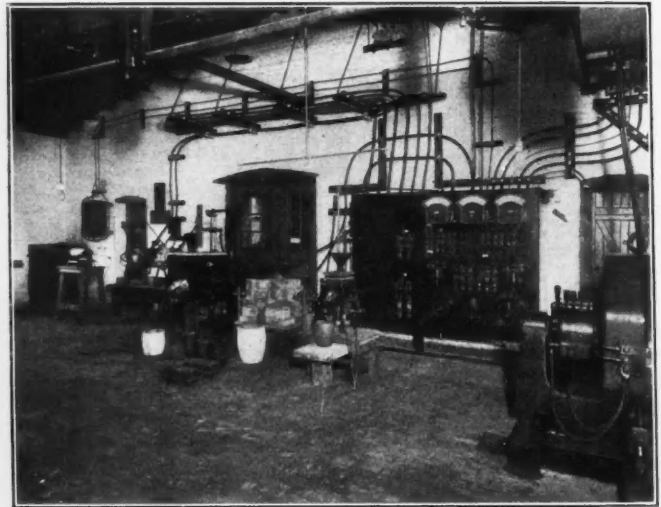


FIG. 2. SMALL ELECTRIC FURNACES, SWITCHBOARD AND PART OF DYNAMO

EQUIPMENT

The following description of the plant will furnish an idea of the work carried on: The building is divided into three rooms, the front room containing a 4-stamp mill, concentrating, cyaniding and leaching plants, apparatus for magnetic separation and electrolytic work, a steam plant for drying purposes, and an air compressor. The middle room contains rolls, sample mills, crushers, screen, reverberatory furnace, blast furnace (24 in. diameter by 12 ft. high), and a large power hammer for testing steel bars. The back room contains one 75-h.p. Springfield gas engine (another of 100-h.p. to be added), one 60-kw. Eddy dynamo, six electric furnaces for smelting refractory metals, making carbides and the different alloys of nickel, chromium, molybdenum, tungsten, vanadium, titanium, thorium, etc.

On one side is a room containing one 25-h.p. White & Littleton gas engine, and one small dynamo for the small electric

are fitted with short steel pins with ball ends. These pins work freely in sockets fitted to the ends of the cross-pieces and on the bottom side of the table, as shown in Figs. 3 and 4. The cross-pieces are fixed rigidly to the channel bars. Projections from the cross-pieces work freely between guides attached to the bottom of the table (see Fig. 4). The guides may be set at any angle with the line of the driving rod (shown in Fig. 3), thus giving to the table the required amount of side motion. In addition to the longitudinal motion, and the side motion just described, the table is also capable of a rocking motion, which is imparted by the ball-and-socket arrangement. The motion of the table in operation is very similar to the motion imparted by the prospector to the ordinary pan.

The driving gear is all in one piece and embodies fast and loose 12-in. pulleys, balance wheel and double eccentric drive. The longitudinal oscillations may be varied

The feed trough, shown in Fig. 5, is 15 ft. 7 in. long, 3 in. high, 8 in. wide at the feed end, and 3 in. wide at the discharge end of the table. Partitions or gates divide the trough into five compartments, the gates consisting of a strip of wood which may be raised or lowered and fixed in position. Extending along the bottom of the entire trough is a groove. The gates are capable of adjustment so as to leave a space anywhere from 1/16 to 5/16 in. The pulp is charged onto the table through holes placed 2 1/4 in. apart in the outer side of the feed trough; at the feed end of the table these holes are 3/4 in. in diameter, those at the discharge end being 3/8 in. in diameter. In the improved table this feed trough is capable of adjustment to within 0.001 in. The table assembled is shown in Fig. 5.

OPERATION OF THE TABLE

The ore is fed into the wide end of the trough at the head end of the table.

Through the agency of the table motion, the gates and the grooved bottom of the trough, a concentrating effect is obtained, the mineral portion of the feed collecting in the groove and passing on toward the discharge end of the table. The overflow from each of the compartments passes by means of the holes referred to onto the table proper. The fineness of the concentration in the feed trough and the quality of the pulp fed through the holes is controlled by the inclination of the trough and the space left under the gates. By this arrangement the bulk of the concentrates are made in the trough, only the remaining pulp passing over the table.

Diamonds in German Southwest Africa

Some interesting particulars come from Berlin with regard to the discovery of diamonds in alluvial deposits near Lüderitz-huaht in German Southwest Africa. At the first discovery point a white man and six natives, working with spades and a sieve are said to have taken out 70 carats in a day. At another point near 150 carats were taken out in a day with a washing machine run by hand.

The diamonds so far produced have been very small, rarely exceeding $\frac{7}{8}$ carat, the average being half a carat. The qual-

Fast Tunnel Driving

The American record for speed in tunnel driving has been broken at the Elizabeth tunnel, which is being driven to furnish water to the city of Los Angeles, Cal. This tunnel, according to J. B. Lippincott, *Engineering News*, Nov. 19, 1908, is 12x12 ft. in section and was advanced in granite during the 31 days of October 466 ft., or at a rate of 15 ft. per day. The best previous record was the driving of the advance heading, 8x12 ft., of the Gunnison tunnel, 449 ft. in granite during one month. The best record in driving a large mine adit was the run of 354 ft. in the Kellogg tun-

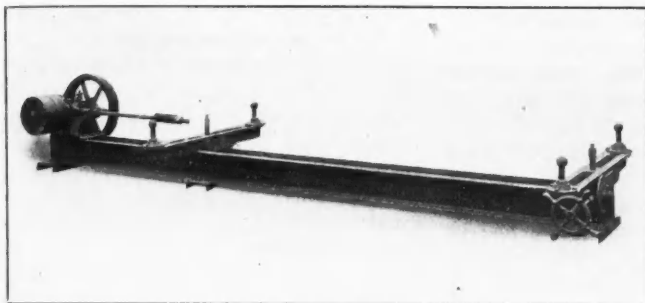


FIG. 3. CHANNEL BARS, CROSS-PIECES AND DRIVE, HENNING ORE CONCENTRATOR

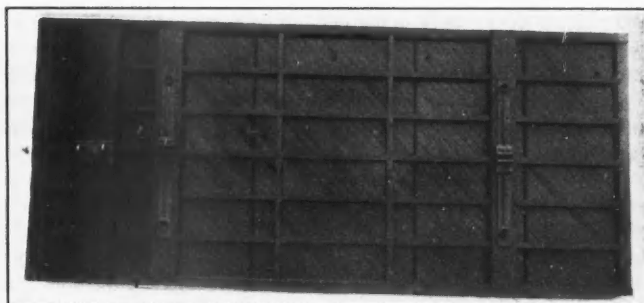


FIG. 4. BOTTOM OF HENNING ORE CONCENTRATOR; NOTE GUIDES AND SOCKETS

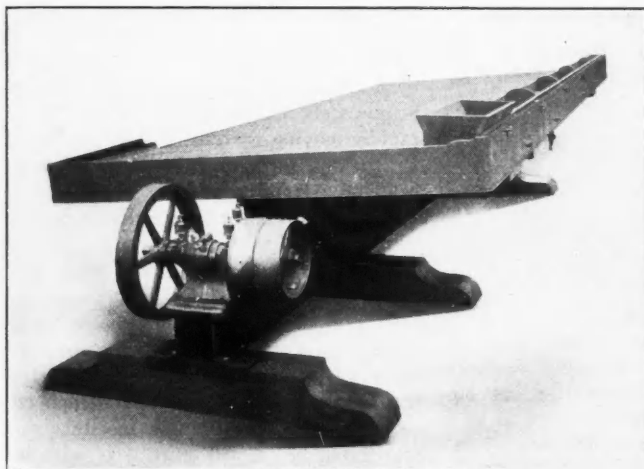


FIG. 5. HENNING ORE CONCENTRATOR ASSEMBLED; NOTE DRIVE, FEED TROUGH AND FOUNDATION

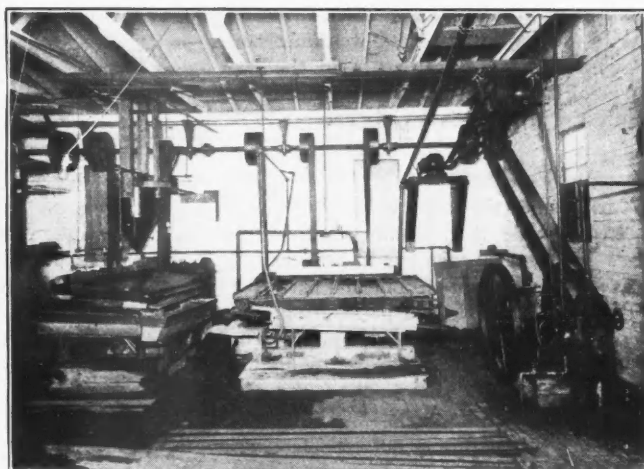


FIG. 6. SLIME CONCENTRATOR IN CENTER; SMALL HENNING TABLE TO LEFT; HENNING PLANT

Through the agency of the curved riffle and the gyratory motion of the table the pulp is washed at every curve and within the arc of each curve, thus making the concentrating process continuous over the entire length of every riffle. The average capacity of the table is 50 tons per 24 hours.

During the six months ending May 31, 1908, the Broken Hill Proprietary Company sunk its Delprat shaft 5 ft., making the total depth 1302 ft.; the Stewart shaft was sunk 112 ft., making the total depth 1324 ft.; the Half Way shaft was sunk 113 ft., making the total depth 1313 feet.

ity, however, is said to be first-class, the stones being flawless and of a clear white color, except, sometimes, for a slight yellow shade. During October 2687 carats were sold for 65,427 marks.

Attempts to find water by boring have been fairly successful, a supply suitable for working but not for drinking having been tapped at a depth of about 10 ft. Land in the vicinity of the discovery, which is near the railway, has increased enormously in value, but the owners are unwilling to sell. A large area has been staked out, on which great activity prevails, but the most promising ground has already been taken up and there is no room for newcomers.

nel, Bunker Hill & Sullivan mine, Idaho.

In driving the Elizabeth tunnel a bonus system was used as was the case at the Gunnison tunnel. Both were in charge of public-service engineers. The Elizabeth tunnel was driven full size by the lower-heading method. Model 6A Water Leyner drills were used; the mucking was done by hand, the tramping by electric motors, and ventilation by a No. 7 Root blower. At the end of the month the face was 2508 ft. from the portal. Each man was paid a bonus of 40c. for each foot driven above the base rate of 8 ft. per day. The cost of driving the Elizabeth tunnel, inclusive of the bonus, was \$35.81 per foot.

Gayley's Invention of the Dry Blast

Mere Condensation, as Proposed by Others, Was Not Sufficient for the Removal of Moisture; Solidification Made the Method Practicable

BY ROSSITER W. RAYMOND

The immense commercial value of the Gayley dry-blast process has been established beyond controversy. The testimony of practical blast-furnace managers, on both sides of the Atlantic, agrees that it reduces the cost of pig-iron about \$1 per ton; but from the same testimony it appears that this direct economy does not by any means cover its commercial advantages—in fact, that under conditions frequently encountered in practice, it presents other benefits of even greater immediate financial importance. To this point I shall recur in a later part of the present paper.

The history of the reception given to this invention, especially on the other side of the Atlantic, has repeated an experience familiar to American engineers. First, the reports of our practice were rejected as theoretically impossible, according to generally accepted notions and formulas; then the figures were reluctantly accepted; and finally the attempt has been made to explain how they could have been obtained. As to the Gayley dry-blast, we Americans have been for several years in the last stage of the discussion, and the rest of the professional world is rapidly coming to it.

WHAT DID MR. GAYLEY INVENT

Meanwhile, the remark has been repeatedly made that, whatever Mr. Gayley's process may turn out to be worth, it was not an invention on his part, but simply the energetic and persevering execution of a procedure already proposed by others. This question I wish to discuss first in the present paper. What did Mr. Gayley invent?

Realizing that this is not the place for detailed argument on an issue of patent law, I shall not undertake to quote and criticize the publications prior to Mr. Gayley's first patents. It may be admitted, without such critical analysis, that the possible advantages of removing moisture from the air forced into an iron blast furnace were recognized and talked about a hundred years ago, and again fifty years ago; that methods and apparatus for cooling air (and incidentally precipitating moisture from it) were known before Mr. Gayley's invention, and that, in one case at least, a system of cooling the blast for a converter had been actually patented. All these prior prophecies and proposals might be shown in detail to be impracticable, defective or visionary; but it is not my present purpose to discuss them. The fact

NOTE—A paper read at the meeting of the American Institute of Mining Engineers in Chattanooga, Tenn., Oct. 2, 1908.

remains, that after they had all died out, to the last echo, and after the object they sought had been pronounced by high scientific authority, with the general consent of technical experts, economically unattainable, Mr. Gayley went ahead, and did the thing!

This alone might not be conclusive as to his claims, since mere energy and perseverance, however meritorious, do not constitute invention. But this is not all. The significant fact must be added that, after beginning, with all the light that previous investigation and invention could give him, his attempt to carry out the "well-known" operation, Mr. Gayley spent six years in costly experiments before he found out how to do it. This certainly raises a strong presumption that during those six years, Mr. Gayley discovered something not previously known; and it is that discovery which I wish to define.

FEATURES OF PREVIOUS PROPOSALS

All previous plans or suggestions for removing moisture from the blast by reducing its temperature have two features in common.

(1) Following the analogy furnished by the natural precipitation of dew, they assume that moisture can be effectively removed from the blast in proportion to the reduction of its temperature to successively lower dew-points.

(2) They assume that this operation would be metallurgically advantageous in proportion to the extent to which moisture was thus removed. Considering the objectionable effect of such moisture to be a direct function of its amount, they all infer that removing part of the moisture would to that extent remove part of the evil, and that the benefit thus realized would be positive, even if it were but partial.

The first of these assumptions is based upon an incomplete conception of the analogy of nature. Closer observation should have shown these theoretical inventors that the lowering of the temperature of the atmosphere below its dew-point does not produce the deposition of dew, except in a quiet atmosphere, because wind prevents the fall of dew, and drives it away as fog. Moreover, all the inventions for taking moisture out of air by cooling it deal with bodies of air practically at rest. Nobody before Mr. Gayley had attacked the problem of taking the moisture out of a hurricane in that way; and everybody who had talked, however vaguely, of doing something of the kind

with the blast for a furnace had overlooked the circumstance that simply segregating the moisture by such means, as a mist, and then letting the mist be blown into the furnace, would secure no metallurgical benefit whatever.

SOLIDIFYING THE MOISTURE

By years of patient experiment, Mr. Gayley discovered, and was the first to declare, that if the reduction of temperature were carried to or below the freezing point of water, the ice or snow thus formed could be precipitated as well as segregated; that (with proper proportions of apparatus) it could be practically caught and held, so as to permit a blast free from suspended mist or fog to go forward into the furnace. The amount of aqueous vapor still held in the air would depend, of course, upon its temperature. There would be less of it at 10 deg. below freezing point than at that point. But this small difference has little practical significance. The main point is, that unless the moisture be not only segregated by cooling, but actually solidified, its approximately complete deposition from a rapidly moving current cannot be effected. Practically, therefore, the effect of going below the freezing point is to make sure that that point has been effectively reached in all parts of the current.

With regard to the second assumption above stated, it follows from what has been said already that no reliable metallurgical advantage can be secured by cooling the blast to any temperature short of the freezing point. For, under such circumstances, not only might moisture thus segregated be carried onward as mist, but the possible precipitation of a part of it as rain, *en route*, would introduce a new and serious evil—the evil of uncertainty. This point deserves special discussion.

SIGNIFICANCE OF CERTAINTY

The significance of certainty as a necessary element of any real industrial art has been often overlooked. To such loose logic we owe much fascinating but misleading rhetorical celebration of the "lost arts" of the ancients. In spite of the eloquence with which these "lost arts" have been extolled by orators and amateurs, I have been brought by much patient study to the conviction that (as a general rule, at least) no real arts have been lost. For an art is a process which arrives with reasonable certainty by the intelligent use of definite means at a desired and foreseen result. This proposition may be made clearer by illustration. For instance:

Certain ancient tribes are said to have heated iron ore and wood or charcoal together in rude hearths, with the aid of the wind blowing across a mountain-top, or of a primitive bellows, supplying an artificial wind, producing thus a half-fused conglomerate, out of which could be selected pieces of true steel—indeed, of tool steel or razor steel, of exceptionally high quality. But the assertion that these ancient experimenters had the art of making steel is not justified by any such stories, however authentic. To combine blindly the materials and forces furnished by nature, and then to overhaul the result, seeking for fortunately valuable products, is not to practice an art. Such vague experimenting may be the beginning, out of which, with greater knowledge and the growth of conscious skill, an art may come; but an art it is not. For an art demands the intelligent use of definite means for a definite end.

On the other hand, it is not easy to say at what point a primitive and empirical procedure attains the rank of an art; and it is not necessary for my present purpose to fix that point. The much more important proposition which I wish to emphasize is this: that every industrial process involves the two elements of ignorant dependence upon natural conditions and intelligent control of such conditions; and that the degree of perfection attained by a given art is the degree in which the former element has been superseded by the latter. In practice we try to make a specified product by a given process; yet often, in spite of all our scientific or traditional precautions, a part of our output fails to meet the specifications imposed upon us, and must be rejected; so that, in a general way, it is fair to say that the perfection of an art is measured in inverse ratio to the proportion of such "rejections."

IMPORTANCE OF EXACT KNOWLEDGE

The progress of our metallurgical arts toward perfection in this respect has been largely due to the exact determination of the composition of our raw materials. We can all remember when American iron and steel works began to employ chemists of their own, and to determine by chemical analysis not only the character of their products, but also the nature of their ores and fluxes. The result has been a revolutionary transformation of our blast-furnace practice. The old "founder," who diagnosed his slag, and dosed his furnace accordingly, has disappeared. The superstitious reliance upon this or that brand of ore as a material for this or that brand of iron has gone with him. The chemist dictates the charges, and tests the product.

Yet, with all this increase of analytical control the blast furnace has continued to be, as a great authority once described it, at once the crudest and the most

delicate of metallurgical apparatus, subject to inexplicable irregularities, and seemingly obeying whims of its own, beyond the prevision or regulation of the most scientific manager.

One reason (and, in my judgment, the chief reason) is, that while we have analyzed our ores, fuels and fluxes to the second or third place of decimals, we have practically ignored the composition of the blast which goes into the furnace, although this material constitutes more than half the total weight of the materials charged. This defect in our control of the furnace process has not escaped notice. The effect of varying moisture in the blast has been recognized for a hundred years past, especially as between summer and winter; and furnace managers have adjusted burden and blast, in a rude way, to meet the conditions they created. But I do not think that the significance of diurnal and even hourly variations of the moisture in the blast was ever fully recognized until Mr. Gayley called attention to it. At all events, he was the first to propose a practical remedy for the evils resulting from such frequent changes.

EVILS OF CHANGES IN BLAST COMPOSITION

The nature of these evils deserves here a preliminary word, especially because it affects profoundly the validity of all our theoretical calculations of heat economy, etc.

The influence of moisture in the blast may be summarized with sufficient accuracy for my present purpose, as consisting of two elements: (1) the effect of a useless constituent, diluting the effective oxygen of the air, and absorbing the heat in requiring the temperature of other materials; and (2) the effect of a constituent which, by its dissociation, absorbs heat in the hearth (where heat is most needed), and either, by the recombination of its elements, restores that heat in another part of the furnace (where it is neither needed nor desired) or else, through incomplete recombination (evidenced by the presence of free hydrogen in the furnace gas), fails to restore a part of the heat it has absorbed.

We are accustomed to determine the economy of the blast-furnace process by means of thermo-chemical equations and heat-balances, in which we take account of the composition, temperature, specific heat, heat of combination or separation, etc., of the materials entering the furnace, and the composition and temperature of the materials escaping from it. With due allowance for the incidental loss of heat by conduction and radiation, this method should be accurate, if the data upon which it rests are accurately determined. That it fails to give us a perfect criterion of our practice, is due, in my judgment, to the circumstance that it is necessarily based on averages, and assumes these averages to represent uniform conditions: such and

such a quantity, pressure and temperature of blast, composition of ore and flux, and quantity and grade of pig-iron produced. These data are usually averaged from considerable periods: in fact, the longer the period taken, the stronger the assumption of the trustworthy character of the calculation—an excellent rule for most purposes, since averages eliminate incidental variations. But when incidental variations are directly influential upon technical and commercial economy, it is not to be hastily assumed that they can counteract one another, so that the average result is equivalent to that of uniform conditions. Suppose, for instance, that a certain temporary change in one factor of the process would have an injurious technical or economical effect; and that a subsequent equal change in the contrary direction, would likewise have an injurious effect. Evidently, the net result would not be fairly represented by calculations based upon the average conditions of the period embracing both changes, and upon the assumption that they cancelled and neutralized each other.

SHORTCOMINGS OF THE HEAT-BALANCE

That this supposed case is not imaginary, I shall try to show. But first I would point out another defect in our usual method of stating the "heat-balance" of the blast-furnace. Our estimates of the utilization and the waste of heat may be practically fair enough, so far as the heat-requirements of reduction and fusion, and the loss of heat in slag and gases are concerned; but they are seldom based on accurate data as to the grade of the pig-iron actually produced. At least, so far as I now recall, the highest degree of accuracy in that respect does not go beyond a recognition of the general distinction between different grades, from foundry to white iron, or of the special heat-requirements of pig-iron of peculiar chemical composition (as to silica, sulphur, manganese, etc.). The statement that a given furnace is "running on" this or that grade of iron, and the use in calculation of the figures appropriate to that grade, seems to be the best that has been achieved in this regard. But a furnace "running on" a particular kind or grade of iron not only may, but in present practice invariably does, produce more or less iron of other grades (sometimes colloquially called "off-iron") the amount of which, sometimes even exceeding 50 per cent. of the total product, may seriously affect the value of our technical calculations of heat-economy, if these do not include it as a factor. I offer this suggestion as a partial explanation of the fact that such theoretical calculations do not always furnish a safe criterion of alleged or possible technical economies. The method is scientifically sound; but it is applied to data too roughly determined for such precise mathematical discussion. Many of us have heard of the distinguished engineer, of whom it was said

that in "duty-trials" of engines, he "would carry out to the third decimal place the determination of the weight of the ashes, while he guessed at the amount of coal shoveled into the fire-place." Possibly some such inconsistency may explain the hasty conclusion of some foreign experts that the reported technical economy of Mr. Gayley's process was "simply impossible."

COMMERCIAL ECONOMY

As regards commercial economy, on the other hand, there is no room for doubt or contradiction. If a blast-furnace is "running on" (i.e., managed with the purpose of producing) a particular kind of pig iron, and if Mr. Gayley's process will deliver it altogether, or to an unprecedented degree, from the risk of producing incidentally another kind, not called for, and probably not desired or readily salable at a profit, the commercial value of this insurance is beyond measurement by any technical formula that has been, or could be constructed. The case presented in Mr. Cook's paper on "Experience with the Gayley Dry Blast at the Warwick Furnaces," furnishes a striking illustration of this proposition. As already observed, the testimony from iron works both in the United States and abroad agrees in declaring that the Gayley process reduces the cost of pig iron about \$1 per ton; but this saving, though important, is trivial compared with the commercial advantage of a more effective control of the operation and product of the furnace. To state the case roughly, the Warwick company was caught, with innumerable others, in the financial revulsion of 1907, which stopped for a time the market-demand for pig iron. It had a profitable contract with solvent customers for iron of a special grade; but the old and almost dilapidated furnace, which it had kept in blast for the purposes of that contract was running so irregularly that only half—or less—of its product could be delivered under the contract, and the rest would have to be stored as not immediately salable, and, indeed, as never likely to be salable at a price covering the special expenses incurred for the purpose of producing the special and more costly grade of product for which the furnace had been burdened and operated. Under these circumstances, the interest on the capital represented by the "off-iron" would have exceeded the profits on the proportion of special iron deliverable under the specifications of the contract; and a prudent manager would have been obliged to accept the unwelcome alternative (adopted, in fact, by most of our American merchant furnaces) of sacrificing his pending contract, blowing out his furnace, and submitting to the losses in general expenses, interest, etc., and the even greater damage caused by the scattering of skilled and trusted workman, and the inability to take immediate advantage of a general revival of business,

or of a sudden special opportunity for a local resumption of work. These disastrous effects of a suspension of operations are, as I need scarcely say, those most dreaded by technical managers, since, besides their direct financial results, they involve the immeasurable anxiety and responsibility of subsequent reorganization.

ACTUAL RESULTS IN OPERATION

Fortunately for the Warwick company, it had just completed the installation of an expensive plant for the Gayley process; and by the operation of this plant, under all the disadvantages of new and untried apparatus, inexperience of both manager and workmen, and dilapidated condition of the furnace then in blast, enabled the company to raise the proportion of its immediately and profitably marketable product from below 50 to above 80 per cent.; to fill its pending contract; and to realize, instead of industrial demoralization and financial loss, a substantial profit from continued operations. Indeed, it is no secret that, through the total gains of this campaign, the entire cost of the installation of the Gayley system, including the sum paid for the patent right, was repaid in a few months, though the certified saving of \$1 per ton in the average cost of pig iron would not by any means have accomplished that result in so short a time.

The situation above described is one which any manager of a "merchant" blast furnace (i.e., a furnace selling its product to outside customers) may at any time encounter. But it carries a meaning also for establishments, like the works connected with the U. S. Steel Corporation and other great concerns, which have a use for the "off-iron" produced by their blast furnaces. For such "off-iron" could be manufactured at smaller expense than when it is turned out as an unwelcome by-product from a furnace charged and operated, at extra cost, to yield a more valuable product. In short, every blast-furnace manager knows that both technical and commercial economy, as well as relief from personal anxiety, would be secured if he could only be sure of making what he is trying to make.

BEARING UPON THE ELEMENT OF CERTAINTY

This brings us back to the inquiry, what is the bearing of Mr. Gayley's invention upon this desirable element of certainty, through complete and intelligent control, in the operation of the blast furnace?

As I have already observed, we have sought to secure such certainty through the minute analyses of all the raw materials, etc., except the air of the blast, which weighs more than all the rest put together. But when we come to consider this element, we perceive at once that it cannot be usefully analyzed like ore, flux or fuel. We cannot determine its composition and then store it, until we wish

to use it; and if we could analyze it as it enters our blowing engines, our knowledge would come too late to permit any effective action on our part, based upon such information. If we would attain that certainty of control which constitutes the perfection of an art, we cannot treat the air of the blast as we do all the other elements of the charge, which we regard as variables, to the character of which we adjust our practice. The air, most variable of all, cannot be thus dealt with. We must make it practically a constant. Mr. Gayley has shown us that the only way to do this is to freeze the moisture out of it. No attempts at vague amelioration by partial measures will meet the case. What we want is, first, to know just what we are putting into the furnace through the blast, and, secondly, how we can continue to do that particular thing practically without variation.

Mr. Gayley, after years of costly experiment, has shown us, for the first time, how to attain this object; and I am not surprised that leading ironmasters, in this country and abroad, have recognized this invention as the greatest advance in blast-furnace practice since the introduction of the hot blast by Neilson. It is scarcely too much to say that this invention, completing our mastery of conditions previously uncontrollable, has elevated the manufacture of pig iron from the category of processes which are partly art and partly accident to that of the true arts, which may be practiced with approximate scientific certainty.

Ontario Mineral and Metal Production

According to the Ontario Bureau of Mines the output of metals and minerals from mines and smelters in the Province for nine months ending Sept. 30 was as follows:

MINERAL PRODUCTION OF ONTARIO, JAN.-SEPT., 1908.

Substance.	Quantity.	Value.
Gold, oz.	1,738	\$ 40,796
Silver, oz.	12,223,834	6,141,090
Copper, tons.	5,892	837,559
Nickel, tons.	7,760	1,494,693
Pig iron, tons.	189,287	3,098,661
Arsenic, tons.	464	19,892
Cobalt, tons.	408	80,623
Iron ore, tons.	166,088	448,532
Iron pyrites, tons.	13,417	43,948
Total.....		\$12,205,795

In 1907 the production of white arsenic in Canada was 317 tons; hence it will be seen that the arsenic in the Cobalt ores is being utilized to a greater extent this year.

After the first of the year the use of metric weights and measures will be compulsory in the Philippine Islands.

The largest crushing equipment on the Rand under one roof is the Knights Deep-Simmer East mill; it consists of 400 stamps and seven tube mills.

Camp Alunite, a New Nevada Gold District

A New Camp in Lincoln County Situated and Mineralized Like the Goldfield District and Having Similarly Altered Rocks

BY ROBERT T. HILL*

Camp Alunite is the name which we have given to a new alunite locality which we found as a result of our prospecting in Lincoln county, Nev., 22 miles southeast of Las Vegas. The camp and its accompanying topography and geology do not appear upon any current map, although possibly indicated at the northwest corner of the old Mojave quadrangle of the U. S. Geological Survey. The mountains surrounding this camp, so far as known, have no names other than those here given them. The general geology and topography of the locality is entirely erroneous and misleading upon Wheeler's and other maps of the region.

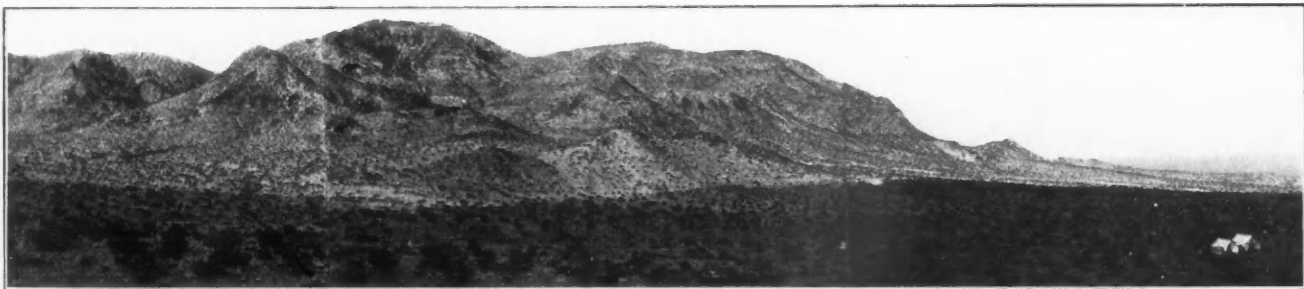
The locality is situated in a low volcanic cross-range, running in a north-east-southwest direction, or contrary to the normal trend of the larger north-south ranges of stratified sedimentary rocks (mostly Paleozoic) known as Charleston

Monzonite mountain, and consists of a long-crested and peaked ridge with salients leading toward the pass. This mountain is an eroded remnant of a once deep-seated laccolite or volcanic neck, which has been uncovered by erosion.

The mountain on the east may be termed Andesite mountain. It is a mass of eroded peaks, which terminate on the sides of the pass in sharply defined lines suggestive of fault scarps.

Railroad pass, the pass between the mountain in which Camp Alunite is located and which alone for our present purposes is considered as mineral ground, is a somewhat low, flat area connecting the desert areas which lie to the north and to the south of the range. Its surface drainage, mostly southwest, is largely desert "wash," through which here and there a few low ridges and hills of bedrock project.

colored rocks, which at first glance would appear to be entirely distinct species from the monzonites and andesites of adjacent mountains. To the eye these whitish and grayish rocks of the pass at the localities mentioned might be easily mistaken for rhyolite and some other light-colored volcanic rock, and are usually called rhyolite on first observation. When thinly sliced and studied under the microscope, however, it is seen that these rocks are mostly the same species as the dark-colored andesites and monzonites of Andesite and Monzonite mountains and that their entirely different color is due to the intense and peculiar alteration which their original feldspar minerals have undergone, being converted into kaolinite and alunite minerals. The nature of this alteration, produced by hot, ascending, acidic, volcanic, mineralized vapors, especially the occurrence of alunite, is the key and guide



CAMP ALUNITE, UNALTERED MOUNTAIN OF ANDESITE IN BACK-GROUND. WHITE HILL IN FOREGROUND AND DISTANT HILLS ON RIGHT, ALUNITIZED

(Spring mountain) and El Dorado ranges. There is a low gap or pass in this cross-range of mountains, known as Railroad pass, which is clearly visible to the southeast from Las Vegas. This pass is the site of the mining prospects here described.

TOPOGRAPHY

The range is a comparatively low, narrow ridge, probably less than 1000 ft. above the pass, rising to altitudes of 4000 to 5000 ft. above the sea. It is composed, so far as studied, exclusively of igneous rocks, which apparently differ in kind from one another in the mountains to the east and west of the pass and apparently within the pass itself.

The two portions of the range to the west and east of the pass differ somewhat in details of configuration and geologic material. The portion to the west is called

ROCKS OF CAMP ALUNITE

Our studies at Camp Alunite have not progressed to the point where we can fully discuss or describe all of the rock species, but according to microscopic determination the chief rocks are biotite monzonite, latites and andesites. The monzonite occurs in the mass of Monzonite mountain to the west of the pass, in Big Butte, and in one or two isolated localities. For the present we are considering the area of the main Monzonite mountain as nonmineralized ground, although gold occurs in it, and it has been extensively located and prospected in times past. The unaltered andesites and latite are found in Andesite mountain to the east of the pass, which, like Monzonite mountain, for the present, is not included in the area of expected value.

The area of the pass between Monzonite and Andesite mountains (Alunite and Homestake ground) is underlain by peculiar-looking white and gray, or red

to the mineral occurrence, as will be described later on.

These altered rocks, in the area of the pass, are those wherein valuable mineral is expected to be found and which are the present objects of interest. These rocks are exposed here and there in gullies, ridges and low conical hills in the pass and on the edge of the plain to the southward. They also outcrop in many places along the base of Andesite mountain, in direct contact and contrast with the black andesite of the mountain.

Near the northern end of the pass is a low, white, three-pointed hill (Alunite hill). The two southern cusps or points are of intensely silicified rock, which is a fine-grained quartz, resembling very much the honestone of commerce. It is surrounded by and passes into a white, intensely altered and decomposed material, resembling the talc and kaolin of the miners. Occasionally there is a little iron stain, but this is comparatively feeble.

*Mining geologist, 25 Broad street, New York.

At the foot of the south end of Andesite mountain, extending in an east-west direction for 2500 ft., and in line with and allied to Alunite hill, there is a row of five peculiar tepe-shaped white hills composed of the whitish material above described. Between these hills and the main mass of Alunite mountain is a great "foot-wall," an east-west fault zone, running along the east side of the pass. These hills are aligned with Alunite hill and probably collectively constitute a belt or zone of similar conditions.

There are also many little areas of bedrock exposed in the pass where the wash has eroded down to bedrock, showing that a broad belt extending through the whole pass is underlain by these altered rocks.

In the southern half of the pass and the plain southward there are several elongated ridges of the grayish-white rock which appear as low erosion divides between arroyos. These are from 20 to 50 ft. high, and have a north-south axial direction. When closely examined the ridges are seen to be intensely indurated, and the apexes or combs are found to be north-south fracture lines which have been hardened by silicification along the fractures, removed the softer altered material alongside these ridges, leaving them a little higher than the adjacent ground.

These little ridges, the Silverspoon, Long Ridge, Homestake and others, have a north-south strike directly toward the belt of white hills, above described.

STRUCTURE

The configuration of Alunite pass, the rock alternation and mineralization and the former extrusion of volcanic vapors at this site, is largely due to the intense fracturing, faulting and cross-faulting, of which this locality seems to have been a focus of intersections and which permitted the ascent of the mineralizing volcanic vapors.

The main west of north-east of south direction of the pass conforms in general to a great fault zone along which the andesite mountain has suffered great downthrow against the monzonite area to the west. Still another strong set of fracturing in a north-south direction is seen in the fractures along the combs of the silicified ridges and in the adjacent Andesite and Monzonite mountains. This is a zone of intense fracturing, and its effects are seen in many details. A strong east-west fault zone is also present, as seen at the south end of Andesite mountain, and cuts directly through the pass. There are also complimentary northeast-southwest fracture lines.

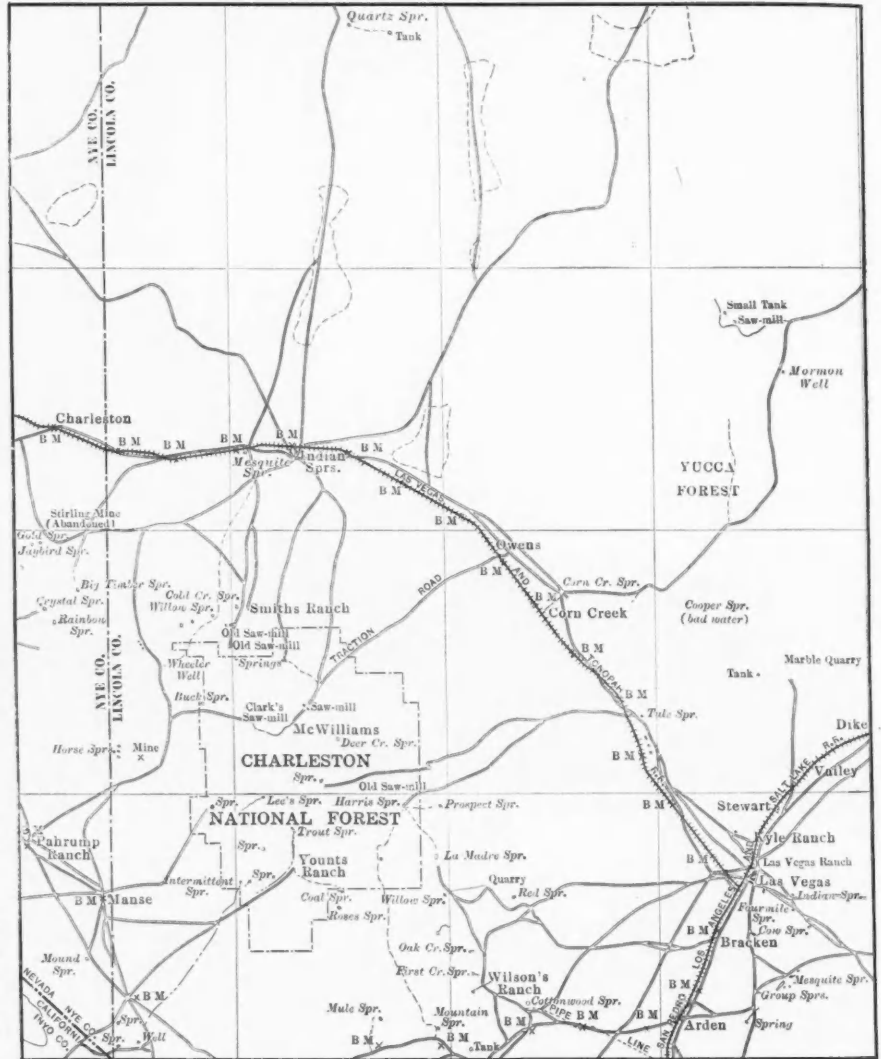
This intense faulting and fracturing is actually seen and mapped in many places within the pass, even though in some areas the fractures are lost in the soft altered ground, or veneered by wash. An accompaniment of this faulting is the occurrence of many strong minor intersection points, which, as mining men know, are most

favorable localities for the finding of ore-bodies.

In general, the pass is an area of intersection of the three major Nevada fault systems accompanied by many minor intersections; and it was this condition of structure which permitted the ascension of the volcanic vapors (fumarolic or solfataric) which altered the dark andesite into the white rocks described, and introduced the mineralization, as will be further explained.

are: a small proportion of silver (detected in the assays), small patches of copper resembling bornite, pyrite (oxidized) and magnetite. Bismuthinite and sylvanite have also been reported, but not yet confirmed. These accessory minerals in kind, association and mode of occurrence are similar to those at Goldfield.

The studies and deductions by Dr. F. L. Ransome, of the United States Geological Survey at Goldfield,¹ have shown the close relationship in genesis and occur-



MAP OF LAS VEGAS, NEVADA, AND VICINITY

MINERALIZATION

The surface at Camp Alunite shows gold values upon many of the claims located. In fact, no portion of the surface seems void of traces of gold. The assays ran from 40c. to \$26 per ton. These assays are very similar in value to those originally found at the surface at Goldfield, where rich ore did not occur at the surface, but in the unleached zone below; the preliminary assays are as high as anticipated or desired in the type of mineralization here described.

The accompanying or accessory minerals thus far noted at the surface at Alunite

rences of the mineral alunite to the gold ores of that camp. Concerning the occurrence of this mineral he says: "The recognition of alunite as a characteristic constituent of the Goldfield ores, and the demonstration of its genetic relation to them establishes a new type, that of alunitic and kaolinitic gold quartz veins. It is not believed that the Goldfield district is unique in the possession of this type. Other examples are likely to be found

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

among the great number of ore deposits associated with Tertiary volcanism."

SIGNIFICANCE OF ALUNITE

In view of the general resemblance of the altered rocks of Camp Alunite, we collected and had studied microscopically and chemically specimens of all the altered and gold assaying rocks of the camp. These studies were made by the firm of Washington & Lewis. They discovered that in all of the altered rocks from the mineralized zone of the pass at Camp Alunite, alunite was either present, abundant, or apparent. Concerning the rocks of Homestake hill "much alunite" was reported; others in the center of the field "mostly alunite" (57 per cent.). These determinations were from the two

scientific interest and possibly much economic significance.

From this resemblance and the actual occurrence of gold we have strong reason for believing that Camp Alunite, when developed, will show in depth ores similar in origin to those of Goldfield. Whether they will be similar in value development alone can tell, and Camp Alunite may now be defined as a Nevada mineralized locality of the Goldfield-Alunite type.

The igneous rocks at Alunite do not present the same succession as at Goldfield, nor can the andesites be correlated with the earlier or later andesites elsewhere separated, nor is the matter material, inasmuch as the andesite is alunitized and mineralized and that is the chief point of economic interest.

strongly resemble those of Goldfield than any other locality; in fact, it is the only known spot in Nevada approximating it, although others may be found. The two localities in essential conditions present many strong points of resemblance.

In order to more fully appreciate the significance of the prospects at Camp Alunite, one should be thoroughly acquainted with the conditions and occurrences at Goldfield, as published in scattered and somewhat inaccessible literature, especially the researches of Dr. Ransome, which I have summarized in earlier articles.

In general, Camp Alunite presents the following points of resemblance to Goldfield, which justify our expenditures in development of the camp in the expectation of finding similar returns of gold:

(1) *Similar Topographic Aspects Due to Similar Geologic Causes*—The Goldfield pay ground is located in a low pass or plain between two adjacent mountains, as at Camp Alunite. These passes are at both places developed in areas of shattered and altered rock due to extensive faulting and rock softening by solfataric metamorphism. At Goldfield the ore was found at the surface as an enriched portion of one or two low ridges of quartzose rock in the valley plain. Some of the ridges of the southern part of the Alunite field resemble those of Goldfield, as seen in the accompanying figures.

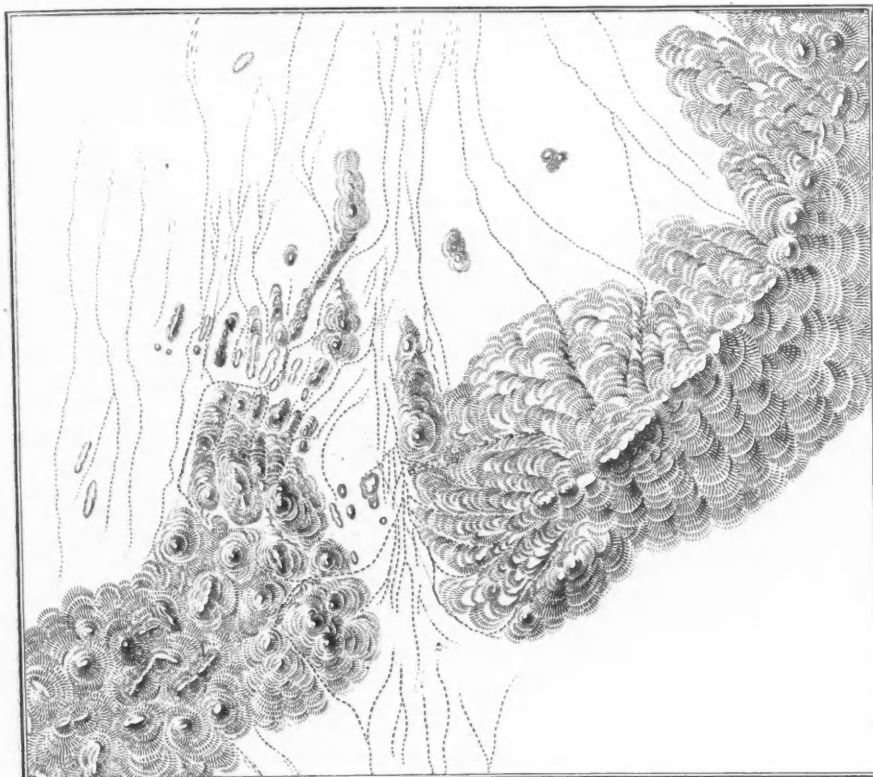
(2) *Similarity of Geological Aspects*—Both areas consist of andesite lava flows, which have been intensely changed and altered by ascending solfataric volcanic vapors. Both areas are fractured and faulted by intersecting faults.

(3) *Similarity of Alteration Products*—The rocks of both areas are altered into similar rocks by similar action of the ascending hot volcanic vapors, resulting in the production of similar alteration products, kaolinized, gypsumized and alunitized rocks, especially alunite, which is known in Nevada in only these two localities; also the similar alteration of quartz into the same kind of semi-flinty stone.

(4) *Similar Character of Introduced Mineralization*—Under this classification may be included the same character and occurrence of gold at the surface; the similar feeble ferrugination of the outcrops; the similar accessory minerals in similar proportions, silver and copper, and probably bismuthinite, and tellurium.

DEVELOPMENT WORK AT CAMP ALUNITE

The foregoing account of Camp Alunite describes the conditions which we have selected for the purposes of making a scientific attempt to locate oreshoots. Since the acquirement of the properties on Sept. 1 the sites for five shafts have been determined by the structure, pinnings and assays of the outcrops. Each of the shafts at the present writing has progressed to a depth of 50 ft., and all the conditions en-



RAILROAD PASS, NEVADA, SHOWING FAULT ZONES INTERSECTING IN PASS

ends and center of the altered ground of the pass and indicate that the whole belt, which is of similar rock, is alunitized. The proportions of alunite varied from 1 to 57 per cent. of the mass of the material studied. In the monzonite areas the percentage was small, but large in the areas of the altered andesites.

These microscopic determinations in connection with the actual occurrence of gold in these rocks demonstrated beyond all doubt that we had found a new alunite gold locality in Nevada, and the only one thus far discovered except Goldfield. It is apparent, from Ransome's careful studies of Goldfield and the significant association of gold with alunite in that camp, that the discovery of a second alunite gold locality in Nevada is of great

It is the feldspar in both the andesite and dacite rocks which alters into alunite and affords the matrix for the gold introduction, inasmuch as these feldspars are the same in both plain andesite and dacite-andesite the absence of dacite at Camp Alunite is not necessarily of significance. The andesite of the pass is altered, mineralized and alunitized exactly like the dacite and andesite at Goldfield, and that fact is the all-important point.

GOLDFIELD AND CAMP ALUNITE

The details at the various localities of mineralization in Nevada differ very much at different camps as at Tonopah, Goldfield, Rhyolite and Searchlight, but the conditions of the geology, topography and mineralization of Camp Alunite more

countered so far justify our faith in the experiment. The work of organizing, equipping and mining in camp in Nevada, should be the subject of a separate story.

It is hardly necessary to say that no stock of the Alunite Mining Company is for sale, or will be placed upon the market, and that the money for the experiment was raised entirely from private resources. If the experiment succeeds, its backers will be abundantly rewarded; if it fails, there will be no complaints from a dissatisfied public.

DuPont Blasting Gelatin

In driving adits, drifts and tunnels, great trouble is often experienced in bringing the cut even when the cut holes are loaded with 60-per cent. dynamite. In overcoming this trouble, the new explosive, DuPont blasting gelatin, has been

4 to 7 cartridges of 1¼x8-in. blasting gelatin in the bottom and 6 or 7 cartridges of 1½x8-in. 60-per cent. gelatin dynamite on top, placing a quintuple detonator in the top of the blasting-gelatin charge and tamping the hole to the collar, the cut holes could be broken to the bottom by blasting twice. The first charge broke out about half the depth of the hole and chambered the bottom so that 15 to 20 cartridges of 60-per cent. gelatin dynamite could be got into the bottom chamber where the two holes met. As this second charge is directly behind the center of the cut and one-half the ground is already broken, little trouble has been experienced in bringing the remainder of the cut. Occasionally one stick of blasting gelatin was used in the "relief-cut" holes but usually a charge of 60-per cent. gelatin dynamite was all that these holes required. The rest of the round was charged with 50-per cent. gelatin dynamite.



SILICIFIED RIDGES AND ALUNITIZED GROUND, CAMP ALUNITE

found satisfactory at the Cripple Creek drainage adit.

When A. E. Carlton began to drive this adit in February, 1908, he found it difficult to blast two rounds in a face in 24 hours owing to the fact that the cut holes had to be blasted several times. These were drilled 10 ft. deep in the granite country rock, being started 2½ ft. to either side of the center line of the adit and made to almost meet at their bottoms. Heavy charges of 60-per cent. gelatin dynamite were used in the cut holes for some months, but without very satisfactory results for up to September the best monthly advance was 301 ft. At that time Mr. Carlton decided to try Du Pont blasting gelatin; so the holes were loaded with approximately the same amount of blasting gelatin as formerly had been used of gelatin dynamite, and fired. The effect of this explosive was so much greater than that of the gelatin dynamite that great havoc resulted. Finally by experiment it was found that by loading

By this method of loading the holes 353 ft. was driven in September or an increase of 17 per cent. over the best previous work. While the blasting gelatin costs somewhat more than gelatin dynamite, the smaller amount of explosive required offset this, and the cost for explosives was approximately the same. In October the work showed considerably better results than those for September. This new explosive, the DuPont blasting gelatin, has a strength of practically 100 per cent. Apparently it will have considerable usefulness where a quick shattering explosive is required.

Although in Mexico electrically driven stamp mills (20 stamps in a unit and each 10 stamps driven by a separate belt from the unit-line shaft) are common, especially at Guanajuato, Pachuca and El Oro, in South Africa the use of individual electric motors for driving separately the line shafts of each unit is causing much discussion.

Iron and Steel in Russia

We are indebted to the American Iron and Steel Association for figures of the iron industry in Russia for a series of years, compiled chiefly from official sources.

IRON ORE

The production of iron in 1904 was 5,160,990 metric tons, the largest ever reported. In 1905 it was 4,942,182 tons; in 1906 it was 3,873,356; and in 1907 it was 4,227,419 tons. The production last year showed an increase of 354,063 tons over 1906, but was 933,571 tons less than that of 1904. The exports of iron ore from South Russia to Germany increased from 373,000 tons in 1905 to 535,000 in 1906, and 1,613,000 tons in 1907.

The exports of manganese ore from Poti, in the Caucasus were 464,016 tons in 1906, and 881,322 in 1907; an increase of 417,306 tons.

PIG IRON

The output of pig iron has been almost stationary for several years, decreasing slightly from the maximum reached in 1904. In that year the total was 2,950,651 metric tons. In 1905 it was 2,713,674 tons; in 1906 it was 2,691,606 tons; and in 1907 it was 2,820,604 tons. The make last year exceeded that of 1906 by 128,998 tons, but it was less than that of 1904 by 130,047 tons. Pig iron reported includes castings made direct from the blast furnace.

STEEL

The production of steel for two years past compares as follows:

	1907.	1908.	Changes.
Converter.....	402,268	524,786	I. 122,518
Open-hearth.....	2,046,935	2,129,503	I. 82,568
Crucible, etc.....	193,824	168,739	D. 25,085
Total.....	2,643,027	2,823,028	I. 180,001

The total steel made by all processes was 3,034,911 tons in 1904, and 2,751,930 in 1905. The total for 1907 was 180,001 tons more than in 1906, but 211,883 tons less than in 1904. The steel rails made in 1904 were 401,668 tons; 358,499 tons in 1905; 271,739 tons in 1906; and 311,806 tons last year.

The H. W. Johns-Manville Company, of New York, is introducing a chemical compound, called Leak-No, which resembles powdered iron, and when mixed with water and applied like putty to cracks, or other defects, in iron or steel articles, metallizes and becomes a permanent part of the article to which it is applied. When hard it much resembles iron in color. The manufacturers offer to refund the purchase price in case it fails to stop any ordinary leak in anything made of iron or steel against any pressure of oil, steam, gas, air, ammonia, or water; and to stand any heat or chemicals that iron will stand, when applied according to directions.

Fatal Accidents in Coal Mines of America

Over 3000 Persons Were Killed in Coal Mining Operations in 1907 and 20,000 Lives Have Been Lost During the Last Decade

BY FREDERICK L. HOFFMAN*

During 1907 more miners were killed in the coal mines of North America, in proportion to the number employed, than during any single year of the last quarter century since the facts have been made a matter of accurate and official record. Among an average number of 673,657 coal miners in North America, there occurred

to the period of time intervening between the occurrence of the accidents and the final presentation of the totals in the usual form. The subject is certainly one in which the public at large has a vital interest which demands that the statistics should be made public within not more than three months after the close of the

and considering the vast extent of the coal-mining industry, the interest is certainly of equal importance to that of railway transportation.

Table I exhibits in detail, for twenty-one States, Territories and Provinces, the number of persons killed by accident in the coal mines of North America during the ten-year period ending with 1907, except as otherwise stated on account of the impossibility of securing the necessary information. Coal is mined in certain States for which as yet the information is not available for a period of some length, and which it has not been thought advisable, for that reason, to include in the present tabulation, but in the course of years it is to be hoped that all the coal-mining States can be included in the annual summary and that the returns will be furnished at a sufficiently early date to make it possible to publish comparative statistics during the middle of the year. If allowance is made for the States for which information is not at present available, it is practically certain that during 1907 over 3000 persons were killed in coal-mining operations in North America, and that during the ten-year period ending with 1907 more than 20,000 lives have been lost on this account.

Table II shows the fatality rate in coal

TABLE I. NUMBER OF PERSONS KILLED BY ACCIDENTS IN COAL MINES OF NORTH AMERICA, 1898-1907.

	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1898-1907
Ala.	45	40	37	41	50	57	84	185	96	154 ^a	789
Colo.	24	41	29	55	73	40	89	59	88	99	597
Ill. <i>f</i>	75	84	94	99	99	156	157	199	155	165	1,283
Ind.	22	16	18	24	24	55	34	47	31	53	324
Ind. Ter.	17	25	40	44	60	33	30	44	39	32	364
Ia. <i>f</i>	26	20	29	26	55	21	31	24	37	35	304
Kan.	17	16	22	26	27	36	160	36	30	32	258
Ky.	6	7	17	21	19	25	19	31	39	32	216
Md.	4	5	7	12	11	13	12	13	7	^e	84
Mich.		4 ^a	10	6	6	8	7	8	6	7	62
Mo.	9	14	10	15	10	17	11	11	16 ^d	8	121
N. Mex. <i>f</i>	7	15	15	9	17	17	15	5	9	31	140
Ohio.	52	57	68	72	81	114	118	131	127	153	973
Pa. <i>a</i>	411	461	411	513	300	518	595	644	557	708	5,118
Pa. <i>b</i>	199	258	265	301	456	402	536	479	477	806	4,179
Tenn.	19	20	10	53	226	26	28	29	33	31	475
Utah.	3		209	10	8	7	9	7	7	8	268
Wash.	9	45	33	27	34	25	31	13	13 ^d	36	266
W. Va. <i>f</i>	90	89	141	134	120	159	140	194	268	356	1,691
Br. Col.	7	11	17	102	139	42	37	12	15	31	413
Nova Scot.	7	19	21	14	19	31	19	20	28	35	213
Total deaths.	1,049	1,247	1,503	1,604	1,834	1,802	2,018	2,191	2,078	2,812	18,138

^a Six months only.
^b Six months only.
^c Underground accidents only.
^d Nine months only.
^e Returns not available.
^f Statistics are for the year ended June 30, 1907.

2812 deaths from accident, or 4.17 per 1000 employed. This rate contrasts with 3.16 per 1000 for 1906, and 3.33 for the ten-year period ending with December 31, 1907. The statistical tabulation for 1907 is, unfortunately, incomplete and does not include a number of states for which the returns could not be secured. Although the publication of this article was delayed for several months to secure the information, the effort proved fruitless.

Since the tabulation of statistical facts of coal-mining accidents is very simple, there appears to be no good reason why the publication of such statistics should be unduly delayed for more than a year after their occurrence. If the State laws are defective with respect to the early publication of this information, they should be amended to make it mandatory upon the inspectors to give publicity at the earliest possible date to a summary statement of the facts as they have been made a matter of official record. The practical value of such information is materially increased by the earliest possible publication, and diminished in proportion

TABLE II. FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA, 1898-1907. RATIO OF PERSONS KILLED PER 1000 EMPLOYED.

	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1898-1907
Ala.	4.55	3.10	2.59	2.90	2.79	2.94	4.71	10.74	5.23	7.61	4.87
Colo.	3.23	5.60	3.99	6.88	8.11	3.89	8.26	4.96 ^c	7.32	7.67	6.16
Ill. <i>f</i>	2.14	2.27	2.39	2.24	2.15	3.13	2.87	3.36	2.49	2.47	2.60
Ind.	2.63	2.07	1.82	1.98	1.83	3.64	2.70	2.53	1.61	2.79	2.30
Ind. Ter.	4.82	6.24	7.59	8.35	9.62	5.42	3.63	5.76	4.81	4.15	5.86
Ia. <i>f</i>	3.38	2.49	2.22	1.97	4.23	1.59	1.90	1.36	2.20	2.05	2.24
Kan.	1.95	1.57	2.06	2.28	2.70	3.61	3.09 ^b	2.97	2.95	2.67	2.54
Ky.	0.67	0.83	2.06	2.14	1.58	1.85	1.37	2.06	2.33	1.82	1.74
Md.	0.89	1.08	1.32	2.23	1.99	2.29	2.11	2.09	1.13	^e	1.71
Mich.		4.88 ^a	6.11	3.26	4.24	2.54	2.58	2.93	2.83	2.43	3.06
Mo.	1.22	1.80	1.31	1.63	1.09	1.85	1.47	1.06	1.65 ^d	0.73	1.41
N. Mex. <i>f</i>	3.71	7.98	7.44	4.81	10.11	7.26	7.61	2.35	3.82	10.13	6.61
Ohio.	1.77	2.03	2.14	2.15	2.16	2.75	2.57	2.96	2.73	3.20	2.52
Pa. <i>a</i>	2.89	3.28	2.86	3.47	2.03	3.41	3.69	3.83	3.35	4.19	3.33
Pa. <i>b</i>	2.27	2.82	2.43	2.56	3.37	2.65	3.44	2.90	2.76	4.40	3.05
Tenn.	2.43	2.60	1.15	6.10	25.80	2.69	2.81	2.38	3.07	2.79	4.98
Utah.	4.38		138.96	5.81	3.24	3.21	4.06	5.14	3.69	3.07	15.04
Wash.	2.70	13.60	7.79	5.59	7.83	5.13	6.69	2.73	2.52 ^d	6.04	5.85
W. Va. <i>f</i>	3.86	3.55	5.03	4.14	3.78	4.03	3.08	4.24	4.98	6.92	4.49
Br. Col.	2.34	2.91	4.22	25.67	34.65	9.85	8.31	2.72	3.12	5.12	9.66
Nova Scot.	1.56	3.39	3.17	1.83	2.36	2.79	1.63	1.86	2.31	2.89	2.36
Average.	2.59	2.98	3.25	3.24	3.49	3.14	3.37	3.44	3.16	4.17	3.33

^a Six months only.
^b Six months only.
^c Underground accidents.
^d Nine months only.
^e Returns not available.
^f Statistics are for the year ended June 30, 1907.

calendar year. In fact, it would be a decided improvement if quarterly reports of coal-mining accidents were published, in conformity to the methods adopted by the Interstate Commerce Commission,

mines in the United States and Canada, calculated upon the usual basis of the number employed. The fatal accident rate for 1907 for the entire coalfield of North America was 4.17 per 1000 against

*Statistician, Prudential Insurance Company of America, Newark, N. J.

an average of 3.33 for the entire decade. The excess in the fatality rate is in remarkable contrast to former experience and foreshadows the possibility of even more serious and disastrous experiences in the future than have become a matter of record in the past. During 1907 the fatality rate was above the average for the ten-year period as a whole in the States of Alabama, Colorado, Indiana, Kansas, New Mexico, Pennsylvania (anthracite), Pennsylvania (bituminous), Washington, West Virginia, and Nova Scotia. The rates were below the average in Illinois, Indian Territory, Iowa, Michigan, Missouri, Utah and British Columbia. The highest rate during the year prevailed in New Mexico, where it attained to 10.13 per 1000 against an average of 6.61 during the decade, followed by Colorado with

dent rate, under normal conditions, should not exceed 2 per 1000, it is nevertheless a safe assumption, based upon world-wide experience, that such a rate is not incompatible with the conditions under which coal-mining operations, combining a high degree of productive activity with comparative safety, can be carried on.

Table IV affords a means of convenient comparison of the fatality rate in coal mining during 1907 with that of previous years, showing the number of employees, the number of miners killed, and the rate per 1000 employed, for each of the years 1893-1907. The table shows that while the rate during the first five years of the period was 2.56, it increased to 3.14 during the next five years, and to 3.47 per 1000 during the last quinquennial period. The table discloses a distinct tendency

The foregoing statistical data suggest a comparison with the corresponding fatality rates of other coal-mining countries throughout the world. While all international comparisons are subject to the risk of serious error in the interpretation of statistical tabulation based upon possibly widely varying methods in accident notation and registration, the risk of error is reduced to a minimum in the case of fatal accidents, to which the present comparison is limited on account of the more serious difficulty in eliminating the risk of error in comparative tabulations of non-fatal accidents. The wide attention which the subject of coal-mining accidents has attracted during the past few years, leading to a special government investigation into coal-mine accidents, their causes and prevention, and the publication of a considerable amount of useful and suggestive data, warrants the inclusion in this article of a series of tables derived from official sources, exhibiting the degree of fatal accident frequency in the principal coal-mining countries of the world.

Table V exhibits in detail the number of persons killed by accident in the bituminous coal mines of Austria during the decade ending with 1906.

TABLE III. FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA. COMPARISON OF 1907 WITH THE FIVE PREVIOUS YEARS.

	NUMBER PERSONS KILLED, YEARLY AVERAGE.		RATE PER 1000 EMPLOYED.		Rate of Increase or Decrease per 1000 Employed.
	1902-06.	1907.	1902-06.	1907.	
Ala.	94	154	5.21	7.61	+2.50
Colo.	70	99	6.46	7.67	+1.21
Ill. c.	153	165	2.82	2.47	-0.35
Ind.	38	53	2.43	2.79	+0.36
Ind. Ter.	41	32	5.67	4.15	-1.52
Ia. c.	34	35	2.18	2.05	-0.13
Kan.	29 ^a	32	2.99	2.67	-0.32
Ky.	27	32	1.87	1.82	-0.05
Md.	11	*	1.91	*	
Mich.	7	7	2.67	2.43	-0.24
Mo.	13 ^b	8	1.34 ^b	0.73	-0.61
N. Mex. c.	13	31	6.01	10.13	+4.12
Ohio	114	153	2.65	3.20	+0.55
Pa. a.	523	708	3.29	4.19	+0.90
Pa. b.	470	806	3.01	4.40	+1.39
Tenn.	68	31	6.66	2.79	-3.87
Utah	8	8	3.75	3.07	-0.68
Wash.	23	36	4.88	6.04	+1.16
W. Va. c.	176	356	4.07	6.92	+2.85
Br. Col.	49	31	11.17	5.12	-6.05
Nova Scot.	23	35	2.18	2.89	+0.71
	1985	2812	3.31	4.17	+0.86

* Returns not available.

^a Four and one-half years only.

^b Four years and nine months only.

^c Statistics are for the year ended June 30, 1907.

7.67, Alabama with 7.61. West Virginia with 6.92, and Washington with 6.04 per 1000.

Table III exhibits the fatal accidents in coal mines during 1907, compared with the average for the preceding five years, both upon the basis of actual numbers and the rate per 1000 employed. The States showing an increase in the rate during 1907, compared with the preceding five years, were Alabama, Colorado, Indiana, New Mexico, Ohio, Pennsylvania (anthracite), Pennsylvania (bituminous), Washington, West Virginia and Nova Scotia. The net increase in the rate was 0.86 per 1000. Of all the States and Territories under review, only two (Missouri and Kentucky), during 1907 returned a fatality rate of less than 2 per 1000. In the case of all the other States and Territories the rates exceeded 2 per 1000, and in the case of eleven States and Territories the rates were above 3 per 1000. While this experience would appear to disprove the rule laid down in former years, that the coal-mining acci-

TABLE IV. FIFTEEN-YEAR RECORD OF FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA, 1893-1907.

	Employees.	Number Killed.	Ratio per 1000 Employed.
1893	382,133	965	2.53
94	385,579	957	2.48
95	395,549	1,057	2.67
96	401,874	1,120	2.79
97	405,433	947	2.34
98	405,600	1,049	2.59
99	417,415	1,247	2.98
00	462,308	1,503	3.25
01	494,367	1,604	3.24
02	525,443	1,834	3.49
03	574,210	1,802	3.14
04	598,856	2,018	3.37
05	637,522	2,191	3.44
06	658,189	2,078	3.16
07	673,657	2,812	4.17
1893-97	1,970,568	5,046	2.56
1898-02	2,305,133	7,237	3.14
1903-07	3,142,434	10,901	3.47
1893-07	7,418,135	23,184	3.13

toward a greater average accident liability, and as previously stated, never during our coal-mining history, as far as the records enable us to judge, has the rate attained to the high proportion of 4.17 recorded for the year 1907.

TABLE V. FATAL ACCIDENTS IN BITUMINOUS COAL MINES OF AUSTRIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	58,067	55	0.95
1898	60,809	55	0.90
1899	62,943	68	1.08
1900	67,461	61	0.90
1901	70,344	84	1.19
1902	66,582	72	1.08
1903	66,663	49	0.74
1904	66,507	61	0.92
1905	66,072	96	1.45
1906	68,115	70	1.03
1897-01	319,624	323	1.01
1902-06	333,939	348	1.04
1897-06	653,563	671	1.03

During the period under observation the rate has been as high as 1.45 per 1000 and as low as 0.74, but comparing the latter five-year period with the former the rates have remained practically the same, or 1.04 and 1.01, respectively. The aver-

age rate for the decade was 1.03 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907, there would have been 694 deaths from accident instead of 2812 actually recorded.

Table VI exhibits in detail the number of persons killed by accident in the brown-coal mines of Austria during the decade ending with 1906.

TABLE VI. FATAL ACCIDENTS IN BROWN COAL MINES OF AUSTRIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	48,084	94	1.95
1898	49,690	87	1.75
1899	50,790	88	1.73
1900	54,473	163	2.99
1901	59,591	97	1.63
1902	56,269	124	2.20
1903	55,065	54	0.98
1904	52,732	49	0.93
1905	53,189	87	1.64
1906	53,064	85	1.60
1897-01	262,628	529	2.01
1902-06	270,319	399	1.48
1897-06	532,947	928	1.74

During the period under observation the rate has been as high as 2.99 per 1000 and as low as 0.93, but comparing the latter five-year period with the former, there has been an increase in the rate from 1.48 to 2.01 per 1000. The average rate for the decade was 1.74 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1172 deaths from accident instead of 2812 actually recorded.

Table VII exhibits in detail the number of persons killed by accident in the coal mines of Belgium during the decade ending with 1906.

TABLE VII. FATAL ACCIDENTS IN COAL MINES OF BELGIUM.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	120,382	124	1.03
1898	122,846	172	1.40
1899	125,258	121	0.97
1900	132,749	140	1.05
1901	134,092	157	1.17
1902	134,889	144	1.07
1903	139,592	159	1.14
1904	138,567	129	0.93
1905	134,747	123	0.91
1906	139,394	132	0.95
1897-01	635,327	714	1.12
1902-06	687,189	687	1.00
1897-06	1,322,516	1,401	1.06

During the period under observation the rate has been as high as 1.40 per 1000 and as low as 0.91, but comparing the latter five-year period with the former, there has been a decrease in the rate from 1.12 to 1 per 1000 during the latter quinquennial period. The average rate for the decade was 1.06 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 714 deaths from accident instead of 2812 actually recorded.

Table VIII exhibits in detail the number of persons killed by accident in the coal mines of France during the decade ending with 1906.

TABLE VIII. FATAL ACCIDENTS IN COAL MINES OF FRANCE.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	143,401	153	1.07
1898	148,626	159	1.07
1899	153,925	208	1.35
1900	162,079	230	1.42
1901	163,796	198	1.21
1902	164,810	180	1.09
1903	167,213	170	1.02
1904	171,792	184	1.07
1905	175,104	182	1.04
1906	178,431	1,280	7.17
1897-01	771,827	948	1.23
1902-06	857,350	1,996	2.33
1897-06	1,629,177	2,944	1.81

During the period under observation the rate has been as high as 7.17 per 1000 and as low as 1.02. The high rate during 1906 was due to the exceptional accident at the Courrieres mine, which caused a loss of approximately 1000 lives and which is without parallel in the mining history of the world. As the result of this accident there has been a material increase in the average death rate during the last five years as compared with the first five, or from 1.23 to 2.33 per 1000. Even when this remarkable accident is included, however, the average fatality rate during the 10-year period was only 1.81, and had this rate prevailed in the coal mines of North America during 1907 there would have been 1219 deaths from accident instead of 2812 actually recorded.

Table IX exhibits in detail the number of persons killed by accident in the coal mines of India during the nine years ending with 1906.

TABLE IX. FATAL ACCIDENTS IN COAL MINES OF INDIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1898	62,905	43	0.68
1899	74,285	98	1.32
1900	90,409	64	0.71
1901	95,309	70	0.73
1902	98,902	77	0.78
1903	86,138	97	1.13
1904	92,993	67	0.72
1905	89,991	60	0.67
1906	99,138	100	1.01
1898-01	322,908	275	0.85
1902-06	467,162	401	0.86
1898-1906	790,070	676	0.86

During the period under observation the rate has been as high as 1.32 per 1000 and as low as 0.67. There has been a very slight increase in the rate, from 0.85 per 1000 during the first four years to 0.86 during the last five years. The average rate for the nine years was 0.86 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907, there would have been 579 deaths

from accident instead of 2812 actually recorded.

Table X exhibits in detail the number of persons killed by accident in the coal mines of Natal during the decade ending with 1906.

TABLE X. FATAL ACCIDENTS IN COAL MINES OF NATAL.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	1,560	7	4.49
1898	2,723	9	3.31
1899	2,044	11	5.38
1900	1,602	1	0.62
1901	3,397	43	12.66
1902	3,850	16	4.16
1903	4,405	13	2.95
1904	4,792	16	3.34
1905	5,650	22	3.89
1906	6,059	39*	6.44
1897-01	11,326	71	6.27
1902-06	24,756	106	4.28
1897-06	36,082	177	4.91

During the period under observation the rate has been as high as 12.66 per 1000 in 1901 and as low as 0.62 in 1900, showing remarkable fluctuations. The rates were very high during most of the years, but comparing the latter five years with the former, there has been a decrease from 6.27 to 4.28 per 1000. The average rate during the period was 4.91, which is still higher than the corresponding rate of 4.17 for the coal-mining area of North America during 1907. Natal, according to the information at present available, exhibits the highest fatality rate of any mining country in the world, but if the comparison were made with the individual States of North America the difference would be in favor of Natal, since quite a number of our States have experienced an average rate higher than that of Natal during the 10-year period under review.

Table XI exhibits in detail the number of persons killed by accident in the coal and shale mines of New South Wales during the decade ending with 1906.

TABLE XI. FATAL ACCIDENTS IN COAL AND SHALE MINES OF NEW SOUTH WALES.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	9,979	16	1.60
1898	10,519	25	2.38
1899	10,523	10	0.95
1900	11,491	24	2.09
1901	12,415	17	1.37
1902	13,114	105	8.01
1903	13,917	13	0.93
1904	14,034	12	0.86
1905	14,019	24	1.71
1906	14,929	21	1.41
1897-01	54,927	92	1.67
1902-06	70,013	175	2.50
1897-06	124,940	267	2.14

During the period under observation the rate has fluctuated very materially, having been as high as 8.01 per 1000 during 1902 and as low as 0.86 during 1904, but comparing the latter five-year period with the former, the rate has increased from 1.67

to 2.50 per 1000. The average rate for the decade was 2.14 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1442 deaths from accidents instead of 2812 actually recorded.

Table XII exhibits in detail the number of persons killed by accident in the coal mines of New Zealand during the decade ending with 1906.

TABLE XII. FATAL ACCIDENTS IN COAL MINES OF NEW ZEALAND.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	1,912	4	2.09
1898	2,003	1	0.50
1899	2,153	3	1.39
1900	2,460	4	1.63
1901	2,754	3	1.09
1902	2,885	2	0.69
1903	2,852	4	1.40
1904	3,288	4	1.22
1905	3,269	6	1.84
1906	3,692	6	1.63
1897-01	11,282	15	1.33
1902-06	15,986	22	1.38
1897-06	27,268	37	1.36

During the period under observation the rate has been as high as 2.09 and as low as 0.50. The average during the former five years was 1.33, and during the latter, 1.38. The average rate for the decade was 1.36 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907, there would have been 916 deaths from accident instead of 2812 actually recorded.

Table XIII exhibits in detail the number of persons killed by accident in the bituminous coal mines of Prussia during the decade ending with 1906.

TABLE XIII. FATAL ACCIDENTS IN BITUMINOUS COAL MINES OF PRUSSIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	303,370	714	2.35
1898	324,351	929	2.86
1899	344,368	797	2.31
1900	377,855	848	2.25
1901	408,375	956	2.34
1902	411,323	818	1.99
1903	429,537	826	1.90
1904	449,160	808	1.80
1905	452,151	840	1.86
1906	469,700	924	1.97
1897-01	1,757,849	4,244	2.41
1902-06	2,212,171	4,216	1.91
1897-06	3,970,020	8,460	2.13

During the period under observation the fatal accident rate of the bituminous coal-fields of Prussia has been as high as 2.86 per 1000 and as low as 1.80, there being apparently a definite tendency toward a decrease in the rate, which is measured by the difference in the averages of 2.41 per 1000 for the former half of the decade, and 1.91 for the latter half. The average rate for the decade was 2.13 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1435

deaths from accident instead of 2812 actually recorded.

Table XIV exhibits in detail the number of persons killed by accident in the brown-coal mines of Prussia during the decade ending with 1906.

TABLE XIV. FATAL ACCIDENTS IN BROWN COAL MINES OF PRUSSIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	33,020	78	2.36
1898	35,135	70	1.99
1899	37,017	72	1.95
1900	42,350	100	2.36
1901	48,801	122	2.50
1902	44,342	96	2.16
1903	43,211	83	1.92
1904	43,297	86	1.99
1905	44,607	79	1.77
1906	47,374	81	1.71
1897-01	196,323	442	2.25
1902-06	222,831	425	1.91
1897-06	419,154	867	2.07

During the period under observation the rate has been as high as 2.50 per 1000 and as low as 1.71, with apparently a definite tendency toward a decrease in the rate as measured by the difference between the average for the first half of the decade, 2.25 per 1000, and that for the second half or 1.91 per 1000. The average for the decade was 2.07, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1394 deaths from accident instead of 2812 actually recorded.

Table XV exhibits in detail the number of persons killed by accident in the coal mines of Queensland during the nine years ending with 1906.

TABLE XV. FATAL ACCIDENTS IN COAL MINES OF QUEENSLAND.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1898	1,278		
1899	1,142	1	0.88
1900	1,246	9	7.22
1901	1,266	1	0.79
1902	1,336	1	0.75
1903	1,329		
1904	1,336	1	0.75
1905	1,432	1	0.70
1906	1,349		
1898-01	4,932	11	2.23
1902-06	6,782	3	0.44
1898-06	11,714	14	1.20

During the period under observation the rate has been as high as 7.22 and as low as 0.70 per 1000, but the returns cover only the nine-year period commencing with 1898. Apparently there were no accidents during three of the years, but during the remainder the rate fluctuated between 7.22 per 1000 in 1900 and 0.70 in 1905. During the first four years the average rate was 2.23, and during the last five years it was 0.44. The average rate for the nine years was 1.20 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have

been 808 deaths from accident instead of 2812 actually recorded.

Table XVI exhibits in detail the number of persons killed by accident in the coal mines of the United Kingdom during the decade ending with 1906.

TABLE XVI. FATAL ACCIDENTS IN COAL MINES OF THE UNITED KINGDOM.*

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	695,213	930	1.34
1898	706,894	908	1.28
1899	729,009	916	1.26
1900	780,052	1,012	1.30
1901	806,735	1,101	1.36
1902	824,791	1,024	1.24
1903	842,066	1,072	1.27
1904	847,553	1,055	1.24
1905	858,373	1,159	1.35
1906	882,345	1,142	1.29
1897-01	3,717,903	4,867	1.31
1902-06	8,255,128	5,452	1.28
1897-06	7,973,031	10,319	1.29

*Reported under Coal Mines Regulation Acts.

During the period under observation the rate has been as high as 1.36 per 1000 and as low as 1.24, with a slight tendency toward a decrease as measured by the difference in the rates for the two quinquennial periods, indicating a reduction from 1.31 during the former period to 1.28 during the latter. The average rate for the decade was 1.29 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 869 deaths from accident instead of 2812 actually recorded.

Table XVII exhibits in detail the number of persons killed by accident in the coal mines of Victoria during the decade ending with 1906.

TABLE XVII. FATAL ACCIDENTS IN COAL MINES OF VICTORIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1897	908	3	3.30
1898	893		
1899	880	4	4.55
1900	807	1	1.24
1901	827	4	4.84
1902	1,303	1	0.77
1903	377	1	2.65
1904	589	2	3.40
1905	640	2	3.13
1906	678		
1897-01	4,315	12	2.78
1902-06	3,587	6	1.67
1897-06	7,902	18	2.28

During the period under observation the rates for the different years have fluctuated considerably, having been as high as 4.84 per 1000 in 1901 and as low as 0.77 in 1902. The average rate for the former half of the decade was 2.78, and 1.67 per 1000 for the latter half. The average rate for the decade was 2.28 per 1000, and had this rate prevailed in the coal-mining area of North America during 1907 there would have been 1536 deaths from accident instead of 2812 actually recorded.

Table XVIII exhibits in detail the number of persons killed by accident in the coal mines of Western Australia during the nine years ending with 1906.

TABLE XVIII. FATAL ACCIDENTS IN COAL MINES OF WESTERN AUSTRALIA.

Years.	Average Number Employees.	Persons Killed.	Rate per 1000 Employed.
1898.....	70		
1899.....	192	1	5.21
1900.....	400		
1901.....	383		
1902.....	368		
1903.....	402	1	2.49
1904.....	358		
1905.....	351		
1906.....	307		
1898-01.....	1,045	1	0.96
1902-06.....	1,786	1	0.56
1898-06.....	2,831	2	0.71

The returns are only for the nine-year period beginning with 1898, and during only two of these years did fatal accidents occur in the coal-mining operations of this colony. The operations were on a very limited scale, and the number employed being very small the rates are merely included to make this international comparison as complete as the present state of coal-mining statistics will permit. During the period under observation, the rate has been as high as 5.21 per 1000 and as low as 2.49, the average rate for the first four years having been 0.96, and for the last five years 0.56 per 1000. The average rate for the decade was 0.71, and had this rate prevailed in the coal-mining area of North America there would have been 478 deaths from accident instead of 2812 actually recorded.

The foregoing summary of coal-mining accidents in North America and the most important coal-producing countries of the world, emphasizes the serious importance of the subject from a commercial, social and economic point of view. In the preparation of this summary I have received much valuable aid from all of the mine inspectors of the different States, to whom I am under material obligation for their courteous coöperation. The foreign statistics are all derived from Part IV, Colonial and Foreign Statistics; Mines and Quarries; General Report and Statistics, which is the most convenient source of information on the subject.

Water as a Motive Power Underground

According to the *Coal and Iron Trades Review*, there are many coal mines with wet shafts in which a considerable amount of water has to be collected and pumped, but there are probably few cases in which the water falling down the shaft has been utilized for driving machinery underground. Under the circumstances, the experience of the Bowhill Coal Company

may prove interesting to those who have a similar set of conditions to contend with.

The circumstances leading up to the introduction of water as a source of power in the mine in question are as follows: Some time ago R. A. Muir, the general manager of the company, found that the surface fan was not capable of providing sufficient ventilation in the lowest of the three working levels, and on measuring the resistance at each level he discovered that the highest resistance existed in the bottom seam; he therefore concluded that if this could be reduced it would ease the drag on the surface fan. To meet the case he decided to install an auxiliary fan to deal with the entire ventilation of the bottom seam, and to allow for development, a 60-in. diameter double-inlet "Sirocco" fan was installed, capable of dealing with from 60,000 to 90,000 cu. ft. of air per minute at from 1-in. to 3-in. water gage.

As electric power is also available in the mine, the tubing was cut, and a

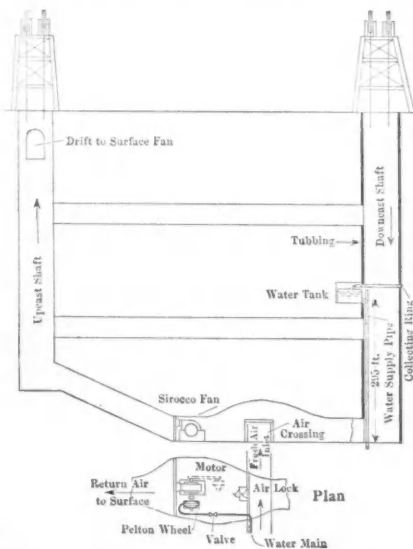


FIG. 1. SKETCH SHOWING GENERAL ARRANGEMENT OF WATER TANK, FAN AND MOTOR

ring fitted around the shaft; this ring caught and conveyed the water to a tank placed in a lodgment specially made for the purpose. A pipe shaft was then taken from the tank to the bottom of the shaft, giving a head of 295 ft., which was utilized to drive a "Pelton" wheel 4 ft. 6 in. diameter; various sizes of nozzles were supplied to give the speeds required for the different duties.

Provision was made for driving the fan by belt from an electric motor in the event of the water supply failing temporarily, but although the plant has been running for some little time, it has not yet been found necessary to use the electric motor, as the water supply has been quite sufficient.

Should it be necessary to stop the fan at any time, a bypass valve is arranged, which allows the water to be discharged into the sump, from which the main pumps draw their supply.

Colliery Notes

In deciding upon the style of mining machine to use, it should be remembered that the nature of the coal to be mined is a consideration of the greatest importance. One mining company recently purchased disk machines to mine a seam where the coal was of a tender nature. In cutting the coal at this mine, the disk was often jammed and had to be loosened by men with picks.

It should be the rule at every coal mine in case a misfire in blasting occurs, when a safety fuse is used, to require that the place be fenced off and a danger signal put up, which latter should not be removed for at least three or four hours after the misfire occurs. When a system of electric firing is used, the shot-firer should return at once when a hole has missed fire. He should then examine the cable and the connections with the shot-hole, and if defects are here found, this may be remedied by providing a new cable. It is also advisable for him to see that the relieving hole shall not be bored within 12 in. of the hole which has missed fire. If the missed shot has a detonator, the shot-firer should tie a string to it, and attach it to the cable, or prop, which may be close by, before firing the relieving hole. After firing, the shot-firer should return to the face and examine whether the detonator of the missed shot has exploded. Should the missed shot not be dislodged, further holes must be drilled until that is effected. Severe accidents have been known to occur from the detonator becoming mixed with the coal.

One of the most successful devices so far used as a substitute for explosives in coal mines is the hydraulic mining cartridge. This cartridge is worked by means of a specially constructed hydraulic pump, which is connected to the cartridge by a pipe. A cartridge of the standard size gives a pressure of three tons per square inch, which amounts to a total pressure of over 60 tons on the coal. This machine has entirely superseded explosives in a large number of mines in England, Scotland and Wales; also in Germany and Canada. As many as 300 holes per day have been forced off in one mine by this method. The advantages claimed over explosives are: 1. There is no danger of explosions from ignition of gas or coal dust. 2. A much larger quantity of round coal is produced. 3. The roof is not injured after the operation. 4. Large spaces of unprotected roof are avoided, as sprags can be left in after the operation until coal is wanted. 5. Its cost is low, as water is used in place of explosives. 6. There is no obstruction to the workmen, as the operation can be performed while they are in the place. 7. Less accidents from flying particles of coal or stone, owing to timber being blown out. 8. No dust is caused.

The Mines of South Carolina

By H. L. SCAIFE*

South Carolina has been more noted for the diversity of its mineral occurrence than for its mineral production, although mining of the non-metallic minerals has recently become important. In 1906 the production of phosphate rock and clay, together with their products, amounted to \$10,070,162. In a few instances gold, monazite and tin have been mined profitably, but at the present time the tonnage is generally small. Little prospecting has been done for other substances such as graphite, asbestos, soapstone, manganese, mica, corundum, magnetite, hematite, specular iron, siderite, beryl, copper, lead, nickel and cobalt, although their occurrence is known. Emerald, sapphire and topaz, of gem quality, are occasionally found, while the finding of one diamond, supposed to have been derived from the itacolumite, is recorded. A few of the rarer metals have been, and probably others will be found if they are sought for.

The existence of tin in pegmatite dikes, which have lately been traced through Kings Mountain, N. C., into Cherokee county, S. C., has been known for more than a quarter of a century, the discovery of cassiterite on the South Carolina side being made by S. S. Ross, of Gaffney, S. C. in 1902. Since 1885 when the first development company was organized several spasmodic efforts have been made to mine the cassiterite of the Carolina tin belt. The Ross mine in Cherokee county has been in operation since 1903, but, as yet, no deposits of considerable commercial importance have been developed, the production in 1906 being \$34,719. In several of the counties attention has been directed to monazite; its production amounted to \$43,000 in 1906, but in 1907 there was a decrease in the production of both tin and monazite. In 1906 the production of gold amounted to \$78,959, most of this coming from the Haile mine in Lancaster county which is the only gold mine in the State where operations have continued for a number of years with any degree of success. The total production of this mine is estimated to be \$3,250,000. It can also be said that the Haile mine is the only one in the State where systematic mining on a large scale has been attempted, and here, by able management, the total cost of production has been reduced to about \$1.60 per ton. At the present time work is being started on several gold properties in Cherokee county, among them the old Nuckolls and Norris mine which was worked to some extent about 50 years ago.

The gold mining operations of this State, as well as in other portions of the Southern Appalachians, date back to the Colonial period, and, as late as 1848, Dr.

M. Tuomey, the State geologist, in his report on the geology of South Carolina, stated: "I believe that it is now satisfactorily settled that the gold formation of the United States is confined to a band of schistose rocks, extending from the Rappahannock, in Virginia, to the Coosa river, in Alabama." The mining industry of this region had reached considerable importance before the discovery of gold in California, but since that time, especially subsequent to the War, mining operations have been of a more or less desultory nature. In the ante-bellum period a large part of the mining was done by the slaves after the harvesting of the crops, and it was during this period of cheap labor that the most substantial results were obtained.

Several important bonanzas were discovered during the active period prior to the Civil War. The Dorn mine, in Abbeville county, is accredited with the production of \$1,100,000 and upward; the Brewer mine, in Chesterfield county, is said to have yielded \$1,000,000; while the Nott mine, in Union county, is known to have produced a large sum, but there are no authentic records as to the amount. Tuomey mentions that a few bushels of ore taken from a bonanza orebody at that mine yielded \$3000. The West and Thomson mines, then known as the Fairforest mines, in Union county, were considered important producers, the yield of the latter being estimated at \$100,000. According to Tuomey, a neighboring mine, known as the Harmon or Mud mine, was abandoned not on account of the absence of ore, but because the presence of copper made it impossible to recover the gold by amalgamation. Near the Harmon mine a number of gold nuggets have been found, the largest of which weighed about 85 dwt. Lieber states that at the Martin mine, in York county, a piece of quartz containing 4000 dwt. was found in a placer, and that the Austin placer, in Cherokee county, yielded \$50,000 to \$75,000. The Blackmon mine, of Lancaster county, and the Schlegelmilch, Ferguson, Wilson and Brown mines, of York county, were well known mines in their day, and, in addition to these, there are a large number of abandoned and forgotten shafts in the mineralized area in the counties lying to the northwest of a line running from Chesterfield to Edgefield county. Dr. Waldemar Lindgren, of the United States Geological Survey, estimates the total production of the Appalachian States between 1800 and 1900 at \$47,000,000, of which amount not less than \$10,000,000 should be accredited to South Carolina, as three of its mines alone are known to have yielded \$5,350,000.

ORE OCCURRENCE

The veins are found in granite, syenite, gneiss, hornblendic and talcy micaceous schists; according to L. C. Graton, of the United States Geological Survey, the veins

occur principally in dense metamorphic rocks and seem to be most common in amphibolite. Many of the veins are considered to be fissures, but the orebodies usually occur as lenses, chimneys and shoots, with the principal axis parallel with the inclosing formation. The geologists of the ante-bellum period have classed the veins of this section into the following groups: 1. The "Carolina group" of crystallized quartz veins, which contract with depth, the gold decreasing in quantity, while copper, associated with the ores of manganese, lead and silver, appears and increases with depth. 2. The "saccharoid veins" of granular quartz, resembling powdered sugar, which become less productive as they pass from the slates into the underlying rocks. 3. The "hornstone lenticular veins," irregular wedge-shaped, detached quartz veins, sometimes containing very rich pockets, which disappear at depth in the talc-slates. Earle Sloan, the present State geologist, asserts that the gold formations of South Carolina pertain to the following three main types (with intergrading phases): The Tyger, the York and the Lancaster, which he has named from localities where each class of deposit occurs. When Tuomey and Lieber wrote, the deepest shaft in the State was down only 115 ft., and at this time there are probably no workings at a greater depth than 200 ft., except at the Haile mine, which still has large orebodies at a depth of 600 ft. In my opinion, until systematic mining and deeper workings are more general, there is not sufficient data to form a basis for the foregoing classifications and deductions.

From the amount of erosion which has taken place since the formation of the veins, as well as from the character of the deposits themselves, Becker, Graton and Lindgren, of the United States Geological Survey, consider the present cropings to be the stumps of quartz veins which originally extended much higher, possibly 20,000 ft. higher, and that no great change in the character of the veins and the occurrence of the orebodies may be expected with depth. With such an estimated height to the veins, the scattered and desultory explorations, which in South Carolina seldom reach a depth of 200 ft., seem insignificant. The present knowledge as to what may be expected with greater depth is meager, but there is no reason for the presumption that orebodies of commercial extent, possibly with secondary enrichment, will not be found in this section at depth. The Haile mine in South Carolina, which is one of the few, if not the only steady dividend-paying gold mine east of the Mississippi river, and the copper mines at Ducktown, Tenn., where a large orebody is developed to 700 ft., are sufficient to prove that all of the veins of the Southern Appalachians do not pinch out with depth. The results of a century of gophering are not inviting to capital, but

*Clinton, South Carolina.

until core drillings and deep workings are undertaken, the mineral possibilities of the oldest mining section of the United States will remain practically virgin and unproved.

Aside from lack of depth, there are several factors which have contributed to the failure of mining enterprises in this region when in some cases the results might have been different. Most of the operations have been attempted with a great lack of mining and metallurgical knowledge. The difference in the character of the veins here and those of the Western States are frequently overlooked, and the orebodies when found are often lost. In the reduction of the ores there has been a general failure to recover a large percentage of the metals, and the lack of facilities for the treatment of the sulphide ores, together with a lack of capital, has no doubt caused the abandonment of properties which otherwise would have been considered bright prospects. The exaggerated stories of rich ore left in the bottom levels by the old miners on account of water, unfortunately, has led to the cleaning out of old workings and sometimes to the sinking of numerous shafts to undercut the orebodies which proved not worth the expense, while the discovery of rich ore of unproved tonnage has in many cases led to a hasty erection of large stamp-mills instead of spending the money on development work.

If the present system of shallow mining is to be continued in spite of past experiences, no doubt better results would be obtained by persistently following the ore-shoots along the dip and the pitch after the method of the Mexican miner, as the rich pay streaks are often lost when an attempt is made to pick them up with crosscuts and drifts from a perpendicular shaft. This system was employed largely during the ante-bellum days, and the chimneys of ore which the old miners followed from the surface are now sometimes found at the bottom of their inclines, but the money thus expended could be more profitably used in sluicing the placers and the surface for gold, at which operations it is rarely the case that money is lost.

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Judge Gary on Steel Coöperation

Elbert H. Gary, chairman of the United States Steel Corporation, entertained nearly 100 steel men at a dinner at New York, Dec. 10. He reviewed the course of events in the trade in the last year, which brought the sharpest reaction the industry had ever seen without demoralization, and dwelt upon the good which had come of the open discussion of trade affairs between the principal interest and the independents. He continued:

"It seems now to be the common belief that the action and disposition of the manufacturers of iron and steel in the last year have been of material benefit to the manufacturers themselves, to their customers, to their employees, and to the general public. Possibly the influence of your action has extended in some measure to other countries.

"What is this movement, and up to date what have been its results? The movement has been simply an effort on the part of those interested in the iron and steel industry to establish a basis of friendly association and intercourse which is calculated to enable each to obtain full knowledge concerning the affairs of all the others, and the beneficial results which naturally follow such knowledge.

"That some have misunderstood our action is probable. Some at least have questioned the propriety, if not the legality, of our efforts; and apparently others have believed these efforts would be of no substantial benefit. I think I represent the views of all present in saying we have never doubted the propriety or legality of our action because we knew our motives were good.

"We have never intended to antagonize the laws of the country or the rights and interests of anyone. As I understand, it is not improper for competitors to meet and without reserve furnish full information and express opinions concerning the business affairs of all, provided they are not acting under an agreement, expressed or implied. It is not wrong, even though any or all may be influenced regarding any particular business, nor even though the

result may be to prevent radical and unreasonable changes in prices.

"It is common practice the world over for men engaged in all the different lines to meet their associates and competitors frequently and to discuss conditions and interchange views respecting the proper and reasonable conduct of all concerned.

"In connection with the movement under consideration we have had no agreement in restraint of trade, expressed or implied. We have never intended nor resorted to any evasion, and the public has been accurately informed concerning our action. Therefore, we may dismiss this subject with the statement that if we shall be convinced we are wrong in our conclusions, or that we have antagonized public interests, or if complaint is made by anyone authorized to make it, we will discontinue our efforts to coöperate, whatever injury may ensue.

"We have been successful in securing stability as opposed to demoralization. This has tended to promote the best interests of ourselves and all others. Whether or not this movement for conciliation and coöperation, as opposed to the unreasonable and destructive competition of the past, shall continue to be successful, I cannot say. As a very learned and eminent gentleman said to me within the last few days, 'It is well worth trying.'"

Tariff Revision

William H. Taft, after a conference with Chairman Payne and other Republican members of the Ways and Means Committee, following a talk with Speaker Cannon, on Dec. 11, made public the following statement:

"I had an interview with Mr. Cannon yesterday, and, with his concurrence and at the suggestion of a member of the Ways and Means Committee, with the Republican members of that committee this afternoon, and from my conversation with them and the discussion which followed as to the examination which they are now conducting and expect to conduct, I have every reason to be confident that they are keenly alive to the obligation which is on them as representatives elected to represent the Republican party to prepare an honest and thorough revision of the present tariff, that they have taken three times as much evidence as has ever been taken in the preparation of other tariffs, and that they are going to make additional effort and independent effort to get at the evidence themselves by the use of subpoena and under oath with a view to reaching the difference in the cost of production of the various articles brought within the tariff here and abroad.

"I found them quite anxious for as much harmony as possible, in which I sympathize with them, and prepared for consultation on points of difficulty that might arise

at any time in the future. The plan is to prepare a bill on such evidence as they have and will have in the course of the hearings, and then to call for additional evidence as to the items whenever it should seem necessary. Not only from conversation with the members together, but with the members individually, I am quite convinced that they are in good faith going to prepare a bill which shall be a thorough revision on the platform of the Republican party."

Withdrawal of Western Phosphate Lands

Acting under instructions from President Roosevelt, the Secretary of the Interior, on Dec. 10, withdrew from entry, selection and location all public lands in Wyoming, Idaho and Utah believed to contain phosphate rock, pending appropriate action by Congress. The list of lands withdrawn was furnished by the Geological Survey as a result of preliminary examination of the field. A careful classification of the lands in question will be made by the Survey as soon as practicable so that the portions that are found to contain no phosphate can be again thrown open to agricultural entry.

This action of the President has been taken largely as the result of facts brought out at the recent meeting of the National Conservation Commission in Washington. At this meeting it was shown that, at the present rate of production, the known available supply of high-grade phosphate rock in the United States will last only about 50 years. Although this Western field embraces the largest area of known phosphate beds in the world, the absolute necessity of utilizing these deposits for the benefit of the farms of the United States was strongly emphasized.

Phosphoric acid is one of the three substances which must exist in the soil if it is to be productive. It has been shown by work at the agricultural experiment stations in Wisconsin, Ohio and Illinois that lands that have been under cultivation in these States for 54 years have been depleted of one-third of their original content of phosphoric acid. This is equivalent to 20 lb. per acre annually. Assuming it to be only half this amount, for the 400,000,000 acres of land in the United States bearing crops it would require 6,000,000 tons of phosphate rock annually to offset this loss, without considering the question of increasing the agricultural yield above the present production.

In 1907 there were 2,265,000 tons of phosphate rock produced in the United States, and of this amount 900,000 tons, or about 40 per cent. was exported. The phosphate rock of South Carolina is practically exhausted; the Florida deposits have reached their maximum pro-

duction; the output of the Tennessee deposits is on the increase, but this field alone would last only 11 years at the present rate of increase in production. There is some phosphate in Arkansas, but it is low grade; therefore, the large deposits of the public-land States must be depended upon for the greater part of our phosphate in the future. To insure the utilization of our own deposits in our own country some means must be devised to prevent its shipment to foreign lands. It would appear that this can be done only by retaining Government title to all public lands underlain by phosphate rock, and leasing these lands under terms which will prohibit exportation.

The Secretary of the Interior is charged by law with the care, preservation and disposition of the public domain for the benefit of all the people of the United States; and the rulings of the Supreme Court are to the effect that he has full power to meet such unexpected contingencies or emergencies as are created by changed conditions, new discoveries or unforeseen happenings. In such cases he fortunately has the power to make temporary reservations or withdrawals of the public domain, with a view to protecting and preserving the same pending the submission of information to Congress in order that it may enact appropriate legislation to meet the conditions disclosed. This power has been frequently exercised during the last 40 years in the public interest. In this particular instance, the question is so vital to every citizen of the United States interested in the present and future agricultural production of the country that immediate action is necessary.

An executive order of withdrawal, general in its nature, like this, is under the rulings effective from the first moment of the day upon which it is made, and thereafter during the existence of the reservation, no valid location can be made or claim initiated. Valid claims initiated prior to a withdrawal and maintained by compliance in all respects with the law are not defeated or impaired by such a reservation.

Ferrosilicon

High-grade ferrosilicon is an alloy of silicon and iron, made in an electric furnace, of which the use by steel makers is now large and increasing. Up to a comparatively recent date, nearly all of the ferrosilicon consumed in this country has been imported from abroad, chiefly from the Austrian Tyrol. Within the last two years, several manufacturers have turned their attention to the establishing of a domestic industry with a view to supplying the demand for ferrosilicon in this country, and, in addition to this, some works have been erected on the Canadian side, using Niagara power.

Mineral Production of Austria

The production of ores and minerals in Austria—other than coal, iron ore and manganese ore—is given by the official report just published as follows, in metric tons:

Ores:	1906.	1907.	Changes.
Gold ore.....	33,033	30,711	D. 2,322
Silver ore.....	21,944	13,380	D. 8,564
Quicksilver ore.....	91,494	89,370	D. 2,124
Copper ore.....	20,255	10,400	D. 9,855
Lead ore.....	19,683	22,792	I. 3,109
Zinc ore.....	32,037	31,970	D. 67
Antimony ore.....	1,071	910	D. 161
Tungsten ore.....	57	44	D. 13
Uranium ore.....	16	11	D. 5
Minerals:			
Graphite.....	38,117	49,425	I. 11,308
Asphalt.....	2,840	3,858	I. 1,018
Sulphur ore.....	15,125	24,099	I. 8,974

The production of salt was 376,212 tons in 1906, and 395,053 tons in 1907. The salt reported in 1907 included 38,608 tons rock salt, and 43,878 tons sea salt, the latter made in the provinces bordering on the Adriatic.

The production of metals—other than iron—was as follows, in metric tons, except gold and silver, which are in kilograms:

	1906.	1907.	Changes.
Gold, kg.....	126	142	I. 16
Silver, kg.....	38,948	39,000	I. 52
Quicksilver.....	526	527	I. 1
Tin.....	42	47	I. 5
Copper.....	877	592	D. 285
Lead.....	15,905	14,461	D. 1,444
Zinc.....	10,804	11,208	I. 404
Antimony.....	.....	207	I. 207
Bismuth.....	.....	2	I. 2
Uranium salts.....	10	11	I. 1

Lead includes a small quantity of litharge—1059 tons in 1906 and 863 tons in 1907. Minor products from metallurgical works for the year are reported as follows:

	1906.	1907.	Changes.
Copper sulphate.....	578	579	I. 1
Sulphuric acid.....	745	.....	D. 745
Copperas.....	154	.....	D. 154
Mineral pigments.....	943	1,091	I. 148

The total value of the mineral products showed a gain in 1907, but this was due entirely to the increase in coal and iron. Many of the other minerals and metals show decreases, but they are generally small in quantity.

Australian Gold Production

Gold production in New South Wales in October is reported at 24,788 oz. fine; an increase of 713 oz. over October, 1907. For the 10 months ended Oct. 31, this year, the total production was 220,380 oz., or \$4,555,255 in value.

Gold production from the mines of Western Australia is reported at 136,380 oz. fine in October, which is 1861 oz. less than in September and 13,437 oz. less than in October, 1907. For the 10 months ended Oct. 31 the production was 1,397,272 oz. fine in 1907, and 1,371,752 oz. in 1908; a decrease of 25,520 oz. By values, the output was \$28,881,612 in 1907, and \$28,354,114 in 1908; the decrease this year being \$527,498, or 1.8 per cent.

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The Discovery of Ore Deposits

We often hear it said, "The world has now been well explored; we shall not discover any more great ore deposits." With this statement we flatly take issue, and we believe that attention to some facts will prove our contention that the era of discoveries has not been closed, but on the contrary, is, perhaps, only in its infancy. If the pessimists should express more precisely what is probably their idea, namely, that we shall not in North America, outside of Alaska and the north of Canada, discover another Comstock, or Leadville, or any new mineral bonanza exposed at the surface, we should agree. However, there are many parts of the world still unexplored, in which important outcropping mineral deposits may be discovered. It is not yet 15 years since the placers of the Klondike acquired fame, since when there have been the discoveries of gold at Nome and in the Fairbanks region, and copper in the Copper River region of Alaska, and in Katanga, Africa, to mention only a few important instances.

Nevertheless, we conceive that the future of ore discovery now depends chiefly upon finding deposits that are not exposed on the surface. It is in this search that the science of economic geology is likely to win its spurs. Already it has established the knowledge of some of those fundamental principles, which have from time to time filtrated into all minds as the essence of practical geological knowledge.

Thus, the early prospectors for gold and silver in Nevada looked especially for quartz lodes. They found occurrences of silver-lead ore, but the then low grade, rebellious, "cooking" ore, existing in limestone formations, was useless to them, and was passed by with contempt. In the districts where rich ore had been found near the surface in limestone country rock the results had been unfortunate, the ore "petering" out early. For this reason, the rich deposits of White Pine, which bore a striking and ominous resemblance to other discoveries of fair prospect and rapid failure were at first regarded with distrust; it was several months before much confidence was felt in their permanence. When, however, their value was demonstrated and knowledge was gained as to their character and mode of occurrence, attention was re-

directed to several of the old districts, which had been abandoned or disregarded on account of the limestone country rock, and in the new light that White Pine had thrown upon this formation many discoveries were made, among them the great ore deposits of Eureka. White Pine may be considered, therefore, to have led directly to Eureka, and ever afterward prospectors looked especially for great deposits of lead ore in limestone formations; not that limestone had not previously been known as a kindly rock for the deposition of lead, but that it remained for the discovery of the Eureka bonanzas to impress the fact on all minds.

Similarly, the discovery of gold in the andesite and phonolite of Cripple Creek, Colo., in 1891, was followed by the rich discoveries at Tonopah, Goldfield and Bull Frog about 10 years later. Previous to 1891 American prospectors did not know that gold occurred in the andesite class of rocks, and were ignorant of the kind of ore indistinguishable by the eye from the mother rock, which could be determined as ore only by the pan or the crucible, but the prospectors of today have learned this lesson.

Only five years ago, Ely, Nev., which had been known since the '60s, was still regarded as a low-grade gold-mining district, and efforts were being made to operate by improved methods the mines which, as gold mines, had been failures for more than 30 years. The original exploitation for gold of districts that subsequently became famous for great deposits of base metals is no new thing. Mining began in that way at Leadville, Colo., at Bingham, Utah, and elsewhere. However, no one dreamed five years ago of the immense deposits of copper ore that underlaid the lean copper-free gold ore of Ely. That discovery was analogous to the nearly contemporaneous discovery that the great bodies of gold ore at the Mount Morgan mine, in Queensland, Australia, were also underlaid by immense deposits of copper ore. These discoveries, to our mind, are of more importance than the development of the particular supplies of copper, inasmuch as they led to a knowledge of new facts in the science of ore deposits which probably will be of immense value. Already we have witnessed the discovery of the great Miami orebody in Arizona under similar conditions, this immense mineralization having shown no copper on the surface. How many more Miamis may

be discovered as the result of this fundamental principle that Ely and Mount Morgan have forced into all minds, namely, that certain conditions of rock, worthless upon any surface showing, may be underlain by immense deposits of copper ore enriched to the profitable point?

The search for these blind deposits is the coming duty of the mining geologist. Up to the present time the deductions of this scientist have been to a large extent negative, i. e., pointing out that because of certain observed conditions the prospect for finding ore is hopeless. His constructive work, i. e., the indication of directions in which ore should be sought, has been almost entirely in connection with mines or districts that have already been found by the rambling prospector. The mining geologist himself has not yet gone into the field as a prospector to any great extent. The novelty of the experiment in this direction lends particular interest to the work that Robert T. Hill is now doing in Nevada, which he has described in a series of highly interesting articles in the *JOURNAL*, concluded in this issue. He has been systematically searching for another Goldfield and has found a place where he considers the general geological conditions of Goldfield to be reproduced. One of the factors, the alunization of certain rocks, is in itself a mark of the progress in geological knowledge. Five years ago no one knew that this phenomenon had anything to do with the formation of an ore deposit; indeed, the word had not been coined. Ransome pointed out the connection, and now geologists feel that they ought to go back and restudy Cripple Creek, where alunization also occurs, in the new light. Whether Mr. Hill will find pay ore at Alunite or not remains to be seen. If he does, it will be the greatest triumph for economic geology; if he does not, his experiment will at least be the forerunner of what will without doubt be one of the greatest activities of the mining geologist of the future.

The Social Life of Miners

The article by Mr. Hanchett in this issue is particularly noteworthy as the chronicle of a successful attempt to relieve the monotony of the Western mining camp and better the social conditions of the employees. Perhaps the means which have been introduced at the Cactus mine by the initiative of Mr. Newhouse and of

Mr. Hanchett are capable of successful application only in a one-company camp, but nevertheless there are many camps of that character, and other companies may undoubtedly profitably follow the example of the Newhouse Mines and Smelters. A little attention toward improving the welfare and social conditions of the men is a good investment, inasmuch as improvement in those respects tends toward increased efficiency in work. There are not many companies which have done so much as the Newhouse Mines and Smelters, but there are a good many which have paid attention to the erection of suitable bunkhouses and the conduction of well managed boarding houses. The Richmond-Eureka Mining Company may be cited as a noteworthy example in this particular.

On the other hand, there are many companies which ignore the private life of their men, and thereby compel them to live under such careless and unsatisfactory conditions as tend to cause the men not only to lose their self respect, but also to lose more or less of their efficiency. Living conditions have been one of the grievances in the Cœur d'Alene, but companies in that district are far from being the only sinners. What shall be said of the conditions at Bingham, Utah, which has been described as a "sewer four miles long?" Some mining districts, Butte for example, have had such a duration that the men have acquired homes of their own, and they have thus become family camps, but these are the exceptions, and the general lot of the Western miner is discouraging. Such amelioration as has been conferred by some enlightened companies like the Colorado Fuel and Iron Company and the Newhouse Mines and Smelters is consequently deserving of particularly favorable commendation.

Statistics of Colliery Accidents

The annual article by Frederick L. Hoffman summarizing the statistics of the accidents occurring in the coal mines of the United States, published elsewhere in this issue, discloses that 1907 was one of the saddest years on record. It is, indeed, disgraceful that the fatalities in coal mining in this country last year amounted to more than four men out of every 1000 employed. In our editorial last week we pointed out some of the reasons for this shocking loss of life and the remedy.

Referring now to the purely statistical

aspect, this publication is the earliest that has been possible for 1907. It is a pity that the data cannot be brought to the attention of the public while the subject is still fresh in mind, and has not become more or less out of date as is at present the case. Mr. Hoffman's statistics are based upon the reports of the mine inspectors of the several States. His summary is held back by the delay in the reports for several States. In some cases this delay is probably due to obstacles (arising through inexperience, insufficient appropriation, etc.), in putting the official report through the press.

Everyone has been talking a good deal lately about the necessity for new legislation by the States with respect to coal mining. If this talk is seriously meant, let each State make a beginning by enacting a law that the report as to accidents in the calendar year must be published before July 1 of the ensuing year. There is really no reason why the report should not be published previous to March 1. If the State officials cannot get the matter through the press so early, let it be provided by law that they shall give their main data in manuscript to the newspapers, which will attend to the matter of publication for them.

Mr. Hoffman's series of statistical reviews upon this subject is the only one in existence for the United States that covers a long series of years. When the U. S. Geological Survey directed its attention to this subject, it was compelled to have recourse to Mr. Hoffman's figures, in adopting which it neglected to give him the full credit that was due him.

THE RECENT consolidation of gold-dredging companies in California brings all the dredges in the most productive field in that State under one control. The Natomas Consolidated will be far the largest company of its kind in this country, and probably the largest in the world. Moreover the combination is not yet complete, for negotiations are in progress for the absorption of other companies, now independent, which will doubtless be added to its possessions in time. New ground is also being prospected, with a view to a further extension of operations, and a general improvement in the dredging plant is also included in the plans. The strength of the consolidated company will also put it in a position to fight the opposition of the Anti-Débris Association effectively.

The National Conservation Conference

SPECIAL CORRESPONDENCE

The National Conservation Conference in session in Washington on Dec. 8, and the succeeding days spent most of its sessions in discussion of the reports of the four sections of the Conservation Commission already sketched in this correspondence, with additional papers and short speeches tending to develop the same subjects. The outcome of the conference has taken form in a series of resolutions relating to the general question of conservation and the manner in which it is to be attained. After commending the work of the commission in suitable resolutions the conference specifically approves the principle of coöperation among the States and between these and the Federal Government, and urges both State and Federal legislatures to enact laws to extend and apply such coöperation in all matters pertaining to the use and conservation of natural resources.

The conference further urges the adoption of the policy of separate disposal of the surface rights, timber rights and mineral rights on the remaining public lands of the United States, the disposal of mineral rights by lease only, and the disposal of timber rights only under conditions insuring proper cutting and logging with a view to the protection of growing timber and the watersheds and headwaters of streams used for navigation and other interstate purposes.

As to waters the conference urges legislation providing for the immediate development of the waterways of the country for navigation, water supply and other interstate uses, preferably by direct Federal appropriations; otherwise by the issue of bonds.

After approving those portions of the commission's report pointing out the need for continued investigation the conference supports the maintenance of conservation commissions in every State, and the desirability of maintaining a National Commission on the Conservation of the Resources of the Country, empowered to coöperate with the State commissions.

The most direct result of the work of the conference is found in the following resolution:

Resolved, That a joint committee be appointed by the chairman to consist of six members of State Conservation Commissions and three members of the National Conservation Commission, whose duty it shall be to prepare and present to the State and National Commissions, and through them to the Governors and the President, a plan for united action by all organizations concerned with the conservation of natural resources."

At the special instance of Senator Newlands a resolution was adopted urging adoption of the plan recommended by the Inland Waterways Commission for waterway development under an executive board or commission appointed by the President.

On the suggestion of Mr. Cuttle, of California, it was recommended that the several States enact laws regulating the cutting and removal of timber and slash on private lands, that the continuity of the forests may be assured, that damage from floods may be prevented; and that a more uniform flow in rivers may be maintained.

Powell Evans, of Pennsylvania, and Calvin Rice, secretary of the American Society of Mechanical Engineers, concurred in the following suggestion which was unanimously adopted:

"That the national organizations invited to attend this conference be asked to give their advice and suggestions to the committee of nine which is to be appointed as to how they may best join in this movement, and that the committee of nine thereupon communicate with them in turn transmitting to these various organizations the suggestions and advice thus received and tabulated by the committee."

Mining Costs and Profits in the Transvaal

SPECIAL CORRESPONDENCE

In the elaborate statistics issued each month by the Transvaal Chamber of Mines interesting indications are provided of the results of recent progress. At the beginning of this year, the Chamber enlarged its records to include figures relating to working costs, so that the value of its analysis has been greatly enhanced. The points illustrated by this general compilation, which cannot be learned of elsewhere, and which are especially significant, are the great increase of tonnage due to higher metallurgical efficiency, and the reduction of costs and yields per ton, with a practically constant margin of profit per ton, but greater total profit owing to the bigger tonnage. It is to be regretted that these statistics were not compiled earlier, for they are only available for the current year. An estimate may be given for January, 1907, for comparison with exact results for the last nine months, as follows:

	Yield per Ton.	Cost per Ton.	Profit per Ton.
January, 1907	\$8.20	\$5.28	\$2.92
January, 1908	7.72	4.70	3.02
February	7.86	4.68	3.18
March	7.72	4.52	3.20
April	7.76	4.48	3.28
May	7.62	4.38	3.24
June	7.66	4.36	3.30
July	7.52	4.28	3.24
August	7.48	4.20	3.28
September	7.44	4.20	3.24

Notwithstanding the decrease in yield, the profit per ton shows little change. Some critics protest against the reduction of costs at the expense of the grade; but these arguments are weak in view of the constant profit accompanied by greatly increased tonnage. The two elements of progress must be reviewed in association for the position to be equitably judged. Bearing on this latter aspect, the following statistics are illuminative:

	Tons Milled.	Total Profit.
January, 1907	1,321,915	£810,000 (approx.)
January, 1908	1,459,645	898,372
February	1,387,950	894,577
March	1,503,431	977,893
April	1,466,365	979,028
May	1,540,489	1,012,059
June	1,506,149	1,009,215
July	1,564,490	1,029,505
August	1,582,782	1,051,805
September	1,580,975	1,051,023

The number of companies remained practically the same.

The increase in tonnage was not accompanied by a corresponding increase in stamp mills, though there was an increase in the tube mills. The following table shows the average duty per stamp for the same months:

	Stamps at Work.	Tons per Stamp per 24 Hours.	No. Tube Mills.
January, 1907	8,450	5.40	?
January, 1908	8,775	5.80	72
February	8,770	5.88	76
March	8,830	5.93	74
April	8,875	5.95	74
May	8,920	6.00	76
June	8,955	6.08	79
July	8,975	6.17	86
August	8,914	6.23	95
September	9,069	6.40	103

Two mines, the Luipaardsvlei Estate and New Modderfontein, record stamp duties of over 9 tons per 24 hours; while the scheme of coarse crushing with stamps is to be carried to far at one mine that a duty of 12 tons is anticipated.

Since the work thrown upon the tube mills can be increased almost indefinitely by the adoption of coarser screening, the stamp duty figures cease to constitute a criterion of milling efficiency. At the same time the greater tonnage passed through the mortar boxes indicates to a considerable extent the influence of heavy stamp practice.

Mineral Production of Greece

An abstract of official returns for the full year shows that the fuel production of Greece in 1907 was only 11,719 metric tons of lignite, an increase of 137 tons over 1906. The production of iron ores—mainly exported—was, in metric tons:

	1906.	1907.	Changes.
Iron ore	680,620	768,863	I. 88,243
Manganiferous iron	96,382	92,970	D. 3,412
Manganese ore	10,040	11,139	I. 1,099

The production of chrome ore in 1907 was 11,730 tons, an increase of 200 tons over 1906; of magnesite 60,248 tons, a decrease of 4176 tons.

Questions and Answers

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

CENTRIFUGAL PUMPS

Are centrifugal pumps suitable for mining work? What is their efficiency?

T. T. N.

For certain work they offer advantages. The Sulzer high-pressure centrifugal pump is extensively employed. An efficiency of 80 per cent. is often obtained, and that high figure is exceeded in favorable cases where the relation of quantity of water to height of lift is particularly advantageous.

EQUIVALENCY OF COAL AND PETROLEUM

How much petroleum is equivalent to a ton of coal as fuel? H. S. K.

The amount is variable, of course. One of the most convenient tables is given by Prof. G. F. Gebhardt in "Steam Power Plant Engineering," as follows:

B.t.u. Per Lb. of Coal.	Lb. Coal = 1 Bbl. Oil.	Barrels of Oil Equal to 2000 Lb. Coal.
10,000	620	3.23
11,000	564	3.55
12,000	517	3.87
13,000	477	4.19
14,000	443	4.52
15,000	413	4.82

A barrel of petroleum contains 42 gal. and weighs 310 to 332 lb., according to the specific gravity.

TREATMENT OF MIXED SULPHIDE ORES

What is the maximum grade of zinc ore that can be separated from a mixture of pyrites, galena and blende? Would not a discussion of this subject be of interest to the readers of the JOURNAL?

A. R. K.

The subject has been treated repeatedly in the JOURNAL. Under certain conditions it is conceivable that a zinc ore containing as much as 60 per cent. zinc might be obtained. However, in ordinary practice, it is difficult to exceed 45 per cent. zinc. The subject is treated exhaustively in the report of the Canadian Zinc Commission, published by the Department of Mines, Ottawa, Canada.

SILVER SHIPMENTS TO THE EAST

In the JOURNAL I find weekly a report of silver shipments to the East from London; but I find no statement of shipments from United States ports to the East, which ought to be large.

A. G.

Silver shipments from London to the East are given periodically because they constitute the great bulk of this trade. From United States ports there are no shipments direct to India. Some are made to China, with which this country has a large trade. The total direct ship-

ments, however, are insignificant compared with those from London. In 1908 they have been much larger than for several years past; but for nine months of this year the total was only \$3,619,680, against about \$45,000,000 from London. The reasons for this are that the trade of India is largely controlled by Great Britain; and that the East is extremely conservative and prefers to buy in London, where it has bought for many years. Some years ago an attempt was made to arrange for large shipments of silver from San Francisco to India direct; but it was not a success, and the trade kept on its old course. The only country which has any considerable share in the Eastern silver trade, outside of Great Britain, is Australia. Recent reports indicate that over 60 per cent. of the silver produced at the Broken Hill mines is sold in the East.

CONCRETE CHIMNEYS vs. BRICK CHIMNEYS

How do concrete chimneys compare with brick chimneys in first cost? W. T. S.

Of course, much depends upon the relative cost of material under local conditions. However, concrete chimneys are apt to be the cheaper inasmuch as the quantity of material required is less, while the cost of concrete and brick per cubic foot in place is apt to be about the same. Landmann, in *Zeit. f. Architektur u. Ingenieurwesen*, 1905, iii, 278, gives computations for a chimney 164 ft. high, upper diameter 4.6 ft., lower diameter 7.9 ft., the thickness at top and bottom being 7.9 and 17.7 in., respectively. The concrete required was 3770 cu.ft., and the iron reinforcement 4530 lb., whereas a similar chimney in brick, of the best material, having a thickness at the top of 7.9 in. and at the bottom of 25.6 in., would require 5225 cu.ft. of material at a stress of 360 lb. to the square inch. Since, however, experience indicates that 9.85 in. is about the least thickness allowable at the top of the stack, this necessitates that the thickness at the base shall be increased to 27.6 in., in order to keep the stress within the allowable limit of 375 lb. per sq.in., thereby adding at least 350 cu.ft. of material, whereas with reinforced concrete the same result could be obtained by increasing the radius by ½ or 1 in. only, or by adding slightly to the reinforcement. Allowing for greater difficulties of construction, Landmann considers that the reinforced concrete has a decided advantage in point of economy as compared with brickwork for this type of structure.

THE LASZCZYNSKI COPPER PROCESS

What is the Laszczyński copper process? E. D. C.

The Laszczyński process is based upon lixiviation of the roasted ore with a dilute sulphuric acid, and electrolysis of the resultant solution in special vats, using lead anodes and copper cathodes. The principle

of the process is not new, but Laszczyński has introduced some novel features. The ore is carefully sorted to free it from gangue, etc., ground to pass a 1 mm. sieve, and is then mixed with clay and formed into briquets, which are roasted. By this treatment the iron is converted into an oxide that does not dissolve in the leaching liquor. The copper is present in the roasted ore partly as sulphate and partly as oxide. The roasted ore is leached with a 5-per cent. solution of sulphuric acid in lead-lined vats, the saturated copper solution meeting the fresh ore, and the exhausted ore being leached with fresh acid solution. The liquor obtained by this leaching operation contains 5 per cent. of copper and 1 per cent. of free acid, and is filtered before passing into the electrolytic vats.

The electrolytic vats are square wooden boxes lined with sheet lead and measuring 1 m. in each direction. Each vat when fully charged contains nine anodes and eight cathodes, the former of sheet lead, 3 mm. thick, and the latter of thin copper sheet. The anodes are incased in cotton cloth. The electrolyte is constantly agitated during the passage of the current, by aid of wooden frames placed between each anode and cathode, and operated mechanically. The current strength is 900 amperes per vat, and the electromotive force required varies from 2 to 5 volts, while the yield is 25 kg. per 24 hours. In the course of one month the cathode sheets attain a thickness of 20 to 30 mm. and increase in weight to 55 lb. The exhausted electrolyte contains 1 to 1½ per cent. of copper and 5 per cent. of sulphuric acid and is used again, with the addition of fresh acid, for leaching purposes. The presence of carbonate of lime in the ore leads to some loss of acid, due to the formation of calcium sulphate, which is removed during filtration; but this loss is partly compensated by the presence of sulphur in the raw ore and by the formation of copper sulphate during the roasting operation.

The re-solution of copper at the cathodes which usually occurs when a mixed solution of iron and copper sulphate is electrolyzed is avoided in this process by the use of the covered lead anodes. The use of linen covers for these, in some unexplained manner, prevents the formation of ferric sulphate by oxidation of the ferrous sulphate present in small amounts in the solution, and the full theoretical yield of 1.15 gram of copper per ampere-hour is therefore obtained at the cathode. The cotton covering of the anodes is stated to last about four months without renewal.

The success of this extraction process at Boleslav, Poland, has led to the erection of a larger works for operating it on the river Nid, not far from the original experimental installation of plant. The cost of a plant capable of producing 1000 kg. of copper per day is about \$20,000, and the process is stated to be equally efficient when worked on a small or large scale.

New Publications

INDUSTRIE DES METAUX SECONDAIRES ET DES TERRES RARES. By Paul Nicolardot. Pp. 435; illustrated. 4 $\frac{3}{4}$ x7 in.; cloth, 5 francs. Paris, 1908: Octave Doin.

THE CLAYS OF ARKANSAS. By John C. Branner. U. S. Geological Survey, Bull. No. 351. Pp. 247, illustrated. 6x9 in.; paper. Washington, 1908: Government Printing Office.

This report was originally prepared by Doctor Branner when he was State geologist of Arkansas. It has been revised and brought up to date, including all the results of recent field work. The chapters are occupied by the general topography and geology; the character, origin and occurrence of the clays; their geologic age and graphical distribution. The rest of the book includes descriptions by counties of the clay deposits, and of their utilization. Tables of analyses of clays are appended; also statistics and a list of the clay-working industries.

THE MECHANICAL ENGINEERING OF COLLIERIES. Vol. II. By T. Campbell Futers. Pp. 296, illustrated. 7 $\frac{1}{2}$ x9 $\frac{3}{4}$ in.; paper. London, 1908: The Colliery Guardian Company, Ltd.

Mr. Futers completes his treatise in this second volume. Together with Vol. I it forms the most elaborate discussion of the mechanical engineering of coal mines that has yet been issued. The drawings have taken years to complete, and are of such size and detail as to make them of great practical benefit to the mechanical draftsman. The index at the end of the book makes it easy for the reader to turn to any section or discussion desired. The various phases of coal mining are now being covered with greater thoroughness than ever before; however, the mechanical side of the subject has been somewhat neglected, and the present treatise is certain to be of great advantage to the engineers who are engaged in coal mining.

THE MECHANICAL ENGINEERING OF COLLIERIES. Vol. I, Part III. By T. Campbell Futers. Pp. 177, illustrated. 7 $\frac{1}{2}$ x9 $\frac{3}{4}$ in.; paper. London, 1908: The Colliery Guardian Company, Ltd.

This book completes the first volume of Mr. Futers' treatise. It has been prepared with the same care and completeness that characterized Part I and Part II. The subjects here treated are the screening and washing of coal. The author has succeeded in presenting a concise investigation of all the accepted practices. The discussions are not only of much importance to mechanical engineers, but will prove of benefit and interest to coal-mine managers and superintendents who have to do with the construction of coal plants. One of the most interesting parts of this book is the discussion dealing with the various tipplers now in use at the different coal

operations. The rotary tippler is examined in detail and the descriptions are further improved by many excellent mechanical drawings.

PRINCIPLES AND PRACTICE OF AGRICULTURAL ANALYSIS. Vol. II. By Harvey W. Wiley. Pp. 680, illustrated. 6x9 in.; cloth, \$4.50. Easton, Penn., 1908: The Chemical Publishing Company.

The second volume of this work treats of fertilizers and fertilizing materials and contains a short treatise on insecticides. Part I is devoted to sampling and to analytical methods for phosphoric acid and other constituents of natural fertilizers; Part II, the determination of nitrogen and nitric acid; Part III, the analysis of potash fertilizers; Part IV, miscellaneous fertilizers and insecticides and fungicides. The general principles of fertilizer manufacture are presented insofar as they tend to throw light on the rational method of examination and analysis. Dr. Wiley's book will be welcomed by chemists who are interested in this important branch of the chemical industry.

THE MECHANICAL ENGINEERING OF STEAM POWER PLANTS. Third Edition, Revised. By Frederick Remsen Hutton. Pp. 825, illustrated. 6x9 $\frac{1}{4}$ in.; cloth; \$5. New York, 1908: John Wiley & Sons. London; Chapman & Hall, Ltd.

The more we study Professor Hutton's well known work, the more does it excite our admiration as one of the great classics of steam engineering. The manner in which this new edition differs from its predecessor is best told by the author himself, who says in his preface:

A former edition of this book, issued in 1897, embodied the study and experience of the author gathered during the previous 20 years and brought together for teaching purposes. The years since then have been a period of great and rapid progress in the power plant and in all engineering departments contributory thereto; and while the old edition was modernized here and there and year by year, the time had come with the opening decade of the 20th century that it be rewritten entirely. The present edition is the result of such rewriting.

It is a new book so much enlarged that the old plates could not be used, but the size of page has been increased, new illustrations chosen, and many new topics and treatments have been introduced. While the former approved analytical viewpoint is retained and amplified, there has also been introduced a discussion in many chapters of the principles and data of applied mechanics attaching to the subject in hand. This has been done to enable teachers who desire to enliven the drill in the mathematical classes to find practical problems and applications of interest and future meaning, and to encourage teachers of the applications of theory to find easily the links and bases for such sound applications. The distinction be-

tween the applied thermal principles and those derivable from other departments of theory should tend also to clearness and benefit.

The new treatments which are specially noteworthy are those of the analysis of the power plant and its diagram, and the separation between the simple and the complex phases of this problem; the treatment of the steam pipe as an element of coördinate importance in the plant with the boiler and the engine; the chapters on the auxiliaries as distinguished from the essentials; the steam-turbine chapter, the engine-mechanism chapter, and the establishment of the philosophy of the expansion of the elastic medium as the basis for the valve gear, the governor, the condensing and the compound engine. This is new, and it is believed that it will be helpful and illuminating. Some data and tables have been introduced, but only sparingly. The author prefers that students should acquire the habit of going to the "Engineers' Pocket Books" for statistical or quantitative information, using this book to give a perspective or setting to make clear the meaning and interpretation of such data and constants as these excellent books are prepared to furnish.

MODERN PRACTICE IN MINING. Vol. I Coal. By R. A. S. Redmayne. Pp. 199, illustrated. 5 $\frac{1}{2}$ x9 in.; cloth, \$2. New York, Bombay and Calcutta, 1908: Longmans, Green & Company.

Contents: Coal: Varieties, composition and occurrence. Determination of the value of fuels. Geology applied to coal mining. Prospecting and boring for coal. Later developments in boring. Some boring problems.

This volume is the first of a series of technical works which the author intends to bring out in successive order, the completed set to constitute a comprehensive library on modern practice in coal mining. Mr. Redmayne has remembered one point which the average writer fails to consider: coal mining is an industry requiring specialists in the various branches, and as a consequence, the subject is here carefully subdivided rather than treated in a general manner. There is a happy blending of the practical and theoretical, and an effort has been made to present only such ideas as are supported by facts. The book is not a resumé of antiquated methods, but contains only the latest information concerning the best modern practice. The chapter on "Geology as Applied to Coal Mining" is opportune, as mining men now recognize that a correct understanding of the geology of a field is essential to the economical development of the different seams. The best part of the book is the chapter on boring, for this subject is one, concerning which but little useful information has been available. The various drills are examined in detail, and excellent tables showing costs and records of boring are given.

The Tariff Hearings

SPECIAL CORRESPONDENCE

At a hearing before the Ways and Means Committee on Dec. 10, E. H. McCullough, Philadelphia, for the Westmoreland Coal Company and for delegates representing nearly the entire bituminous coal output of Pennsylvania and West Virginia, requested the maintenance of the present duty on coal as a maximum, with possibly free trade under a reciprocity provision with Canada as a minimum.

H. E. Miles, of Racine, Wis., a member of the National Manufacturers' Association and other organizations, at several hearings before the Ways and Means Committee Dec. 5, 8 and 10, discussed the tariff question generally but paid special attention to iron and steel. Mr. Miles asked for large reductions in iron and steel duties, discussed the question of "trust" organization, gave figures for costs of production, and speaking as a farm implement and wagon producer estimated the duties needed by that industry as probably not more than 15 or 20 per cent. or with free trade in, or materially reduced duties on, iron and steel, perhaps no tariff whatever.

A large number of briefs relating to tariff revision have been filed with the House Ways and Means Committee by interests representing minerals and mining industries. With reference to schedule C (metals and manufactures of), the members of the Western Bar Iron Association ask that in the adjustment of tariff rates comparative labor costs be considered, a differential between steel and iron bars corresponding to that in the present tariff being maintained. The brief is signed by James H. Nutt, secretary.

James M. Swank, for the American Iron and Steel Association, has filed a long brief protesting against the maximum and minimum tariff plan. Frank Samuel, of Philadelphia, has presented argument to show that producers of iron and steel products need no protection. Andrew J. Ennis, of Ennis & Co., Philadelphia, recommends the repeal of the duty on iron ore.

The American Iron and Steel Manufacturing Company, Lebanon, Penn., on behalf of 25 producers, suggests reduction of duties on bar iron from 0.6 to 0.5c. per lb. The Pittsburg Forge and Iron Company, Pittsburg, argues that no considerable portion of the trade will assent to reductions of duty on bar iron. Joseph L. Hills for the Association of Agricultural Colleges and Experiment Stations requests the transfer of basic slag meal from the metal schedule to the fertilizer schedule under the free list. H. G. Hester for the New Orleans Cotton Exchange has filed resolutions asking that cotton ties be put on the free list. Searle & Pillsbury, Boston, representing certain New England importers of strip, plate, and sheet steel that

has been cold-rolled only, protest against any additional duty levied upon such steel in accord with polish or brightness. Searle & Pillsbury for New England importers of high-speed steel, request that no ad valorem rate be substituted in paragraph 135 for the present specific rate on steel valued above 16c. per lb. but that the rate be made specific at 3.5c. per lb. instead of 4.7c. Godfrey L. Cabot, Boston, in a brief urges the removal of duties on iron pipe, rods, bars and pig iron and argues that they are sold cheaper abroad than at home. The Taylor Iron and Steel Company, of High Bridge, N. J. has submitted additional argument in behalf of specific duties on manganese steel (not less than 7 per cent. manganese) of from 2c. per lb. to 4c. per lb. A new classification of steel bands or plates for making saws is recommended by the Simonds Manufacturing Company, Fitchburg, Mass., whereby the duties on steel bands or strips untempered suitable for making band-saws will be the same as on saw-plates wholly or partially manufactured. They desire that there be 30 per cent. extra duty on the tempered strips over and above the duty on the untempered strips for making saws. Wallace H. Rowe, Pittsburg, protests against reductions of duty on steel hoops, bands, and cotton ties. Searle & Pillsbury, for Edward Ward & Sons, request that strip steel be dutiable as low as or lower than at present. Jas. A. Coe & Co., Newark, N. J., request a marked reduction on Swedish bars and billets with corresponding cuts of 0.5c. per lb. on English tool steels.

Henry K. McHarg, of the Virginia Iron, Coal and Coke Company, has filed a long brief in behalf of the retention of the present duty on pig iron. The Grasselli Chemical Company, Cleveland, O., urges that pyrites ore be left on the free list. Joseph B. Carper, West Milan, N. H., asks for a duty of 25 per cent. on pyrites ore. The Collins Company, Collinsville, Conn., and the Aetna Nut Company, Southington, Conn., demand the removal or reduction of duty on scrap iron and steel.

Specific enumeration of steel wool is requested by the American Steel Wool Manufacturing Company, New York, giving a duty at the rate of 11c. per lb. on steel wool and steel shavings.

The Electro-Metallurgical Company, Niagara Falls, N. Y., submits a supplemental brief as to ferro-alloys, asking that the duties on ferrosilicon, ferrotungsten, etc., be made clear, be equalized on all these alloys, be ad valorem and be reasonable. About 20 per cent. would be satisfactory. The American Vanadium Company, Pittsburg, requests the retention of crude vanadium on the free list with a duty of 20 per cent. on the manufactured article. The Titanium Alloy Manufacturing Company, Niagara Falls, asks that titanium be made dutiable at 35 per cent. Dana & Co., New York, have filed argu-

ment to show that the ferro-alloys need no duty. The Globe Steel Company, Mansfield, O., asks increase of duties on iron shot, steel shot, iron grit and other iron abrasives from 45 to 75 per cent. The Standard Roller Bearing Company, Philadelphia, urges the retention of present duties on steel balls, ball bearings, roller bearings. The Excelsior Steel Ball Company, Buffalo, N. Y., asks for increase of duty on anti-friction ball forgings to a protective point. The Tungsten Roller Bearing Axle Company, Canton, O., asks an increase of 20 per cent. on anti-friction ball forgings. The Standard Roller Bearing Company, Philadelphia, Penn., has filed a list of concerns importing foreign ball bearings and steel balls. The Diamond Machine Company, of Providence, R. I., through Z. Chafee, treasurer, argues that free trade in iron and steel and free lumber would greatly advance the manufacture of grinding machinery. They also complain of the retaliatory tariffs of several foreign countries and ask for a policy of reciprocity rendering it possible to buy cheap materials in bulk. A considerable number of representatives of the machine-tool industry have united in argument filed with the committee for a maintenance of the present tariff of 45 per cent. on machine tools, with a minimum tariff of 30 per cent. to be used in bargaining with foreign countries. The King Bridge Company, Cleveland, O., asks for reduction of duty on structural shapes such as I-beams, channels, angles, plates, etc.

Hon. James Kennedy, for the Carnation Tin Plate and Sheet Company, Canton, O., asks the retention of the present duties on tinplate and the reduction of the drawback allowance to 40 or 50 per cent. A committee representing the Amalgamated Association of Iron, Steel and Tin Workers has filed argument against the present drawback on tinplate. John Williams, secretary-treasurer of the association, has submitted elaborate comparative wage tables in support of the request for maintenance of the tinplate duties and abolition of the drawback. The John A. Roebling's Sons Company suggests a reduction of 0.25c. per pound from the specific rates on wire of 1.25c., 1.50c. and 2c. under paragraph 137 of the present tariff. On wire coated with other metals they suggest an advance from 0.2c. per lb. to 5c. per lb. H. F. Lyman, Cleveland, O., has filed an account of a conversation with John A. Roebling about 1900 in which the latter stated that he could profitably sell wire-rope abroad in competition with English producers. John W. Walton, Cleveland, O., suggests a duty of 25 per cent. on wire, wire-rope or cordage whose chief element is drawn wire.

The New Jersey Zinc Company, through H. L. Wardner, asks for the same duty on zinc dust as there now is on the spelter—1.5c. per lb.—the change to be made by inserting in paragraph 192 the words, "or zinc dust." L. Vogelstein &

Co., New York City, dealers, importers and miners, ask duties as follows: "Zinc ores crude of any kind, carbonate of; silicate of or sulphides of, free of duty. Spelter (zinc in pig), duty 1.5c. per pound;" with lead or copper mixed with zinc ore free. This concern further asks that whatever be done as to a tariff on lead, the present relation between lead in ores and lead in bullion be maintained. A new paragraph making ores containing more than one metalliferous substance dutiable according to their chief element of value is also recommended.

J. M. M. Shimer, of L. & R. Wister Company, Philadelphia, advocates the removal of duty from lead. The Cockerill Zinc Company, Nevada, Mo., protests against duties on zinc ore. M. L. Cohn, of the Federated Mines and Milling Company, Chicago, Ill., asks for a protective duty on zinc ore. R. A. & Jas. Balph, Pittsburg, request a specific duty of 1.5c. per pound on the metallic contents of zinc ore. The Lanyon Starr Smelting Company, Bartlesville, Okla., protests against any duty on zinc ore.

Hon. Amos Allen, for Jabez True and others, of Portland, Me., asks that calamine be made dutiable at 20 per cent. The Commercial Club, of Joplin, Mo., urges a duty of 1½c. per pound on zinc ore. The Chanute Zinc Company, St. Louis, protests against all zinc ore duties. The National Zinc Company, New York, asks that zinc ore be free.

The Tacoma Chamber of Commerce and Board of Trade protest against any reduction in the tariff on lead and are supported by telegrams and letters from a large number of western and north-western concerns. A large number of individuals and firms in Leadville, Colo., protest against the tariff on lead and ask for duties on zinc in ores and spelter.

The Asheville Mica Company, Asheville, N. C., opposes any reduction in duty on mica. The Ohio & Western Lime Company, Huntington, Ind., protests against any reduction of duty on lime. The California Board of Trade asks a duty on asphalt containing over 60 per cent. bitumen of \$3 per ton, with \$5 per ton on all containing over 60 per cent. The Republic Mining and Manufacturing Company, Philadelphia, asks a duty of \$2 per ton on bauxite. The Aluminum Company of America asks the retention of the present duty of \$1 per ton. The National Carbon Company, Cleveland, O., files a supplemental brief in favor of making present rates on carbons apply to pieces of commercial length only, thus taxing proportionately the greater lengths. E. E. Cory, New York, asks readjustment of the classification of carbons so as to permit importation of standard lengths at present rates. Several paper companies have filed argument for the large reduction or abolition of the duty of \$2.50 per ton on kaolin. The Laclede-Christy Clay Products Company, asks a duty of about

33 per cent. on clay and gas retorts. This is supported by the Parker Russell Mining and Manufacturing Company, St. Louis. Several other American manufacturers unite to suggest 35 per cent. ad valorem or not less than \$5 per ton on firebrick used for gas retorts, etc.

The Anselma Graphite Company, New York, asks a duty of 2 or 3c. per lb. on graphite, filed denial of statements made by graphite producers, and is supported by the Imperial Graphite Company and the Chester Graphite Company.

The Monarch Plaster Company, Rochester, N. Y., asks protection from Canadian gypsum. J. B. King & Co., New York City, in supplemental argument denies the statements of domestic gypsum interests in favor of protection. The Keystone Plaster Company, Chester, Penn., objects to the duty on gypsum and asks that the article be placed on the free list. The Atlantic Terra Cotta Company, New York, Staten Island Shipbuilding Company, Port Richmond, N. Y., Keystone Fireproofing Company, Philadelphia, and a large number of others, request the removal of duties on gypsum rock.

George M. Whitwell for the Rosiclaire Lead and Fluorspar Works, Rosiclaire, Ill., asks for a duty of \$3 per ton on fluorspar, now free. C. S. Munn, for the Kentucky Fluorspar Company, Marion, Ky., asks a duty of \$5 per net ton on fluorspar.

The Beckton Chemical Company, Philadelphia, manufacturer of lithopone, asks that the duty on crude barytes be not advanced. This is supported by H. M. Earle, New York City, in behalf of certain users of barytes.

The Semet-Solvay Company, Syracuse, N. Y., has filed a statement admitting its former demands to be in part unwarranted, and submits a revised schedule of requested duties omitting entirely from its proposed dutiable list tar, pitch, and all primary coal-tar products, and all but a few items of the class of intermediate coal-tar products.

Frank G. Carpenter, for the Vermont Marble Company, has filed a supplemental statement on costs of producing marble abroad. C. D. Jackson, New York, requests reduction of duties on carrara marble, breccia and marble mosaic. The Puffer Manufacturing Company, Boston, asks that marble be placed on the free list. W. R. Guy, San Diego, Cal., suggests a new classification of Mexican onyx marble, giving it a duty of 65c. instead of \$1.50 per cu.ft. The Italian Chamber of Commerce, New York, asks the removal or reduction of the present duties on marble.

James H. Rhodes & Co. submit supplemental argument for the abolition of the 15 per cent. duty on pumice stone and an increase on the manufactured product from \$6 to \$9 per ton with retaliation on foreign export duties. L. L. Boone, San Diego, Cal., asks that sandstone be admitted free under certain conditions.

Anti-Debris Activity in California

SPECIAL CORRESPONDENCE

The California Anti-Débris Association, with headquarters in Sacramento, is sending out men to see if any hydraulic mining operations are in contemplation in the drainage basins of the Sacramento and San Joaquin rivers. This means that the association intends not only to worry the hydraulic miners who have procured licenses to mine from the California Débris Commission, as in the past, but also, if possible, to prevent any new hydraulic enterprises from commencing operations. For these reasons few persons are contemplating hydraulicking in the regions referred to, since they will not only be annoyed by the association named, but are apt also to be brought into expensive litigation. This is all wrong, of course, but can hardly be helped since the California Miners' Association is no longer in a financial position to combat its old enemy.

At the last meeting of the Anti-Débris Association much attention was given to the subject of gold dredging. Reports were received from agents who have made examinations of the various dredging operations and some of them described the so-called "damage" done near Oroville. Finally a committee was appointed with full power to instruct the attorneys for the association to bring suits against all dredging companies which declined to comply with the suggestions of the association as to their operations. The association which intends these rather high-handed actions is in no sense a State institution, though it carries the State's name. It is a private association with no authority whatever to compel incorporated bodies to adopt its suggestions or obey its orders. It is evident that the dredge people will eventually have trouble with this association and they will suffer as the hydraulic miners did unless they band together for mutual protection and aid the California Miners' Association to defend the mining interests against this long-lived and active foe to the mining industry of California.

Indian Gold Mines

Gold production in Kolar goldfield, Mysore, India, in November was 45,900 oz. bullion, being 315 oz. more than in October. For the 11 months ended Nov. 30 the total was 481,416 oz. bullion in 1907 and 483,741 oz. in 1908. The bullion reported this year was equal to \$8,999,036, or 435,367 oz. fine gold. The output statements of the larger mines in November show 19,629 oz. from the Mysore; 10,007 oz. from the Champion Reef; 7087 oz. from the Nundydroog; 7010 oz. from the Ooregum.

Personal

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

There will shortly be a vacancy on the editorial staff of the JOURNAL, open to a young engineer, who must be a graduate of a technical school and must have had several years of practical experience.

J. R. Finlay has returned from the West.

F. F. Sharpless has returned from Europe.

E. G. Reinert, of Denver, Colo., visited Cobalt, Ont., recently.

W. H. Shockley has removed from Tonopah, Nev., to Palo Alto, California.

Henry F. Lefevre has spent four weeks examining gold mines near Sumpter, Oregon.

J. Nelson Nevius, of Pasadena, Cal., has been investigating dredging methods at Oroville.

R. B. Brinsmade sailed from New York Dec. 12, on his way to Germany on mining business.

William M. Brewer has returned to Victoria, B. C., from a stay in southeastern Alaska.

P. R. Whitman is with the Virginia & Mexico Mine and Smelter Corporation at Hostotipaquillo, Jalisco, Mexico.

George A. Guess is now superintendent of the smelting works of the Tennessee Copper Company at Copperhill, Tennessee.

D. C. Jackling, general manager of the Utah Copper Company, has returned to Salt Lake City from a visit to New York.

George Leyson, formerly of the Silver Queen mine, has been placed in charge of the Green-Mechan and Red Rock mines, Cobalt, Ontario.

George Gordon Crawford, of Birmingham, Ala., president of the Tennessee Coal, Iron and Railroad Company, is ill with typhoid fever.

D. P. Shuler, of the Dominion Nickel-Copper Company, Sudbury, Ont., recently visited New York in connection with the business of his company.

A. S. Dwight, consulting metallurgical engineer, of New York, has returned from the West, where he has been engaged for several months on professional business.

Herman C. Bellinger, well known in Montana and British Columbia as a metallurgical engineer, has gone to New South Wales to take charge of the Great Cobar Copper smelting and refining works.

A. Von Hammerstein, who for several years has been engaged in exploring for oil in the region north of Athabasca Landing, Alberta, has been in Winnipeg and reports that he has a large force of men engaged.

G. C. Lloyd has been appointed secretary of the Iron and Steel Institute of Great Britain, in place of Bennett H. Brough, deceased. Mr. Lloyd was formerly assistant to Mr. Brough, but for some time past has been secretary of the Institution of Electrical Engineers. L. P. Sidney has been appointed assistant secretary, a new office.

Bennett Brown, of Kansas City, Mo., has resigned his position as commissioner of the Southwestern Interstate Coal Operators' Association, to date from Jan. 1, on account of ill health. William D. Ryan, of Indianapolis, Ind., has been chosen commissioner to succeed him. Mr. Ryan is at present national secretary-treasurer of the United Mine Workers of America.

The Council of the Iron and Steel Institute has awarded the Bessemer gold medal to Alexander Pourcel, an eminent French metallurgist. The Bessemer medal is awarded annually for services to metallurgy and it is for his investigations in the manufacture of ferromanganese and for his work on the thermal reactions involved in the manufacture of iron and steel that Mr. Pourcel becomes the recipient for this year.

Obituary

A. B. Boecker, for many years connected with the Argentine smelter at Kansas City, and latterly with different smelters in Mexico, died at his home at Parsons, Kansas, Nov. 12, 1908.

E. W. Chapman, manager of the Channel Mining Company, was killed Nov. 22, in the Chapman mine near San Andreas, Cal., by a fall of gravel from the roof of a drift. He was well known in California as a miner and superintendent of long experience.

George McCully Laughlin, who died in Pittsburg, Dec. 11, aged 66 years, was born and brought up in that city. After serving with some distinction in the Civil War, he entered the employ of Jones & Laughlin, the iron and steel firm established by his father, James Laughlin, and B. F. Jones. He served in this concern actively for over 35 years, in various capacities. He was secretary and treasurer for about 20 years, and later vice-chairman of the board. In 1900 he retired from active work, remaining a director of the company. Three brothers survive him, all interested in the management of the company.

Societies and Technical Schools

Colorado State School of Mines—Dr. Victor C. Alderson, president of this school, has asked the Colorado legislature to establish an experimental ore-dressing and metallurgical plant at Golden. This is a most worthy object, and must redound to the best interests of the mining industry of this State. The plant as advised by

Dr. Alderson would consist of four units: first, a sampling mill; second, an ore-dressing plant; third, a mill for amalgamation, cyanidation and chlorination; fourth, a section for roasting and smelting, each unit to be capable of treating a carload a day.

Scranton Miners' Institute—At the regular meeting in Scranton, Penn., Dec. 14, Mine Inspector Hubert Johnson occupied the chair, and in a brief opening address said that the subjects to be discussed would be divided into three parts: First, "The advantages and disadvantages of safety and black powder;" second, "What determines the amount of cost;" and third, "The dangers of mixed powder." Mr. Johnson said that they must take exception to the use of the word "safety" in connection with the use of powder. No powder was safe. The general discussion that followed seemed to favor the ideas advanced by Mr. Johnson in his opening address.

University of Washington—The special three months' course for mining men begins its eleventh annual session at the School of Mines of this university at Seattle on Jan. 5. Admission to the classes is without examination. Instruction is given by lectures, laboratory exercises and visits to mines and plants in operation. The past experience and future aims of each student are taken into consideration, and the character of his work arranged accordingly. During the first week of the course the instruction is of a general nature. Thereafter the students select those courses which best fit their needs. These include geology, mineralogy, assaying and analysis, mining, mining law, the care of machinery, making and sharpening drills and general forge work. The laboratory equipment of the school includes a stamp-mill, concentrating plant, sampler, compressed air and drill plant, machinery for framing timbers and a complete assaying plant.

Coal Mining Institute of America—The fifty-second meeting was held at Pittsburg, Penn., Dec. 1. In the absence of President B. F. Jones, of Irwin, the vice-president, H. H. Stoek, presided. Several papers were read touching on the practical and technical work of mine operation. The old officers were re-elected except that Peter Y. Cox, of Carnegie, was elected auditor, in place of John Britt, deceased. There was a day and night session, the chief feature of the latter being a paper on "The Organization of First Aid Corps," written by Dr. W. J. Shields, of Scranton, and read by W. M. Judd. Dr. Shields was the originator of the first-aid movement in coal mines. A plan of organizing a working corps in mines and training men in elemental surgery to be available for use, was discussed in the paper. It was decided to hold the next meeting at Uniontown, in conjunction with the West Virginia Coal Mining Institute.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

Dec. 9—For the past week there has been more or less stormy weather in the mountain and foothill region of the State, bringing welcome rains to fill the streams, reservoirs, ditches, etc. In the higher altitudes from 6 to 24 in. of snow has fallen, thus starting the storage snow of the season.

The old mining camp of Darwin, Inyo county, is showing greatly increased activity after a long period during which little or nothing has been done. Several of the old mines are being reopened or developed with additional men, and prospectors are showing renewed interest in the possibilities of the district. The proximity of the new smelter at Keeler which has already taken considerable ore from Darwin has encouraged property owners to hold and develop and newcomers to invest. J. B. Haggin is developing the old Modoc mine, where high-grade silver ore is found. The Giroux Copper Company will shortly start up. On the Mineatta mine operations will shortly be resumed, and the Jackass mine of Porter & Beeman will soon be opened again. The Inyo Consolidated Mining Company, 20 miles south of Darwin, will complete its new mill next month and has finished its three-mile pipe line. Several mines of the McKenzie estate have shipping ore and some of them have sent more or less to the Keeler smelter.

The Monster mine in Lead cañon, near Big Pine, Inyo county, has been sold to S. A. Stanton, of Manhattan, Nevada, representing New York men. Miners have been set at work and a contract let for hauling ore to the railroad. The mine is a silver-lead property and is already well developed, having been a shipper for some time.

One of the first advantages that the people of Angels district, Calaveras county, have received from the work of the Union Construction Company, is the furnishing of a supply of water to the Eho hydraulic, a Lake mine, near the Stanislaus river. This mine is now being put in condition for winter work. The water for the mine comes from the Union Company's new ditch and will be siphoned across the Stanislaus river.

Probably the largest placer mining plant in the Mother Lode section of Calaveras county is the new one being installed by the Reiner Gravel Mining Company, of Angels. Work was started on this mine in May of this year, and a three-

compartment 250-ft. shaft has been sunk. A hoist has been installed and a compressor building put up ready for the new compressor which is nearly complete. The building for the new 20-stamp mill is finished ready for the machinery. Three electric motors are being installed, and the power line is nearly finished. The new rock breaker has a capacity of 400 tons daily. The gravel to be mined is cemented, and hence the necessity of the crushing plant. By the first of the new year the mine and plant will be in full operation.

The Natoma Consolidated of California, which has taken over the properties of the larger dredging companies at Folsom, has also acquired the dredge and ground of El Dorado Dredging Company at the same place. There is one more independent company at that point and negotiations for the purchase of its property by the Consolidated are nearly completed.

The North Star Mines Company, of Grass Valley, has offered a reward of \$500 for information leading to the recovery of gold precipitates stolen from its cyanide plant recently. A large amount of gold was taken, but thus far the company has been unable to get any track of the robbers.

At Grass Valley the 1000-ft. level of the Idaho-Maryland mine has at last been reached, the shaft having been unwatered and entirely retimbered. Drifting will now be carried on to the west where there is known to be a large amount of virgin ground; this same ground has been worked in the upper levels by the present management. The entire plant of the company has been put in first-class order. Four years ago the present company began to reopen the property and has now reached a depth where it is confident of being able to take out paying ore.

The old ocean beach black sand gold mine at the mouth of Harris creek opposite Dow's Prairie, Humboldt county, formerly owned and operated by F. M. Schideler, C. W. Hill and others, has been adjudged by the court to belong to A. I. Duprey, of Eureka. He brought suit against the Pacific Beach Consolidated Mining Company, claiming the 88 acres of land in the mining ground.

There is quite a little mining boom in Siskiyou county at present and numbers of investments are being made in both quartz and gravel property. This county shares with Trinity the credit of having the most extensive beds of auriferous gravel in the

State. In comparatively few places are these gravels being worked, though there are numbers of hydraulic mines in operation. Preparations are now being made to work these properties on an extensive scale and many investments are being made in new ones. The anti-débris law does not apply in either Trinity or Siskiyou counties, there being no navigable streams there.

Goldfield, Nevada

Dec. 8—A. D. Parker, vice-president of the Florence Goldfield Mining Company, before leaving stated that the company has decided not to let any more leases. None of the present leases extend beyond the end of March, 1909. The leases have produced approximately \$5,000,000, of which the parent company has received 25 per cent. as royalties. C. A. Gehrman has been appointed mine superintendent and M. T. Morris superintendent of the mill, while Tom Lockhart, the president and general manager, will take a long and much needed rest. One of the romances of the desert attaches to the Florence. Parker is said to have grubstaked Lockhart for many years; from 10 to 35 years, according to various authorities. Lockhart finally found the Florence.

Joe Hutchinson is in Pittsburg making strenuous efforts to get the next American Mining Congress to come to Goldfield. The local Chamber of Commerce is supporting this effort. Goldfield has been maligned and wildcatted until it is almost impossible for an earnest inquirer to obtain authentic information regarding this camp which contains the *mine that in 1907 produced more gold than any other mine in the world. It did not produce the largest tonnage nor pay the most dividends, but it did produce the most gold.

A recent decision by Judge O'Brien, of Tonopah, has been handed down which has a wide bearing on business interests in Goldfield, and as a result of which plans for further building are now being drawn. Owing to a question of original title, leasers of buildings and ground after obtaining possession have in many cases claimed squatters' rights, refusing further remuneration to the landlords and fighting dis-possession. The opinion says: "To permit a person, who has been let into possession of one of these town lots under a lease from the original possessor, and after recognizing his title by the payment of rent or by accepting possession thereunder to repudiate his lease and the title under which he entered simply because the

officials of the land office might cancel the mining claim upon which the title rests and afterward issue a townsite patent, would be to place a premium upon fraud, violation of personal covenants and other acts of more or less moral turpitude."

Two long tunnels on the Western Pacific railroad have been completed. The Flower lake tunnel is 5657 ft. long, and cuts under the Pequop mountains in the middle of Elko county. This tunnel was completed in 21 months. The Spring Garden tunnel at Beckworth pass is 7306 ft. long and was completed in 27 months. A regular train service has been inaugurated on the Western Pacific railroad from Salt Lake City to Shafter, where connection is made with the Nevada Northern road running to Ely.

It is still impossible to get production figures from the local ore-purchasing concerns, but it is certain that the production of Goldfield is pretty near the lowest in the history of the camp. This is due mainly to the fact that the main companies in the district no longer are letting leases. A large number of leases are still working, but the frantic production from bonanza leases, which yielded over half a million dollars per week, is a thing of the past.

Water has been found in one of the mines at Tonopah. Almost without exception the Goldfield mines are wet and show no unusual temperatures. But the Tonopah mines have been dry and have shown a high rate of temperature increase. In the Montana-Tonopah shaft temperature measurements showed an average increase of 1 deg. F. for every 43.5 ft. in depth, one reading going as high as 1 deg. for 36 ft. The water encountered between the 1250- and 1300-ft. level in the Belmont probably marks the water level of the camp. The determination of the nature of the ore deposits below water level will be eagerly awaited.

Butte

Dec. 10—On Friday of last week considerable excitement was caused in Butte and throughout the State by news received from Washington that President Roosevelt was considering the advisability of Government action in the courts for the purpose of enjoining the operation of the Washoe smelter at Anaconda, because of the injury the fumes from the smelter were causing to the forest reserves in the vicinity. Two years ago the farmers in Deer Lodge valley adjoining the smelter instituted an action in the Montana Federal Court for the same purpose, claiming that their farm products were ruined by the sulphur fumes. Many months were consumed in the hearing of the case before a special master in chancery appointed for the purpose, and volumes of testimony were taken. The findings of the Master in Chancery were submitted to Judge Hunt some months ago and are

now held under advisement by him preparatory to rendering his decision.

When the news was heard in Butte it was received with indignation and disapproval on all sides. The closing of the smelter by temporary injunction or otherwise would also mean the closing of practically all the larger mines in the Butte district and would directly affect more than 100,000 persons who depend upon the mining industry for their livelihood. Mass meetings in Butte, Anaconda and other mining centers were held and resolutions telegraphed to the President and the Montana representatives at Washington urging that no action be taken until an opportunity be presented for hearing both sides of the controversy. As a result of the telegrams and a conference held at the White House between President Roosevelt and the representatives of the Amalgamated it is probable that no action will be taken by the Government until the feasibility of installing fume consumers at the smelter is determined.

Production of the Butte mines for November was about 28,400,000 lb. of copper. Of this amount the North Butte Company produced 3,900,000; Coalition, 2,300,000; Anaconda Company, 7,200,000; and Boston & Montana, 7,600,000 pounds.

The report of the United States Geological Survey for the year 1907 places Montana eighth in the list of mineral producers, with products of the value of \$60,663,511.

Sylvanite, New Mexico

Dec. 7—During the week the Sylvanite Consolidated Mining Company was organized; Sol Camp is president, Marvin E. Ish, vice-president, C. H. Morse, secretary and S. M. Aguirre, treasurer. The company owns the Holcomb property, composed of eight claims, and is preparing to ship ore.

The most important deal last week was the sale of the Nederland and Oversight claims to C. C. Hamlin, G. F. Fry and E. C. Newcomb, of Colorado. C. H. Lawrence, of Chicago, bought three claims north of Sylvanite, while the Clark brothers, who were the original locators at Sylvanite, sold a claim to Goldfield men during the week.

The Clemmie, Wake-up Charlie and Broken Jug mines will begin to ship this week. The tunnel at the Wood mine, which was sold last week to Pierson Brothers, of Ouray, Colo., for \$65,000, is now 300 ft. long; for half this distance the tunnel is in ore that averages over \$30 a ton, select samples assaying as high as \$967. The Sylvanite Queen Mining Company, composed of Bisbee business men, is sinking a shaft on the Cowboy claim south of Sylvanite.

El Paso men have organized the Gold Pass Mining Company to develop claims across the Playas valley about 15 miles from Sylvanite.

Calumet, Michigan

Dec. 12—At the annual meeting of the Arcadian Copper Company, to be held at Jersey City on Dec. 31, 1908, proposal to sell the company's portion of lands in section 16-55-33 will be taken up and steps taken toward the reorganization of the company. The plans are not fully decided upon but, in all probability, a new company will be organized under the laws of Michigan and will take over the lands and effects of the old company and an assessment may be called to furnish funds to resume operations.

A development company has been formed to fully explore the lands lying in section 16-55-33. A formation, believed to be the northern extension of the Baltic lode was recently disclosed and it is upon this formation that operations will be centered. James P. Edwards will be in direct charge of the work.

Denver

Dec. 12—The ore production of San Juan county for November is given at 20,000 tons, of which 1825 tons were shipped direct from Silverton to the smelters, the balance having to be beneficiated by concentration prior to shipment.

The Camp Bird dividend of 24 per cent. paid on Nov. 7, amounted to \$196,800. The monthly dividends for the year are given at \$787,200, and the total to date \$4,608,504. This on a capitalization of five millions of dollars ought to give the British owners who get most of this money, a fairly good opinion of Colorado mining properties.

In the Cripple Creek district, the committee of assessors appointed for the purpose, are drafting a bill to appoint a Revenue Commission, whose duty it shall be to prepare a new revenue code for the State of Colorado. It is hoped that this bill will be adopted by the next legislature, as it will result in a more equitable enactment than that which now obtains, assessing non-producing property adjoining ground that is richly productive, as high as the latter.

In the same district, the dividends payable this month are stated to be as follows: Elkton Consolidated, \$50,000; Requa Savage, Dec. 10, \$4035; Acacia, Dec. 19, \$14,389; Mary McKinney, Dec. 21, \$28,000; El Paso, Dec. 25, \$24,500; or very nearly \$121,000 in all.

The Golden Cycle mill is credited with a November output of 9000 tons, which could be largely exceeded but for the reason that the company's mill has to take care of the treatment of custom ores under contract. The Portland output was upward of 9000 tons.

It is reported that the Westinghouse Electric Company has secured a site for a reservoir and power plant on the South Platte river, near Denver, which will supply electric current, for which there is a largely increasing demand, in Denver and the surrounding country. It is stated that

the head secured by the dam will give 20,000 h.p. in use.

The Central Colorado Power Company, which project entails the expenditure of about \$20,000,000, is moving its headquarters from Colorado Springs to Denver, and it is stated has contracted to supply the Denver Gas and Electric Company with all the power it needs. The former company will obtain its energy from Shoshone, near Glenwood Springs, where a dam has been built which will furnish 20,000 h.p. Another dam and reservoir will be built at Gore Cañon, on the Moffat road, and another on Middle Boulder creek. It is stated that the total capacity of these three power plants when completed will be 81,000 kw. of electric energy.

Toronto

Dec. 12—A number of mining companies are being prosecuted by the Ontario Provincial government for violations of the Ontario Companies Act. For failure to comply with the provisions of the Act each director is liable to a fine of from \$50 to \$400. Several cases were tried recently before Police Magistrate Kingsford, Toronto. James H. Dixon, president of the Crown Jewel Mining Company was fined \$200, and J. C. Ritchie, secretary-treasurer of the Gifford Extension, and secretary of the Gifford-Cobalt companies was fined \$200 for each company. Informations had been laid against the other directors of these companies, but Thomas Mulvey, who prosecuted the cases intimated that one fine for each company would be sufficient. Several other cases were adjourned.

Since these prosecutions were instituted companies offering stock for sale are complying with the law, and many have modified their announcements accordingly.

Dr. Eugene Haanel, Canadian Director of Mines, has left Ottawa for Sweden to investigate further the electric smelting process. As a result of the experiments in electric smelting undertaken by the Canadian government, at Sault Ste. Marie, Ont., under Doctor Haanel's supervision about two years ago, a leading Swedish firm of ironmasters undertook a series of experiments with a view of perfecting the system and has erected a plant at Dumnarfret, which is claimed to be superior to any yet designed. It employs 800 h.p. in place of the 250 h.p. used at Sault Ste. Marie, and on the same plan a 3000-h.p. furnace could be built, at a cost of \$20,400 with a capacity of 10,000 tons of pig iron per year. The cost of producing pig iron is placed at \$12.03 per ton, which is about three-quarters of the cost of production by existing electrical methods. Doctor Haanel has been specially invited to investigate the operation of the furnace, which will be started on or about December 1. The Mines Department is keenly alive to the industrial importance of the question, as there are extensive

deposits of iron ore in Ontario and Quebec, which cannot profitably be exploited by the ordinary methods on account of their distance from the fuel supply. The process of electric smelting would also render available large deposits which, owing to their high sulphur content, cannot be treated in ordinary blast furnaces; the electric furnace can successfully handle ores containing as high as 2.5 per cent. of sulphur. While in Europe Doctor Haanel will also devote some attention to the latest results of experiments in the use of producer-gas engines for industrial purposes and the employment of bituminous coal for generating producer gas.

The Ottawa mint has received about 70 oz. of gold in bars from the Doctor Reddick mine at Larder lake. It will be coined into British sovereigns, and they will be the first gold coins made in Canada. The mint has at present no dies for stamping Canadian gold coins and has the privilege during this year of minting English sovereigns.

The Ottawa customs department has issued a circular to the collectors at Winnipeg, Brandon and other western points, calling attention to the number of fatal accidents from coal-oil explosions, and enjoining vigilance to prevent the importation of oil unless it complies absolutely with the terms of the petroleum inspection act.

London

Dec. 5—An interesting experiment in co-partnership between employers and employees has recently been started at the ship-building yard at Hartlepool. The head of the works, Sir Christopher Furness, in order to avoid strikes or lockouts, which he complained were far too frequent in England, and which were destroying the ship-building trade of the country, made two offers to his workmen through the trade unions. One was to sell the works outright to the trade unions at a price to be fixed by arbitration, and the other was to take the employees into partnership, a condition of the bargain being that there should be no strike and no lockout, all differences to be settled by a board on which masters and men would be properly represented. If this board failed to agree, the controversy was to be settled by an impartial tribunal. The second proposal has now been accepted by the workmen and the scheme is to be tried for 12 months.

The principle of co-partnership is one which will be generally accepted as sound. When men have a direct personal stake in the work that they are doing, they will naturally take a greater interest in it than when they work merely as wage earners. The experiment at Hartlepool will be watched with much interest, for if successful other industries, including mines, which suffer quite as much from strikes as shipbuilding or engineering works, will

probably not be slow to follow the example.

Quicksilver Mines—The Karabounan Mercury Syndicate, with mines in Asia Minor, reports that for the year ended Sept. 30, 1908, the value of quicksilver sold amounted to £23,076. The quantity is not stated. The profits for the year amounted to £15,850, on £75,000 capital.

Poderosa Mines, Chile—The Poderosa Mining Company, Ltd., is the name of a new company formed to acquire from the Compañía Minera Poderosa de Collahuasi, of Valparaiso, Chile, certain copper mines situated in the province of Tarapaca. The purchase price is £480,000. The capital of the company is £500,000 and £20,000 in £5 shares is now being offered for subscription at 10s. premium. Regular shipments of ore commenced in January last. In October a shipment was made of 1523 tons of ore, containing 25 per cent. copper and 12 oz. of silver to the ton. The general manager of the Chilean company, Robert Hawxhurst, estimated the ore reserves on June 30, 1908, at 100,000 tons of an average value of 25 per cent. copper and 12 oz. silver per ton.

New Zealand Crown Mines—The report of the New Zealand Crown Mines Company, Ltd., for the year ended Aug. 31, 1908, states that the operations have resulted in a loss of £920. Difficulty has been experienced in keeping the water out of the lower levels owing to insufficient pumping plant, and it has now been decided to install new electrically driven pumps. During the erection of this plant mining operations have been discontinued. During the year under review 20,190 tons of ore were crushed and treated from which bullion valued at £43,320 was recovered. The extraction obtained was 88.02 per cent. The cost of mining is given at 15s. per ton, including mining, maintenance and repairs, miscellaneous charges, and haulage of ore to battery, but exclusive of development. Milling cost was 10.99s. per ton. The amount charged to development account was £11,342, which was written off in the profit and loss account.

The new power station is to contain one Belliss-Morcom three-crank triple-expansion engine, one 550-kw. three-phase generator, one 25-kw. exciter, two Babcock & Wilson boilers, each having 1827 ft heating surface, one surface condenser and one feed-water heater and fitter. One 750-h.p. turbine with governor will be erected to drive the generator by water power, which is available for a considerable period of the year. The transmission line will consist of three bare 37/14 stranded conductors, which will carry the power to the mine, and of three core cables which will carry the power down the shaft to the motors. The plant will be capable of pumping, in two stages, 1135 gal. water per minute from a depth of 1000 ft. The motors are each 250 h.p., of the three-phase type.

Mining News from All Parts of the World

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

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Tennessee Coal, Iron and Railroad Company—This company is erecting a large and well equipped chemical laboratory at Ensley, in connection with the steel works and blast furnaces there. J. R. Harris, chief chemist of the Ensley division, will have charge. The company is also building a laboratory at Pratt City, to be used in connection with the Pratt coal mines and washers. It will be in charge of H. R. de Holl, chief chemist of the coal mines division, whose office is in Birmingham.

California

AMADOR COUNTY

Lavazzo—Where the tunnel tapped the vein in this mine at Pine Grove there is 6 in. of \$60 rock. The five-stamp mill will shortly start up.

BUTTE COUNTY

Bills—In this gravel mine near Wyandotte, James Wheeler, superintendent, good pay gravel has been struck, but with it considerable water so that a pump has been installed.

CALAVERAS COUNTY

Etna King—At this property, Angels, F. F. Ames superintendent, a new 20-stamp mill is being put in place, with concentrators.

Gobbi Ranch—Lagormasino & Quierolo, who are working this mine on the Gobbi ranch, have again made a strike of the "black metal."

Heckendorn—This mine is about to be started up again after an idleness of over 40 years. The quartz mill from the Black Wonder mine is being placed on the ground. The mine is near West Point.

Utica Mining Company—This company at Angels is keeping the Madison mill busy on rock from the Gold Cliff, but the Cross and Sticks mines are not running at present.

EL DORADO COUNTY

Big Cañon—This mine, also known as the Oro Fino, has been unwatered and a ditch to supply water for power, etc., has been finished.

INYO COUNTY

Copper—Officials of the Standard Oil Company have bought from Owen Jones a copper mine near Ballarat, where there

is a 30-ft. vein. Extensive development work will be commenced at once.

MARIPOSA COUNTY

Pocket—R. B. Stockton has struck a rich pocket in the Santa Rosa mine a few miles from Mariposa. Mr. Stockton has been prospecting the mine for several years.

MERCED COUNTY

Dredging Ground—A dredge-ground prospecting outfit has been set at work on the Ruddle, Dale and Buckley properties along the Merced river below the holdings, being operated by the Yosemite Gold Dredging Company, near Snelling.

MONO COUNTY

Placers—John Conway has transferred his ranch near Mono lake to Mr. Siebel, representing Chicago men, who will begin placer-mining operations on a large scale.

NEVADA COUNTY

Black Bear—The tunnel on this mine has been driven far enough to prove the permanency of the ledge and development will now go ahead on a larger scale. A compressor has been ordered and a new hoist will be built.

NEVADA COUNTY

Bear River Tunnel Company—This company has been organized at Grass Valley, with Ben Penhall as superintendent, to develop further the Bear river mines which have for the past two years been worked by a prospector's company of local men. The tunnel is now in 500 feet.

Grover & Murphy—These claims near Grass Valley have been bonded to Honolulu capitalists and a hoisting and pumping plant are being put up. A double-compartment incline shaft is to be sunk.

PLACER COUNTY

Fighting Bob—This new quartz mine on the American river hill about a mile from Auburn, is showing up ore of good milling value. The owner is Charles Gaus, of Auburn.

Bellevue—At this mine, Ophir, P. Lozano, superintendent, the last crushing of 110 tons yielded \$2460. Tribute workers are making about \$5 per day.

PLUMAS COUNTY

Crown Point—At this mine, Squirrel creek, 12 miles east of Quincy, H. Gobert, owner, the last crushing yielded \$60 per ton. The leases have run out and Mr. Gobert is now mining the property him-

self. The 3-ft. ledge carries a very rich streak.

SHASTA COUNTY

Shasta King—Work is being resumed on this mine and the Balaklala, the starting of two furnaces in the Coram smelter giving employment to all the idle miners in that vicinity.

SIERRA COUNTY

Omega—This company near Forest City, J. L. Green, manager, has completed its new mill and is now crushing high-grade gravel.

SIERRA COUNTY

Crittenden—Frye, Winrod & Blivens have taken a bond on this mine in Sailor ravine and have put two shifts at work in the lower tunnel. The mine is an old one, but has not been worked for some time.

SISKIYOU COUNTY

Happy Camp—This hydraulic claim has been sold by the sheriff for \$10,500 to Reeves Davis, of San Francisco. The Eastern company, which owned it, spent about \$200,000 and quit some years ago.

SOLANO COUNTY

St. Johns Quicksilver Mining Company—This company, of which A. Tredgidgo is manager, has decided to erect a 60-ton fine-ore furnace. A new shaft will be sunk this winter.

TRINITY COUNTY

Mountain Boomer—This mine at New River is being operated by R. A. Skinner & Co. as lessees. The last clean-up showed values of \$28 per ton.

Yosemite Improvement Company—This company is prospecting the bed of the Trinity river with a view to putting in a dredge. The company already has a dredge at Hamburg Bar, Siskiyou county.

TUOLUMNE COUNTY

Jupiter—At this mine near Jacksonville, owned by Bolton, Foster & Vance, they have been pocket mining, but the finds are such that it has been determined to develop for a milling proposition.

McCormick & McPherson—A new mill is being installed at this mine near Jacksonville, and the mine is idle pending its completion.

Joy Mining Company—This company is working the Mother Lode and Kelly mines near Jacksonville and has sunk a 400-ft.

three-compartment shaft and finished 900 ft. of underground workings.

Colorado

LARIMER COUNTY

A new placer district is being opened in the southwest corner of North Park, 30 miles from Steamboat Springs. A number of claims have been taken up, and it is proposed to organize a dredging company to operate on a large scale.

TELLER COUNTY—CRIPPLE CREEK

Free Coinage—Reid & Young, lessees this company's Wilson claim on Bull hill, are making heavy shipments to clean up work on their lease, which will expire Jan. 1 next.

Gould—Laburge & Co., leasing in this company's mine on Raven hill, are obtaining good ore from a drift on the Doctor vein.

Rubic—A promising orebody has been opened at a depth of 1265 ft. in this mine on Bull hill. It is operated by the Rubie Leasing Company.

Indiana

BLACKFORD COUNTY

The week in oil shows a decided increase in activity. The number of wells completed in this county during the week was 11, all producers.

CASS COUNTY

The additional steel mills in this country and their recent renewed activity are greatly stimulating quarrying in this territory. The Casparis Stone Company, of Logansport, has received a contract which will keep the Kenneth quarries, near that place, and other quarries operated by the company busy. The contract is with the Lackawanna Steel Company, of Buffalo, N. Y., for the delivery of 3000 tons of limestone daily for a period of 25 years. It has also a contract with the Indiana Steel Company, of Gary, and two shifts are being worked at the quarries to supply the demand. New quarries are to be opened.

GREENE COUNTY

Fourteen tons of iron ore mined from a ledge of the Gobin farm, a few miles from Bloomfield, were shipped to Linton a week ago to be given a critical test of value. That part of the country is underlaid with ore which is of easy access on Richland creek. Years ago, before the advent of railroads, there were iron furnaces a mile east of Bloomfield; the ore was smelted and pig iron sent on flat boats down White river and the Wabash, finally reaching Louisville and other river towns. On account of the opening of iron ore in other parts of the country with better shipping facilities the Indiana field was abandoned. But since the recent completion of the Indianapolis Southern railroad, which pierces the heart of the ironfields, the

business is being revived. The railroad company has leased hundreds of acres in this field, and it is reported that this movement is in the interest of the Steel Corporation. If the ore now being tested proves to be of sufficient richness to pay for working there will be further developments.

Clover Leaf—An explosion of gas in this mine, of the Shirley Hill Coal Company on Dec. 9, resulted in a fire which threw 250 miners out of work for several days. The night pumper went into the shaft and the gas ignited from his lamp. By dropping the moment the explosion took place he was not seriously injured. Owing to the dense smoke no one ventured into the mine. The loss cannot be estimated until the fire is extinguished.

Michigan

COPPER

Franklin—The crosscut from the 24th level of No. 1 shaft is entering the Pe-wabic lode and as soon as provisions can be made drifting will be started. The lode opened in the level above was exceptionally rich. The new shaft that is being sunk to operate this lode is down about 450 ft. No. 1 shaft is put down on the conglomerate lode.

Ojibway—Sinking is continuing in both shafts of this company; No. 1 is down about 575 ft. and No. 2 is 550 ft. deep. At No. 2 shaft crosscutting has been discontinued after cutting the lode, which was somewhat shattered, but of a better character than the ground opened in the level above, indicating improvement with depth. In No. 1 shaft the crosscut from the first or 500-ft. level has cut the second, or west lode of the series but it is not as well charged with copper as the lode cut in proximity to the shaft.

Atlantic—The first rock shipment from section 16 shaft has been put through the mill and ran about 28 lb. of copper to the ton. The rock coming from the openings is being stored in cars and when sufficient quantity has been obtained the second run will be made. The shaft is sinking below the 18th level and from this level a crosscut is being driven to open the lode. Openings south from the 12th, 13th and 15th levels are encountering a good grade of rock.

Superior—This company has made its first shipment of rock to the Atlantic mill, but will not be in position to maintain regular shipment until its hoisting and compressor plants go into regular service which, barring some unforeseen delay, will be early next year. The rock was not put through the mill, but stored in the bins.

Victoria—This company has encountered a favorable-looking formation in the breast of the tunnel it is driving and also in the crosscut from the 22d level of its shaft. Attention will be centered upon these two points and their merits fully es-

tablished. The assessment recently levied will provide ample funds to carry on this exploration.

Montana

BUTTE DISTRICT

British-Butte—It is expected that the new gold dredge which has been in the course of construction for the past few months will be completed and ready for operation by the first of the year. The pooling agreement of the company's stock will expire Jan. 1.

Anaconda Company—Forty men were put to work yesterday sinking a new two-compartment shaft on the Right Bower claim, north of Meaderville. By means of this shaft the adjoining Mattie and Adelaide claims will also be developed.

FERGUS COUNTY

Spring Creek Mine—On Monday of this week the coal miners who have been out since Nov. 18 returned to work. While the exact terms of the settlement are not known it is understood that both the miners and the operators have made concessions. Vice-president White, of the United Mine Workers of America, came from Indianapolis to conduct the negotiations.

CASCADE COUNTY

Great Falls Water Power and Townsite Company—The preliminary survey for a high-power line from Butte to Great Falls has recently been completed. When the power dam at Rainbow Falls is completed a large amount of the power used in the Butte mines will be furnished by the company.

CARBON COUNTY

Northwestern Improvement Company—The work of repairing the damage caused by the fire of Nov. 20 in the coal mine at Red Lodge is progressing steadily. For a while the Finnish miners refused to work in the part of the mine where their fellow workmen were incinerated, but later were persuaded to do so.

JEFFERSON COUNTY

Boston & Corbin—The time within which stockholders could subscribe to the new issue of stock at \$25 per share expired about two weeks ago. Since the issued stock was quoted at \$23 in the market, but few of the stockholders took advantage of the offer and practically the entire 1000 shares were taken by President Amster.

MADISON COUNTY

McKee Mine—O. Bergstrom, formerly superintendent of the Pittsmtont mine in Butte, has secured a lease and bond on the McKee gold mine, 20 miles from Norris. The property is being worked through four adits having an aggregate length of 1200 ft. A five-stamp mill was erected on the property last summer.

POWELL COUNTY

True Blue Mine—C. H. & E. H. Powers have recently purchased machinery in Butte which they will place on the True Blue mine, four miles southeast of Iron mountain. The shaft on the property is down about 150 ft. It is the intention to sink to the 450-ft. level, with crosscuts every 50 feet.

Nevada

ESMERALDA COUNTY—BLAIR

McNamara—At this old lead mine 18 miles south of Blair and on the north side of the Palmetto range, leasers have opened up new orebodies in a winze sunk from the tunnel at a distance of 600 ft. from the portal. A wagon road is being built to the mine. The ore averages 50 per cent. lead, 24 oz. silver, and \$1.50 gold per ton.

ESMERALDA COUNTY—GOLDFIELD

Blue Bull—F. B. Knickerbocker has secured an 18-month lease on a block of ground, 400x600 ft. in size, at the north end of the Blue Bull claim. From the Simmerone, Lone Star and Commonwealth adjoining, considerable ore has been extracted from shallow workings. On the Blue Bull there is a vein, 18x24 in. wide, containing shipping ore.

Eureka Group—This group near Diamondfield has resumed work. Trenching is being done. John O. Knight, of Los Angeles, is secretary of the new company, which has taken over these eight claims.

Velvet—At the Ricker lease rich ore has been found at a depth of only 20 ft. The paystreak is only a few inches wide, but assays very high. Both the lessees and the management are pushing work to develop this new vein.

Florence Consolidated—This lease on the Cornishman claim of the Florence has closed down, for, owing to the short time remaining before the expiration of the lease and the refusal of the parent company to grant an extension, it has been deemed advisable not to do any more exploration. The machinery will be moved to a lease which the principal stockholders have secured on the Red Top Extension ground.

Combination Fraction—Ore shipments have been resumed, four carloads having been sent to the smelters last week.

Hazel Goldfield—The recent strike in the Hazel lease on the Last Chance claim of the Laguna has been shown to be the extension of the Red Top vein. The ore is holding out both in width and in value. A station has been cut at the 740-ft. level; drifts are being driven both ways on the ore. The shaft will be sunk another 100 ft. as soon as possible.

Consolidated—The Clermont shaft is now nearly 800 ft. deep, being now the

deepest shaft in the camp. An increased flow of water has necessitated the installation of another pump.

Mohawk Ledge—This lease on the Gold Wedge claim has struck ore on the 300-ft. level, and has resumed shipments. Work is being pushed to find this vein on the 450-ft. level.

Vantage Extraction Company—This company is to erect a small testing plant later to be replaced by a custom mill employing the Porter-Clark cyanide process patents for which it controls. The process is claimed to effect very high extraction of gold and silver ores of all sorts with an inexpensive plant, no amalgamation nor concentration being necessary.

ESMERALDA COUNTY—GOLD MOUNTAIN

Royal Flush—Eight sets of leasers are now at work on the Royal Flush; 40 miners are employed. Considerable excitement is shown here due to the probable finding in this property of the famous lost Breyfogle mine.

ESMERALDA COUNTY—HORNSILVER

Great Western—A traction wagon driven by a 50-h.p. gasolene engine has been sent to haul ore from the mine to Cuprite.

Redemption Gold Mining and Milling Company—On the 200-ft. level a vein of lead-zinc ore about 7 ft. wide and averaging about \$40 per ton has been found. This oreshoot has been developed for a length of 75 ft. Ore is being sacked for shipment.

ESMERALDA COUNTY—RAWHIDE

Rawhide Queen—The Bradshaw lease on the southeast side of Balloon hill is opening up what promises to be one of the biggest bodies of high-grade ore in the Rawhide district. The entire bottom of the shaft is in rich milling ore where the high-grade streak has widened to 18 in.; 10 sacks of specimen ore, worth between \$200 and \$300 per sack, have been sorted out of the ore from this vein.

ESMERALDA COUNTY—WAGNER

Wagner Copper Mining Company—Work has been resumed on this property on the railroad about 25 miles south of Goldfield. The shaft, now 400 ft. deep, will be sunk to water level.

HUMBOLDT COUNTY—LOVELOCKS

Tungsten—A shipment of 30 tons of scheelite has been made from Brown's station. If the results of this trial shipment are satisfactory the property will be developed by De Goria & Atkins, the owners.

HUMBOLDT COUNTY—NATIONAL

National Mining Company—J. H. MacMillan and G. B. Holleran, of Goldfield, have purchased the Fairview, Fairview

No. 1, Charleston, and West Virginia claims from Jesse Workman, on behalf of the National Mining Company. Work is in progress by both the company and leasers.

HUMBOLDT COUNTY—SEVEN TROUGHS

Mazuma Hills—From 100 tons of ore just run through the mill bullion worth about \$11,000 was obtained. The run took 12 days. Assays proved the saving on this high-grade ore satisfactory.

Regan Lease—The new pump is handling 60,000 gal. of water a day. Under ground development will soon be resumed on this lease which has been drowned out for about two months.

LANDER COUNTY—BATTLE MOUNTAIN

Kawohat Mine—Machinery for the 200-ton mill for this mine in Jefferson cañon has reached Battle Mountain and is being hauled to the property. It is expected that the mill will start running by February.

Glasgow Western Exploration Company—A Keystone drill has arrived and is to be used prospecting on the Copper Basin property six miles west of town. It is the intention to drill to a depth of 1000 ft. This same company is running a long tunnel on the Copper Cañon property eight miles farther from town.

LINCOLN COUNTY—GOOD SPRINGS

Monte Cristo—Large zinc deposits are being developed in this group near Good Springs. The veins are 4 to 14 ft. wide.

LINCOLN COUNTY—PIOCHE

Pioche Consolidated—The property of this company at Pioche has been purchased by the Metals Exploration Company, of Goldfield, in which J. R. Davis, of Loftus-Davis, owns a large interest. The property consists of 13 claims known as the Point mine. Active development will be started at once by the new company.

LYON COUNTY—YERINGTON

Nevada-Douglas—A. J. Orem and a number of directors have visited the property for the purpose of selecting a smelter site for the big plant which the company expects to build very soon.

Utah-Yerington—This company has settled the litigation which has been going on for the last two years and has acquired the equity of the Home Bee in all the property in question. The settlement was on a stock basis, but the details of the settlement are not made public.

NYE COUNTY—CLIFFORD

The townsite name has been changed to Helena, although the district continues to be known as Clifford.

Broken Hills—The last carload shipment averaged \$197.12 per ton. It carried 104 oz. silver and \$145 gold per ton.

NYE COUNTY—JOHNNIE

Crown Point—The following bullion shipments have been made: Nov. 8, \$1900; Nov. 15, \$1700; Nov. 20, \$2400; Nov. 23, \$1800; another brick worth \$2000 is now ready for shipment. This gold has been obtained since Nov. 1 from the ore crushed by a single stamp which has been working only 12 hours a day.

NYE COUNTY—MANHATTAN

Toquima Copper Company—Some time ago at a depth of 175 ft. so large a flow of water was met with that work had to be stopped. A pump has now arrived and is being installed. On that level a vein 12 ft. wide and carrying from 3½ to 5 per cent. copper and \$6 to \$8 gold per ton had been found. This property is on the extreme eastern edge of the camp and is on the west side of the Ralston valley.

NYE COUNTY—TONOPAH

Production for the week ending Nov. 28 amounted to 5387 tons of ore valued at \$134,675. The Tonopah Mining Company mined 2950 tons; Belmont, 800 tons; Montana Tonopah, 732 tons; Midway, 100 tons; MacNamara, 350 tons; West End, 205 tons; Jim Butler, 250 tons.

Tonopah Mining Company—Last week 487½ ft. of new ground was broken, this being a record week's work. One-third of this was in the Silver Top ground, the balance in the Mizpah and Red Plume claims.

Belmont—The orebody on which the winze from the 1000-ft. level was sunk has not yet been found on the 1100-ft. level, although the winze was in ore for 80 ft. On the lower level several veins have been cut; the country contains much quartz, but owing to the faulting and fracturing that has broken the formation badly the main vein has not been found.

West End—On the 200-ft. level the west drift is being driven to tap the ore opened up in the level above. The face shows bunches of rich ore; the balance is second-grade material.

STOREY COUNTY—COMSTOCK

For the week ending Nov. 28 the mines on the Comstock lode produced 545 cars of ore valued at \$15,217. The Ophir produced 421 cars; Consolidated Virginia, 46; Mexican, 18 cars.

New Mexico

GRANT COUNTY

Comanche Mining and Smelting Company—Seth E. Hazzard has paid off, dollar for dollar, the indebtedness of this company, whose properties are near Silver City. Almost all of the stockholders of the Comanche have entered into an agreement with the recently organized Savanna Copper Company to accept stock of the new concern so that the Savanna will own and control the property of the old company. As soon as matters pending

between the two companies are adjusted and everything is in shape, the smelter will again be blown in.

SOCORRO COUNTY

Enterprise Mining Company—The machinery for the cyanide plant being built at this property in the Cooney district has arrived at Silver City, whence it will be hauled by wagon to the property, a distance of 90 miles.

Socorro Mining Company—The machinery for the hydro-electric power plant which is to be built by this company on the Whitewater river has arrived at Silver City. The mines of the company are in the Mogollon district.

Pennsylvania

ANTHRACITE COAL

The Delaware, Lackawanna & Western and a number of other coal-mining companies have appealed to the Superior court from the assessment for taxation made by the board of assessors of Lackawanna county. The board fixed the valuation of coal lands at \$200 per foot-acre of coal, and assessed the lands at \$100, half the nominal value. The appeals are taken on the ground that the valuation was put too high, in view of the evidence submitted; and that the assessment at half value is not on a parity with that placed on surface property.

Suffolk Colliery—This colliery, near Mahanoy City, caught fire Dec. 9 from a spark from a naked lamp falling on some straw in the mule stable underground. Active work failed to check the fire promptly, and it has been necessary to close the mine, also the St. Nicholas and Maple Hill, two adjoining collieries. The Suffolk is owned by the Philadelphia & Reading Coal and Iron Company.

Philadelphia & Reading Coal and Iron Company—This company's statement for October and the four months of its fiscal year from July 1 to Oct. 31 is as follows:

	October.	Four Mos.
Earnings.....	\$3,513,484	\$10,104,039
Expenses.....	3,212,869	9,619,950
Net earnings.....	\$ 300,615	\$ 484,089

For the four months, as compared with the corresponding period last year, the earnings decreased \$3,061,574, and the expenses \$2,496,337; leaving a decrease of \$565,237 in net earnings.

Texas

Petroleum production in the southeast districts of Texas in November is reported by the *Oil Investor's Journal* at 1,003,950 bbl., an increase of 60,210 bbl. over October. Shipments by rail were 555,335 bbl.; by sea, 234,795; delivered to refineries, 150,000; total, 940,130 bbl. This does not include oil used in the field.

There were 48 new wells completed in November, 41 being oil producers, one a gas producer and six dry holes. There were 101 wells drilling at the close of the month.

Greene Federal Smelter—This smelting plant in El Paso has been disposed of at sheriff's sale as the result of foreclosures growing out of the suit of J. C. Lackland and others against the Federal Copper Company and W. C. Greene.

Utah

JUAB COUNTY

Black Jack—Only 135 ft. remain to be driven in order to complete the adit, 2100 ft. long, which is to deliver the ore at the railroad.

Mammoth—The winze, sunk from the 2100-ft. level to a depth of 160 ft., is to be sunk 100 ft. deeper. Considerable ore is developed on the lower levels, especially northeast from the shaft.

PIUTE COUNTY

Standard Group—Tunnel No. 3, which is now 291 ft. long, has broken into the copper-sulphide deposit already cut in No. 1 and No. 2 tunnels. The vein is said to carry several ounces of silver per ton and from 2½ to 5 per cent. copper. On the Jennie Maud claim a silver-lead vein has been developed. More than enough work has been done on this group to patent the 11 claims.

Bradburn—Rich gold-silver ore is being sacked from a two-foot paystreak in the wide vein on this property.

SUMMIT COUNTY

Wabash—Most of the water in this property at Park City has been pumped out. Mining will soon be resumed.

Wisconsin

ZINC-LEAD DISTRICT

Hazel Green—The Kennedy is operating two mills at full capacity. The new Mathey roaster at the Mills mine has been fired up. The Scrabble Creek has completed its shaft, installing two Byron-Jackson screw pumps and two 10-in. cross-heads to beat the water. The Cleveland company is sinking on the Witherbee land. The Big Dad is active again and the Murphy will commence work soon.

Platteville—The Cruson has resumed, making seven active producers here. The Lyght mill is completed, which will add another. Shafts are in progress at the Grant county, Calemesis, Dickson and Toadville mines.

Rewey-Mifflin—All the producers here are running again, including the Sunrise, Senator, Union Zinc, Coker, Washburn, Gruno, Slack, Peni and Peacock. The 50-ton mill equipment of the old Eberle, at Lancaster, is being moved to the Squirrel. The Ellesworth shaft has been equipped with two 12-in. lift pumps and gasolene power plant and completion of shaft from water level let by contract. The Big Tom shaft, on the Thomas land, is going down under contract.

Galena—The Royal Princess, a new producer which has accumulated a stock of 1000 tons of zinc concentrates, has made its first sale of ore. It is shipping under contract to the Platteville Separating Company.

Hoosier—This company has resumed shaft-sinking after installing two Columbus vertical pumps.

Klar-Piquette—This mine has developed heavy sheet jack in the east end workings, which will enable it to double its former output of 10 tons daily; the ore makes a 50 per cent. zinc concentrate.

Linden—The Pollard lease was sold Dec. 1 for \$15,000 to Indianapolis men, represented by Jas. Billingsly, of Galena. The property adjoins the Dark Horse and was opened up by shaft last summer. A 50-ton mill will be erected by the new company.

Platteville—The Enterprise mine, the pioneer zinc producer in the Platteville camp, has resumed operations after a shut down of a year.

Philippine Islands

BENGUET

Benguet Consolidated Mining Company—This company has two small stamp mills and a cyanide plant steadily at work. The September yield was 225 oz. gold and 321 lb. cyanide bullion. The ore milled averages about \$7 per ton. The company is now driving an adit which will drain the mine, and also serve as an outlet for ore. M. A. Clark is president; J. H. Seifert, secretary and treasurer.

Bua Mining Company—This company has been carrying development work on a group of 36 claims in Benguet, and has now completed the erection of a stamp mill and cyanide plant.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Dec. 5 were as follows: Coniagas, 59,000 lb.; Crown Reserve, 176,000; City of Cobalt, 85,140; La Rosc, 282,000; McKinley-Darragh, 60,000; Nipissing, 237,870; O'Brien, 128,030; Temiskaming 60,000; Temiskaming & Hudson Bay, 60,000; Trethewey 127,200. Total 1,275,240 pounds.

Foster-Cobalt—A report just issued from Manager MacDonald shows that there are now 1745 ft. of drifts and cross-cuts, 519 ft. of shafts, and 60 ft. of winzes. Describing the workings in detail it shows that the mine has run out of silver ore and is working in several places in cobalt ore in the hope of striking new silver deposits.

Nova Scotia—At the annual meeting held in Montreal the financial statement showed a profit for the year on ore shipments of \$104,117. Screenings, ready for shipment and to be sold during the winter,

were valued at \$150,000, and second-class ore, to be disposed of during the next six months, was estimated at \$100,000. The cost of ore extraction during the year was \$103,198 leaving a surplus on ore account of \$250,919. The orebody exposed in the mine varies from 4 to 8 ft. wide and has been tapped on the lowest or 165-ft. level where some rich silver veins have also been found.

Temiskaming—A dividend of 6 per cent. has been declared payable Jan. 1, 1909. The drift on the 200-ft. level has been extended into the adjoining Gans property.

NOVA SCOTIA

Dominion Coal Company—The output of coal for November was 244,304 tons, as compared with 385,811 tons for November, 1907.

Mexico

Proposed Mining Law—According to late press despatches the Mexican Congress closed on Dec. 15 without taking action on the proposed mining law which has been under discussion since last winter. Congress will convene again in April.

CHIHUAHUA

Parral Output—The production of the camp for the week ending Dec. 4 was 7510 tons, as compared with 9155 tons for the preceding week. About two-fifths of this product was treated at local milling plants.

Mexico Consolidated—The affairs of this company, which has extensive holdings in the Parral district, have been re-organized, J. A. Coram retiring from the presidency and management, and Frederico Stallforth succeeding him. Frederico Larsen is now treasurer and W. J. Freeman is superintendent of mines and assistant treasurer. The new cyanide plant is in successful commission.

International Gold Mines Company—This company, operating the El Socorro and other mines in the Ocampo district, will start up its new cyanide plant about Jan. 1. Col. J. H. Pender is the manager in charge.

Rio Tinto—This company's 300-ton copper-matting plant will be blown in during the present month. Custom ores of northern Mexico, as well as ores of the Terrazas district, will be handled.

American Smelting and Refining Company—The third furnace at the Chihuahua plant has been blown in and the daily tonnage now treated amounts to 400 tons. An increased ore supply has been provided for.

Cia des Mines de Chihuahua—This French-capitalized company, of which M. H. Thofehr is general manager and M. G. Conein commercial agent, has begun development work at its Sogusta denouncement of 190 pertenencias in the Naica section. An installation of sinking machinery is planned.

Greene Gold-Silver—An exhaustive examination of these properties has lately been made by engineers representing the El Oro interests of El Oro, Mexico. It is reported at Chihuahua that the Concheño-Navidad properties are receiving particular attention and may be made the basis of a new working company. C. C. Chase, the general manager at the time of the shutdown, is now at the mines.

La Reina de Plata—Three carlots of ore are being sent out weekly from this Santa Eulalia mine, of which Capt. Lindsay Brown is manager. The ore runs approximately 60 oz. silver, but a small minable body of 1500-oz. silver ore is reported in lately opened ground.

Durazno—A 50-ton cyanide plant is under construction by this Pittsburg company, operating the Durazno and Tetamoa properties in the Chinipas section. Considerable high-grade gold-silver ore has been mined at both properties and a tonnage of cyaniding ore is available on the dumps and in the stopes.

GUANAJUATO

Production—The value of the ores and concentrates that left this camp for the smelters at Aguascalientes the week ending Dec. 4 were valued at \$113,000 as against \$116,000 for the previous week. The bullion sent to the Mexico City refineries was valued at \$172,000 while \$10,000 worth was sent direct by one shipper to New York, making a total of \$182,000 for the past week as against \$185,000 for the previous week.

Guanajuato-Jalisco Development Company—This company has been formed in New York by Dwight Furness, head of the Dwight Furness Company, and formerly consul of Guanajuato. The capital stock is \$4,000,000. James C. Hinchcliffe of New Jersey is president; Thomas H. Wilson, secretary, and Walter Bamford, treasurer. Dwight Furness will be resident manager at Guanajuato. The company has undertaken the development of the following six groups of mines: The Agua Blanca group, a copper property in Jalisco; Dolores group, gold and silver property, Guanajuato; Calabasa group, a gold, lead, silver and copper property in Jalisco, and the San Gregoria, Cabrestante and Sevillana groups in Guanajuato. These six groups of mines cover nearly 1000 acres of highly mineralized territory. Already there has been installed on these properties milling plants, hoisting machinery, buildings and equipments valued at \$350,000, gold.

DURANGO

Durango Iron Works—Arrangements are reported to have been made to resume work at the iron smelting and machine works in the city of Durango. Funds are said to have been secured from American capitalists.

Metal, Mineral, Coal and Stock Markets

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

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 16—The coal trade in the West continues to gain very slowly; the steam coal trade shows the greater improvement, as manufacturing plants are buying a little more freely. They do not, however, show any general disposition to put in stocks ahead. In most of the larger centers contracting has been very slow so far, buyers generally seeming to prefer to take the risks of the open market. Domestic trade is generally dull, on account of the continued mild weather. December is proving a very quiet month, chiefly for this reason.

The Seaboard bituminous trade is quieter than for some weeks past. Very little business is being done in steam coal just now, and manufacturers seem to be taking matters very easily.

Anthracite is a weather market, and it has not been cold enough to start up the trade, which is about as dull as can be, for December. Supplies are more than equal to all demands, and it looks as if a good deal of coal was being stored.

By-product Coke Oven Transfer—The American Coal Products Company announces that it has sold its by-product coke-oven interests heretofore conducted by a subsidiary company—the United Coke and Gas Company—to the Oberschlesische Kokswerke & Chemische Fabriken Aktiengesellschaft of Berlin, Germany, the transfer to take effect Jan. 1. A new company is to be formed to be called the German-American Coke and Gas Company, with headquarters in New York, and a capital of \$2,000,000. Of this \$500,000 is to be paid in cash at once. Director Wilhelm Altpeter, the head of the construction and operating departments of the Oberschlesische Kokswerke & Chemische Fabriken in Europe, will act as consulting engineer for the new company. The American Coal Products Company will have a stock interest in the German-American Coke and Gas Company. The Oberschlesische Kokswerke & Chemische Fabriken is one of the largest by-product coke-oven companies in Germany. The American Coal Products Company will henceforth give its entire attention to the manufacture and disposal of tar products and ammonia. The German-American Coke and Gas Company comes into possession of all the by-product coke-oven patents heretofore exploited by the United Coke and Gas Company, including the Otto-Hoffmann system, and the more re-

cent designs known as the United-Otto system.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania lines east of Pittsburg and Erie, year to Dec. 5, in short tons.

	1907.	1908.	Changes.
Anthracite.....	5,298,065	4,837,718	D. 460,347
Bituminous.....	37,224,427	31,574,905	D. 5,649,522
Coke.....	12,681,548	6,643,079	D. 6,038,469
Total.....	55,204,040	43,055,702	D. 12,148,338

The total decrease this year to date was 22 per cent.

Coal tonnage of Chesapeake & Ohio Railway, four months, July 1 to Oct. 31, short tons:

	Coal.	Coke.	Total.
New River.....	2,242,982	69,457	2,312,439
Kanawha.....	1,695,759	9,956	1,705,715
Kentucky.....	118,259	.....	118,259
Connecting lines.....	84,892	20,157	105,049
Total.....	4,141,892	99,570	4,241,462
Total, 1907.....	4,068,243	161,013	4,249,256

Deliveries this year to points west of mines 2,158,604 tons coal and 58,590 coke; points east, 491,252 tons coal and 40,980 coke; tidewater, 1,488,376 tons coal; anthracite to line points, 3660 tons.

Coal passing through the Sault Ste. Marie canals, season to Dec. 1, short tons:

	1907.	1908.	Changes.
Anthracite.....	1,478,898	1,360,843	D. 118,055
Bituminous....	9,539,634	8,354,344	D. 1,205,290
Total.....	11,038,532	9,715,187	D. 1,323,345

The total decrease this year was 12 per cent.

New York

ANTHRACITE

Dec. 16—The all-rail trade is good, but tidewater business is dull. Both prepared and small steam sizes are in good supply.

Schedule prices are \$4.75 for broken, and \$5 for egg, stove and chestnut. Small steam prices are: Pea, \$3.25@3.50; buckwheat No. 1, \$2.35@2.50; buckwheat No. 2 or rice, \$1.60@2; barley, \$1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

Little interest is shown in the soft-coal market in all consuming territories, especially in New York harbor. Good grades of steam coal fetch \$2.45@2.65 with poorer grades quoted as low as \$2.30. There seems to be some disposition to contract for slack coal for the whole of next year at prices ranging around 70c. per ton at the mines. Transportation is good and cars are in sufficient supply.

In the Coastwise-vessel trade vessels

are plentiful and are finding it difficult to obtain charters. Freight rates, however, remain unchanged. Quotations are as follows, for large vessels from Philadelphia: To Boston, Salem and Portland, 70@80c.; Lynn, Newburyport and Bath, 80@85c.; Portsmouth, 80c.; Bangor, \$1@1.10; Providence, New Bedford and the Sound, 70@75c. per ton.

Birmingham

Dec. 14—Coal operations in Alabama show a little more improvement, and in some places the normal output has again been reached. The production promises to be very good through December. The indications are that the miners and other employees will keep busy through the entire month. There has been no interference as yet by car shortage, and none is yet in sight. The output for the year will show a decided falling off as compared to the output of 1907. There is an improvement, it is believed, in the production for this December as compared to that of last December.

The coke situation is still healthy in Alabama. The accumulations are not being mentioned, an indication that the demand is taking up about all the coke that can be manufactured. Coke prices have been strong right along. Some improvement in demand is noted from the cast-iron pipe producers.

Chicago

Dec. 15—Firmness in general prevails in the Chicago market, although the absence of continued cold weather and the tendency of certain operators to ship all unconsigned products to this market undoubtedly keeps dealers in the standard coals anxious concerning the future. The market for Illinois and Indiana coals may be summed up in the phrase: Too much production. Eastern coals are still doubtful as regards maintenance of prices; smokeless especially has seen a decline in lump and egg, heretofore firm.

Anthracite and bituminous domestic are closely responsive to weather conditions, and the best informed dealers look for active sales only with the coming of cold weather. Lump and egg from Illinois and Indiana mines bring \$1.75@2.75; run-of-mine, \$1.65@1.75, and screenings \$1@1.65. The demand for steam coals is reviving, though slowly. Manufacturing industries are inclined to make contracts more heavily than before for many months.

Hocking Valley coal in general brings \$3.15, the circular price, with the demand

good. Youghiogheny moves steadily on contracts at \$3 for 3/4-in. steam and \$3.15 for 3/4-in. gas. Pittsburg No. 8 is quiet at \$2.75 for 3/4-in. lump. Brazil block is fairly active at about \$3. Smokeless ranges from \$2.70 for the lowest grade, run-of-mine, to \$3.15 for the highest grade with lump and egg \$3.15@4.05 per ton.

Indianapolis

Dec. 14—Pronounced opposition has developed against the bill proposed by State Mine Inspector James Epperson to pension or indemnify mine workers to secure them against financial suffering as a result of mine accidents. The opposition comes from the miners' locals, much to the surprise of Mr. Epperson, who expected from them ardent support. The bill provides for a tax of 0.8c. on each ton of coal mined to be paid by the operator and a tax of 0.2c. on the dollar paid to mine workers to constitute a fund out of which to pay stipulated sums to miners while rendered temporarily unfit to work; or in case of death to pay funeral expenses. In other words it is a form of insurance. Mr. Epperson has called a meeting of the officers of the Indiana Operators' Association and of the Indiana Mine Workers' Association, to consider the features of the bill. If the opposition to the bill continues after the meeting the proposition will be dropped. Mr. Epperson says he has not been advised of the cause of the opposition but hopes to bring the reasons out during a discussion of the bill at the meeting.

After a meeting of the representatives of the 11 mine locals in Indiana, which are affected by the bit controversy, the dispute is no nearer a settlement than heretofore. The miners are firm in their demands for the largest bit permitted by the new law, and the operators show no inclination to install the new bit. The Deering company has notified the miners it will take up the question soon and if possible reach a decision. A joint meeting of the miners and operators is to be held to adjust the matter.

Pittsburg

Dec. 15—The coal trade has brightened up a little and prices are firmer than a week ago. Mine-run remains at \$1.15 but lump coal for the domestic trade is about 5c. higher, at \$1.35@1.40 at mine. Slack is in demand and commands 75@80c. Operations do not show any improvement and the railroad mines continue at around 50 per cent. capacity. All the river mines are idle and stocks in the pools and harbor are large. It is probable that the rains of the past few days may bring up the rivers to a navigable stage and much of this coal will be sent out. The initial shipment of coal from the Kanawha district was sent down the river yesterday and amounts to fully 1,000,000 bu. It all went to the Cincinnati market.

Connellsville Coke—There is no ma-

terial change, but prices on contract continue firm as follows: Furnace, \$2; foundry \$2.25@2.40. One large sale of foundry coke was made this week for delivery over the first six months at \$2.50, but this is regarded as an exceptionally good price. For spot shipment these prices may be shaded 10@20c. Some consumers, it is reported, are deferring the placing of contracts in the hope that low spot prices will continue and in this way they will save by holding back orders. Producers, however, say that with the expected increase in demand after Jan. 1 prices likely will be much higher. About 1000 additional ovens were put in operation last week and more would be started but for a scarcity of miners. The *Courier* gives the production in both regions at 235,211 tons. The shipments were 8427 cars as follows: To Pittsburg district, 2758; to points west of Pittsburg, 5080; to points east of Connellsville, 589 cars.

Foreign Coal Trade

Austrian Coal Production—Coal production in Austria, nine months ended Sept. 30, metric tons:

	Coal.	Brown Coal.	Total.
Coal mined.....	10,648,554	20,106,705	30,755,259
Coke made.....	1,427,822	22,642	1,450,464
Briquets made.....	109,977	139,823	249,800

Nearly two-thirds of the production—65.4 per cent.—was of brown coal, or lignite.

German Coal Production—Coal production in the German Empire, 10 months ended Oct. 31, long tons:

	1907.	1908.	Changes.
Coal	119,296,980	124,560,667	I. 5,263,687
Brown coal.....	51,106,430	55,086,244	I. 3,979,814
Total mined.....	170,403,410	179,646,911	I. 9,243,501
Coke made.....	18,169,231	17,787,471	D. 381,760
Briquets made.....	13,613,762	15,294,289	I. 1,680,527

Of the briquets reported nearly 80 per cent. are made from brown coal, or lignite.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices as follows on Dec. 5: Best Welsh steam, \$3.48; seconds, \$3.36; thirds, \$3.24; dry coals, \$3.60; best Monmouthshire, \$3.18; seconds, \$3.06; best small steam, \$1.92; seconds, \$1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Dec. 16—The iron and steel markets are dropping visibly into the waiting condition which is apt to characterize the closing weeks of the year. This has been helped in some degree by the conference of steelmen held in New York Dec. 10. At this meeting practically nothing was done, and there was no discussion of prices—at least so far as the public is informed. There had been hopes of some adjustment of structural prices, if of no others, and some disappointment is felt at the negative results. The tariff agitation has had some effect. There is

a general idea that if any tariff reductions are made, the iron and steel schedules will have to bear most of them.

Pig iron has been quiet, except for some buying of foundry, chiefly from New England territory. The manufacturers there seem to have more hope for the immediate future than they have had for some time past. Southern iron has done fairly well, the large makers now claiming to be pretty well sold up for the first quarter. The furnace reports show more activity, and the number in blast is gradually increasing.

In finished material the market is quiet. Structural sales have been generally small, but in the aggregate amount to a fair business. Some car and locomotive orders are coming from the railroads. The Pennsylvania Railroad Company, it was positively announced on Tuesday, had placed orders for 135,000 tons of steel rails for 1909 delivery. Later, however, the company issued a statement to the effect that this report was not correct and was premature, no orders having yet been placed. The steel-rail business for next year, therefore, is still in the future.

Pig Iron Production—Reports from the furnaces on Dec. 1 show that there were 210 coke and anthracite furnaces in blast, having an aggregate weekly capacity of 381,100 tons; an increase of 18,400 tons over Nov. 1. Taking the estimate of the *Iron Age* and making allowance for the charcoal furnaces, the approximate production of pig iron in the United States in November was 1,593,000 tons; for the 11 months ended Nov. 30 it was 14,122,500 tons. This includes the statement of the American Iron and Steel Association for the first half of the year.

Lake Ore Shipments—The shipments of ore from the Lake Superior region, by ports, are given as follows, in long tons:

	1907.	1908.	Changes.
Escanaba.....	5,761,988	3,354,952	D. 2,407,036
Marquette.....	3,013,826	1,487,487	D. 1,526,339
Ashland.....	3,437,672	2,513,670	D. 924,002
Two Harbors.....	8,188,906	5,702,237	D. 2,486,669
Superior.....	7,440,386	3,564,030	D. 3,876,356
Duluth.....	13,445,977	8,808,168	D. 4,637,809
Total.....	41,288,755	25,430,544	D. 15,858,211

All-rail shipments in 1907 were 956,315 tons; for 1908 they are not made up yet, but are estimated at less than 500,000 tons. Of the water shipments this year the Mesabi range sent 17,232,891 tons and the Vermilion range 841,544 tons; the balance—7,356,109 tons—coming from the Old Ranges. Of the water shipments this year 14,252,911 tons, or 56 per cent., were sent out by the United States Steel Corporation. The total decrease in shipments this year was 38.4 per cent.

Birmingham

Dec. 14—Heavy shipments of pig iron are being made from Alabama and the indications are that the movement will be steady for some time to come. The president of the Sloss-Sheffield Steel & Iron Company announces that more iron was

shipped away from furnaces of his company during November than for any month in the history of the company. Other concerns report very healthy shipments. There appears, however, to be no inclination to start up additional furnaces in this district before the holiday season. The quotations are strong at \$13 per ton, No. 2 foundry, with several concerns asking \$13.50 per ton. Some sales have been made for delivery in the second quarter of the coming year, though it is admitted that the greater portion of this iron was disposed of at the old rate, \$13. A prominent interest is quoted as saying that it is no trouble to sell iron at \$13 now, delivery during the first half of the new year. One or two of the larger companies are still claiming to be out of the market and are waiting until conditions are more favorable. The make in this district continues good; 23 furnaces are reported in full operation with five ready to start. The Sloss-Sheffield, the Birmingham, the Tennessee and other companies are preparing to start repair work on furnaces in this section.

The Central Iron Company at Holt, Tuscaloosa county, Ala., has let contracts for the erection of a pipe plant. The cast-iron pipe industry has a large business booked already and more in sight.

The Birmingham Coal and Iron Company has purchased the brown-ore properties of the Tecumseh Iron Company, something like 10,000 acres of land in the eastern part of the State.

Chicago

Dec. 15—The iron market continues quiet and is likely to be quiet for another month. There is the usual tendency to hold off from placing large contracts until after the first of the new year, and a feeling of uncertainty concerning legislation on iron and its effect is apparent. Melters in general are back to the old-time policy of buying for short-time needs. They will not contract generally for their probable requirements beyond the first half of 1909—in many cases not beyond the first quarter. On the other hand the furnace agents profess to be equally willing to hold off also, making a tight market for anything beyond the second quarter.

Southern No. 2 iron is the favorite of buyers in the present market at \$13@13.50 for No. 2 (\$17.35@17.85 Chicago). No. 2 Northern iron holds to \$17 minimum for the first quarter and 50c@\$1 more for the second quarter, being steadier than Southern and more restricted as to output. At the prices quoted Northern would seem to have the advantage, but its limited output and the general supply of Southern make the latter more available. Lake Superior charcoal is steady and comparatively scarce at \$19.50@20.

The iron and steel market improves steadily, though slowly. Sales of railroad supplies, structural materials and finished products in general continue good. Coke

is strong at \$5 for first-class Connellsville, with increasing demand.

Philadelphia

Dec. 16—The pig-iron market is not showing accustomed December vitality. The bulk of business has been in foundry irons and in small lots. The large buyers are out of the market and will not reappear until January. Even then there is no certainty that they will buy heavily. Furnaces in eastern and middle Pennsylvania have made inviting offers to large consumers, which are now under consideration. They are in the nature of 30-day options. Consumers generally have small stocks in yards. The mill people refuse to buy for more business than they have in sight. Southern irons are threatening to come this way.

Steel Billets—The business is of a hand-to-mouth sort.

Bars—Reports from various bar mills of the State show diverse conditions and no one statement can summarize all. Several mills have since Dec. 1 secured an encouraging volume of business and at regular prices, it is claimed. The iron manufacturers are generally standing firm on current prices. The retail distribution has fallen off.

Sheets—A few large consumers have just made offers for future requirements. The situation is generally better than a month ago.

Structural Material—The mills are executing large orders on which specifications have recently been delivered. Other large orders are in sight, and the mills are busier than they have been.

Scrap—Scrap consumers are now trying to get supplies, but find that dealers have their own views. An accumulation has been quietly in progress for some weeks and dealers claim to have large quantities now in the hands of owners. No. 1 railroad scrap is in special demand, and all kinds will soon begin to move.

Pittsburg

Dec. 15—About the only improvement in the steel market is an increase in the general run of small orders for finished products. Mill operations show an improvement, and production has increased. The American Steel and Wire Company has started the Donora works practically in full, and the company this week is operating its plants at 90 per cent. of capacity. The farmers have been good buyers of fence wire, and nails have also been in good demand. Agricultural-implement makers are specifying heavily for material and the Republic Iron and Steel Company is operating at close to 90 per cent. of capacity. The Carnegie Steel Company has increased its production of billets and sheet-bars by starting the Mingo Junction plant, which had been idle for nearly a year. The Edgar Thomson rail plant of

the Carnegie company has been operating at around 25 per cent. of capacity on small orders and specifications on old contracts. New business booked during the past week included two orders of 500 tons each from the Pittsburg Railways Company and the Pittsburg Wabash Terminal. It also received some export orders and about 3000 tons of light rails.

New structural business is coming out slowly, but several good contracts are in sight. Bids went in this week for the new buildings of the Crane company at Oakmont which will require about 2500 tons. This order likely will be placed this week with the American Bridge Company. The most important contract placed is for 800 all-steel dump cars by the Duluth & Iron Range railroad, a Steel Corporation interest. This is the largest single order ever placed by this line. The cars will be of the Summers type of ore-dump cars, and will be the first ever built outside of the sample car, which has been in use for six months. The cars will be made at the Hammond plant of the Standard Steel Car Company. The Carnegie Steel Company will furnish the plates from the Homestead plant and also 6400 steel wheels from the wheel plant at McKees Rocks, Pittsburg. The Pittsburg & Lake Erie railroad has ordered five locomotives which will be turned out at Pittsburg.

Pig Iron—The market is extremely quiet, sales for the past week not amounting to more than 2000 tons. Prices are firm, and this is keeping some consumers out of the market. It is not expected that active buying will begin before the opening of the first quarter. Sales of standard bessemer have been made at \$17, but a small tonnage for prompt delivery was sold today at \$16.50. Malleable-bessemer sales aggregated about 500 tons at \$15.75, and over 1000 tons of No. 2 foundry sold at \$16. An order for 600 tons at less than that price was rejected. A large consumer entered the market for 5000 tons of different grades of foundry iron, but upon receiving current quotations decided to defer placing the business. There is no demand for basic or gray forge. Quotations today are as follows: Standard bessemer, \$16.50@17; malleable bessemer, \$15.75@16; basic, \$15.50@16; No. 2 foundry, \$16@16.25; gray forge, \$14.50@15; all f.o.b. Valley furnaces.

Steel—There is no demand for billets, but deliveries under contracts are satisfactory. Prices remain at \$25. Pittsburg, for both bessemer and open-hearth billets. Plates remain at 1.60c., and merchant-steel bars at 1.40c.

Sheets—Production is increasing owing to better demand, and prices are firm, black sheets being quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-manganese—The market is a trifle stronger, and indications point to a further advance. Quotations are \$47@47.50 a ton.

Foreign Iron Trade

British Iron Trade—Values of exports and imports in Great Britain, 10 months ended Oct. 31, as given by Board of Trade returns.

	Exports.	Imports.	Excess.
Iron and steel	£31,439,195	£ 6,309,027	Ex. £25,130,168
Machinery	26,129,994	3,953,641	Ex. 22,176,353
New ships	9,520,905	.....	Ex. 9,520,905
Total	£67,090,094	£10,262,668	Ex. £56,827,426
Total, 1907..	74,990,285	10,297,127	Ex. 64,693,158

Total decrease in exports this year, £7,900,191, or 1.65 per cent.; decrease in imports, £34,459, or 0.3 per cent. The quantities of iron and steel were, in long tons:

	1907.	1908.	Changes.
Exports	4,451,148	3,454,949	D. 996,199
Imports	743,755	909,707	I. 165,952

Imports of iron ore into Great Britain for the 10 months were 6,569,306 long tons in 1907, and 4,969,831 in 1908; decrease, 1,599,475 tons. Of the imports this year 3,681,803 tons were from Spain.

Iron Ore in Norway—According to the *Teknisk Ugeblad*, iron-ore production in Norway increased from 99,000 tons in 1906 to 139,000 in 1907. The exports increased in three years from 81,398 to 137,593 tons.

Metal Markets

New York, Dec. 16—The metal markets have been generally quiet this week with no changes of much importance to be noted.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1908..	\$ 1,952,574	\$ 3,782,705	Imp. \$ 1,830,131
" 1907..	3,716,258	4,512,466	" 796,208
Year 1908..	70,889,954	42,210,678	Exp. 28,679,276
" 1907..	53,596,071	35,374,686	" 18,221,385
Silver:			
Oct. 1908..	4,378,015	3,744,163	Exp. 633,852
" 1907..	5,053,997	3,599,695	" 1,454,302
Year 1908..	43,159,395	34,536,867	" 8,622,528
" 1907..	53,024,790	38,087,919	" 14,936,871

Exports of specie from New York week ended Dec. 12: Gold, \$850; silver, \$681,954, almost all to London. Imports: Gold, \$279,213; silver, \$456,579, both from the West Indies, Mexico and South America.

A total of \$5,400,000 gold has been taken in New York for export this week. Practically all of this will go to Paris. Exchange still remains high.

Gold—The demand for gold on the open market in London this week was less active. Gold bars were quoted at 77s. 9⁷/₈d. per oz., or 1¹/₄d. less than last week. The Bank of France took all the gold received from the Transvaal, amounting to \$3,125,000, and has also secured gold from New York. American gold eagles in London, 76s. 5d. per ounce.

Platinum—Dealers still quote \$24 per oz. for refined platinum; \$26.50 for hard,

and \$20@21 for scrap. The business is fair. Sales to jewelers have fallen off, as is usual at this season, though less than was expected. Electric companies and builders of automobiles are taking rather more than they have been recently.

Silver—Silver has advanced a little owing to China buying; but there does not seem to be any special activity in the demand, and the chances are there will be no great change from current figures during the rest of the month.

SILVER AND STERLING EXCHANGE.

December.	10	11	12	14	15	16
New York....	49 ¹ / ₄	48 ⁵ / ₈	48 ³ / ₄	48 ³ / ₄	48 ³ / ₄	48 ³ / ₄
London.....	22 ³ / ₄	22 ¹ / ₂	22 ¹ / ₂	22 ¹ / ₂	22 ¹ / ₂	22 ¹ / ₂
Sterling Ex..	4.8685	4.8685	4.8710	4.8710	4.8710	4.8685

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Shipments of silver from London to the East, year to Dec. 3, reported by, Messrs. Pixley & Abell, London:

	1907.	1908.	Changes.
India.....	£10,289,254	£8,369,640	D. £1,919,614
China.....	331,750	571,400	I. 239,650
Straits.....	691,150	164,885	D. 526,265
Total.....	£11,312,154	£9,105,925	D. £2,206,229

Receipts for the week £2000 from Chile and £170,000 from New York; total, £172,000. Exports £2000 to Egypt and £10,000 to India; £12,000 in all.

Copper, Tin, Lead and Zinc

Dec.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
10	14 ¹ / ₂ @14 ³ / ₈	14 @14 ¹ / ₂	63 ¹ / ₂	29 ¹ / ₂	4.22 ¹ / ₂ @4.27 ¹ / ₂	5.12 ¹ / ₂ @5.15 ¹ / ₂	4.97 ¹ / ₂ @5.00
11	14 ¹ / ₂ @14 ¹ / ₂	14 @14 ¹ / ₂	63 ¹ / ₂	29	4.22 ¹ / ₂ @4.27 ¹ / ₂	5.12 ¹ / ₂ @5.15 ¹ / ₂	4.97 ¹ / ₂ @5.00
12	14 ¹ / ₂ @14 ¹ / ₂	14 @14 ¹ / ₂	.....	29	4.22 ¹ / ₂ @4.27 ¹ / ₂	5.12 ¹ / ₂ @5.15 ¹ / ₂	4.97 ¹ / ₂ @5.00
14	14 ¹ / ₂ @14 ¹ / ₂	14 @14 ¹ / ₂	62 ¹ / ₂	28 ¹ / ₂	4.20 @4.25	5.12 ¹ / ₂ @5.15 ¹ / ₂	4.97 ¹ / ₂ @5.00
15	14 ¹ / ₂ @14 ¹ / ₂	14 @14 ¹ / ₂	62 ¹ / ₂	29 ¹ / ₂	4.20 @4.25	5.12 ¹ / ₂ @5.15 ¹ / ₂	4.97 ¹ / ₂ @5.00
16	14 ¹ / ₂ @14 ¹ / ₂	14 @14 ¹ / ₂	62 ¹ / ₂	29	4.20 @4.25	5.12 ¹ / ₂ @5.15 ¹ / ₂	4.97 ¹ / ₂ @5.00

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Since Dec. 9 the market has continued dull. Some fancy brands of Lake copper have been sold to domestic consumers under exceptional conditions at 14.50 and 14.60c., but these prices are above the real market. The Lake producers to a considerable extent preserve their previous attitude of aloofness, but some offerings with a guarantee indicate a weakening of confidence. In electrolytic there is less stiffness. This grade has been freely offered by first hands at 14¹/₄c.,

delivered 30 days, or 14¹/₈c. cash, and some sales have been made at that figure; in other cases these offers have been cut, while business for export has been taken at a shade over 14c., New York.

Speaking generally, the character of the market has not changed materially during the last week. There are still some of the larger sellers who have not reduced their quotations, but enough copper is available at the current level to provide for what small business is placed from time to time. The future course of the market will depend altogether upon whether or not there is going to be disappointment with regard to the revival in the demand which is expected after the turn of the year. Meanwhile, a holiday spirit is likely to prevail. The close is easy at 14¹/₄@14³/₈c. for Lake copper; 14@14¹/₈c. for electrolytic in ingots, cakes and wirebars. The average for casting copper has been 13³/₄@14 cents.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. Wire, 15³/₄c. base, carload lots at mill.

The Standard market in London fluctuated within narrow limits, but considering that the statistics for the first half of the current month increased to the extent of 1600 tons, prices have held fairly well. The close is quiet at £62 7s. 6d. for spot, £63 5s. for three months.

Refined and manufacturing sorts we quote: English tough, £66; best selected, £65@66; strong sheets, £77@78.

Tin—The London market has been steady throughout the week, and while large transactions have taken place from day to day, prices have undergone hardly any change. The close is cabled at £132 for spot, £133 15s. for three months.

The domestic market is still as dull as it has been for some time past, the interest of consumers being manifest in their immediate requirements only. Spot tin at the close can be bought at about 29 cents.

Lead—Consumers are not showing any interest in the market, and on this account little progress has been made in disposing of the heavy quantities which are being offered from the West. The close is again lower and weak at 4.20@4.25c., New York, 4.05@4.07¹/₂c., St. Louis.

The London market is neglected and closes at £13 3s. 9d. for Spanish lead, £13 6s. 3d. for English lead.

Spelter—The market has been quiet and unchanged as to prices. Some producers who have sold out for December are now asking a price much above the present level, pending some straightening out of the ore situation at Joplin, where the market is still such as to leave no margin of profit to the smelters. The market closes steady at 5.12¹/₂@5.15, New York, and 4.97¹/₂@5c., St. Louis.

The London market is somewhat firmer, and closes at £20 15s. for good ordinaries, £21 for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Silesian Spelter Market—Paul Speier reports from Breslau under date of Nov. 30 that the current price for ordinary brands was 41.50@42.50 marks per 100 kg.; zinc dust, 39.50 marks per 100 kg., f.o.b. Stettin. Exports and imports in Germany, 10 months ended Oct. 31 were, in metric tons:

	Imports.		Exports.	
	1907.	1908.	1907.	1908.
Spelter.....	24,887	25,840	51,523	56,559
Zinc sheets.....	89	283	17,481	14,961
Scrap.....	874	1,408	5,793	4,843
Zinc dust.....	788	947	1,812	2,070
Zinc pigments.....	7,222	5,588	9,671	9,676
Zinc ore.....	148,458	159,163	28,903	29,727

Zinc pigments include zinc-white and zinc-sulphide.

Other Metals

Aluminum—Prices continue unchanged. Foreign metal is still offered at 22c. for ingots, but no large sales are reported. The Aluminum Company of America still quotes 24c. per lb., base for No. 1 ingots and 33@34c. base for sheets. No change is reported in the market abroad.

Antimony—The market is lifeless and no changes in prices occurred. Quotations are 8.15@8.25c. for Cookson's, 8@8½c. for Hallett's, and 7½@7¾c. for ordinary brands.

Quicksilver—Business has been only moderate, and the market is rather uncertain. The New York quotations are a little lower, at \$45@46 per flask of 75 lb. San Francisco prices are \$45 per flask for domestic orders, and \$43 for export. The London price is unchanged at £8 10s. per flask, with 2s. less named by jobbers.

Nickel—Large lots, 40c., New York.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at \$1.25 per lb. in 100-lb. lots. The price is \$1.40 per lb. for 5-lb. lots.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 12—The highest price paid for zinc ore this week was \$45.50, on a basis of \$42@43 per ton of 60 per cent. zinc. For 80 per cent. lead ore \$50 per ton was paid.

SHIPMENTS, WEEK ENDED DEC. 12

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville ..	730,440	.....	237,000
Cuba City ..	491,388	88,240	.....
Benton.....	489,590	.....	.....
Harker.....	402,910	.....	.....
Elmo.....	271,420	.....	.....
Strawbridge.....	247,900	.....	.....
Hazel Green.....	233,980	.....	.....
Highland.....	228,400	.....	.....
Linden.....	208,500	.....	.....
Livingston.....	160,000	.....	.....
Shullsburg.....	150,000	.....	.....
Days Siding.....	88,000	.....	.....
Galena.....	50,000	.....	.....
Mineral Point.....	20,000	.....	.....
Total.....	3,772,528	88,240	237,000
Year to Dec. 12.....	107,779,590	10,190,055	4,886,504

In addition to the above there was shipped to the Platteville Separating Company, from Galena, 425,000 lb.; to the Joplin Separator Works, 317,100 lb. zinc ore.

Joplin, Mo. Dec. 12—The highest price reported paid for zinc ore was \$47, and the base price ranged from \$43@46 per ton of 60 per cent. zinc. Sales were made at Miami on a base price of \$22.50 per ton of 40 per cent. zinc that are said to have equaled a base of \$48.50 for 60 per cent. zinc, f.o.b., or \$47.50 in the bin. Some sales were reported made today, for next week's delivery, as low as a base of \$42, the general market weakening materially at the week-end. The average price, all grades, was \$39.88. Lead ore was again lowered, the highest known settlement being at \$51, though \$51.50 was an unconfirmed report. The close was weak at \$50. The average price, all grades, was \$50.03 per ton.

With the advent of higher prices the output has been growing larger, now reaching the probable maximum, on account of a shortage of laborers to do the shoveling. United action is being taken among a number of producers to solve this problem by adopting machine shovels, as the American Zinc, Lead and Smelting Company is now using shovels operated by compressed air successfully.

SHIPMENTS, WEEK ENDED DEC. 12

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,977,450	583,100	\$98,104
Joplin.....	2,144,860	210,490	50,306
Galena.....	876,480	60,840	19,051
Prosperity.....	549,590	61,690	13,083
Alba-Neck.....	570,710	.....	11,984
Oronogo.....	570,290	.....	11,668
Duenweg.....	457,240	66,180	11,259
Granby.....	560,000	14,000	8,850
Aurora.....	564,240	.....	8,622
Miami.....	358,160	121,210	8,402
Badger.....	379,220	.....	8,343
Spurgeon.....	412,570	90,790	8,160
Carthage.....	321,910	.....	6,759
Carl Junction.....	101,570	3,530	2,323
Quapaw.....	104,390	.....	1,879
Zincite.....	50,180	.....	1,004
Sarcouxie.....	39,420	.....	848
Wentworth.....	51,160	.....	730
Totals.....	12,089,440	1,212,010	\$271,375

50 weeks.....491,715,130 7,488,450 \$10,429,717
Zinc value, the week, \$241,073; 50 weeks, \$8,389,057
Lead value, the week, 30,302; 50 weeks, 2,040,660

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January.....	\$46.90	\$37.60	\$45.84	\$35.56	\$83.58	\$46.88
February.....	48.30	36.63	47.11	34.92	84.58	49.72
March.....	49.75	36.19	48.66	34.19	82.75	49.90
April.....	49.25	35.40	48.24	34.08	79.76	52.47
May.....	46.90	34.19	45.98	33.39	79.56	56.05
June.....	47.00	33.06	44.82	32.07	73.66	60.48
July.....	46.80	34.55	45.79	31.67	58.18	59.90
August.....	44.56	36.53	43.22	33.42	59.54	60.34
September.....	41.00	37.63	40.11	34.44	53.52	54.59
October.....	41.75	35.95	39.83	33.28	51.40	52.63
November.....	38.60	39.13	35.19	35.02	43.40	54.33
December.....	31.50	.....	30.87	.....	37.71	.....
Year.....	\$44.36	.....	\$43.68	.....	\$68.90	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore;

the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Dec. 16—The market in general is steady and a good volume of business is being done. Contracts are increasing and the demand is improving. The inquiry into tariff revision is keeping some buyers out of the market for the time being.

Arsenic—Prices are firmer and it is rumored that available supplies are not as large as was formerly believed. Practically no business is done below 3¼c. per lb. Spot prices are 3¼@3¾c. according to quantity, seller and terms of sale.

Copper Sulphate—The market is firm but few sales are being made. Prices are unchanged at \$4.75 per 100 lb. for carloads and up to \$15 for smaller lots.

Nitrate of Soda—The market is firm and some business is being done. No goods are available under 2.17½c. which is the current price for spot and futures.

Mining Stocks

New York, Dec. 16—The general course of matters on the Stock Exchange during the week showed prices fairly firm, with generally moderate trading on mainly professional lines. A special drive was made at American Smelting and Refining, and the stock was forced down several points. All sorts of rumors were used to depress it, including much talk of new competition. Sales were large. Outside of this there were few changes of importance.

On the Curb there was fair activity, but no pronounced tendency. Price fluctuations were in both directions. The copper stocks were inclined to be a shade weaker at the close. On the other hand, Standard Oil was forced up to \$7.10 per share, the highest price this year.

The sensation of the week was the break in Rawhide Consolidated, a Nevada stock brought out by a well known actor who has gone into mine promotion. It was put on the Curb a few weeks ago at 50c., and gradually worked up to \$1.40. This week it broke suddenly under large sales. The excitement lasted only a day or two, and the dealings dropped off to a small figure; the stock closing at about 77c. per share.

Boston, Dec. 15—Mining shares have suffered general declines the past week. There has been some liquidation, but the market is more or less professional, and in keeping with the New York list. Here and there strong spots presented themselves, but these were only temporary.

Amalgamated touched \$85, but broke to \$80.12½ today, with the final a trifle above this. Copper Range has declined \$2.62½ to \$79.25 and closed at about the

lowest. Lake Copper received good buying orders from Michigan, with the result that the price advanced \$1.87½ to \$23.87½, although it fell back to \$21 today. North Butte, after striking \$86.50, fell back to \$83.50. Arizona Commercial spurted to \$40.62½, reacting to \$38.50, and Old Dominion rose \$1.25 to \$59.25, reacting to \$57.50. Superior Copper rose \$2.25 to \$34.75, losing to \$33.

Batopilas and East Butte mining have been placed on the unlisted department of the Stock Exchange, but neither has done much. Arcadian made a bow at \$3. Formal announcement is made of a complete reorganization which includes a company under Michigan laws and a \$1 assessment. The capitalizing of the Phelps, Dodge & Company into a \$50,000,000 corporation is well received. Options upon the minority stock of the Old Dominion Company of New Jersey at \$100 per share have been exercised on about 3500 of the 6000 shares out.

Franklin has lost \$2 to \$16.50. The Quincy has taken possession of the old Franklin mine and made partial payment; the full amount is \$170,000. Osceola closed \$5 off, at \$129. The adjourned annual meeting of this company has been further adjourned until next month. Shannon is off \$1.12½ to \$17. Utah Consolidated has gone off \$1.50 to \$44.50. New and strong interests have gone into the Boston Consolidated board.

The Curb has been active and the new quarters have served to give stability to this body.

STOCK QUOTATIONS

NEW YORK Dec. 15		BOSTON Dec. 15	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	¾	Adventure.....	9¼
Amalgamated.....	81½	Allouez.....	39
Anaconda.....	48½	Am. Zinc.....	25
Balaklala.....	22½	Arcadian.....	4¼
British Col. Cop.....	8¼	Arizona Com.....	38¾
Buffalo Mines.....	3¾	Atlantic.....	17
Butte Coalition.....	26½	Bingham.....	£.30
Colonial Silver.....	¾	Boston Con.....	16
Cum. Ely Mining.....	8¼	Calumet & Ariz.....	118
Davis Daly.....	3¾	Calumet & Hecla.....	670
Dominion Cop.....	¾	Centennial.....	34
Douglas Copper.....	3	Con. Mercur.....	£.38
El Rayo.....	4¾	Copper Range.....	79¾
Florence.....	4¾	Daly-West.....	10
Foster Cobalt.....	47	Franklin.....	16¾
Furnace Creek.....	12	Greene-Can.....	11¼
Giroux.....	6¾	Isle Royal.....	23
Gold Hill.....	½	La Salle.....	14¾
Goldfield Con.....	8¾	Mass.....	6½
Granby.....	104	Michigan.....	14
Greene Gold.....	¾	Mohawk.....	68
Greene G. & S.....	7	Nevada.....	19¼
Greenw'r & D. Val.....	£.75	North Butte.....	83¾
Guanajuato.....	2	Old Colony.....	60
Guggen. Exp.....	183	Old Dominion.....	57¾
Hanapah.....	15	Osceola.....	131
McKinley Dar.....	1.03	Parrot.....	30
Micmac.....	2½	Quincy.....	*98
Mines Co. of Am.....	1½	Rhode Island.....	5½
Mitchell Mining.....	½	Santa Fe.....	2½
Mont. Sho. C.....	2½	Shannon.....	17
Nev. Utah M. & S.....	218	Superior.....	33½
Newhouse M. & S.....	5½	Superior & Pitts.....	17¾
Nipissing Mines.....	10¾	Tamarack.....	82
Old Hundred.....	97	Trinity.....	17¾
Silver Queen.....	97	United Cop., com.....	14
Stewart.....	¾	U. S. Oil.....	29
Tennessee Cop'r.....	45½	U. S. Smg. & Ref.....	44
Tri-Bullion.....	1½	U. S. Sm. & Re., pd.....	46¾
Union Copper.....	¾	Utah Con.....	44¾
Utah Apex.....	5¾	Victoria.....	3¾
Utah Copper.....	46	Winona.....	6
Yukon Gold.....	47½	Wolverine.....	152
		Wyandotte.....	2¾

*Ex. Div. †Ex. Rights.

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.....	32
Am. Smelt. & Ref.....	84¾
Am. Sm. & Ref. pf.....	101¾
Colo. Fuel & Iron.....	38
Federal M. & S., pf.....	81
National Lead.....	78½
National Lead, pf.....	106
Pittsburg Coal.....	114¾
Republic I. & S.....	26¾
Republic I. & S., pf.....	86
Sloss-Sheffield.....	78
Standard Oil.....	702
U. S. Steel.....	53¾
U. S. Steel, pf.....	111¾
Va. Car. Chem.....	43

BOSTON CURB

Ahmeek.....	125
Black Mt.....	3¼
Chemung.....	20
East Butte.....	19¾
Globe Con.....	7
Hancock.....	12
Helvetia.....	4¾
Keweenaw.....	5¼
North Lake.....	8
Ojibway.....	13
Superior & Bost.....	17¾

Furnished by Hornblower & Weeks, N. Y.

NEVADA STOCKS. Dec. 16.

Furnished by Weir Bros. & Co., New York.			
Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS			
Belcher.....	.28	Silver Pick.....	.11
Best & Belcher.....	.45	St. Ives.....	.16
Caledonia.....	.17	Triangle.....	.03
Chollar.....	.09	BULLFROG STOCKS	
Comstock.....	.29	Bullfrog Mining.....	£.03
Con. Cal. & Va.....	.79	Bullfrog Nat. B.....	£.04
Crown Point.....	.35	Gibraltar.....	.02
Exchequer.....	.30	Gold Bar.....	£.03
Gould & Curry.....	.09	Homestake King.....	.08
Hale & Norcross.....	.35	Montgomery Mt.....	£.05
Mexican.....	.86	Mont. Shoshone C.....	.87½
Ophir.....	1.72	Original Bullfrog.....	£.01
Overman.....	.20	Tramp Cons.....	.11
Potosi.....	.14	MISCELLANEOUS	
Savage.....	.27	Bonnie Clare.....	.06
Sierra Nevada.....	.26	Lee Gold Grotto.....	...
Union.....	.23	Nevada Hills.....	1.37½
Utah.....	.04	Nevada Smelting.....	1.06½
Yellow Jacket.....	.47	Nevada Wonder.....	.35
TONOPAH STOCKS			
Belmont.....	.92	Nevada-Utah.....	2.87½
Extension.....	.47	Penn-Wyoming.....	.17
Golden Anchor.....	.02	Pittsburgh S. Pk.....	.85
Jim Butler.....	.17	Rawhide Coal.....	.70
MacNamara.....	.30	Round Mt. Sphinx.....	.15
Midway.....	.18	NEVADA STOCKS. Dec. 16.	
Montana.....	.82	Name of Comp. Clg.	
North Star.....	.04	Name of Comp. Clg.	
Tono'h Mine of N.....	6.87½	Name of Comp. Clg.	
West End Con.....	.30	Name of Comp. Clg.	

NEVADA STOCKS. Dec. 16.

NEVADA STOCKS. Dec. 16.			
Name of Comp.	Clg.	Name of Comp.	Clg.
GOLDFIELD STOCKS			
Adams.....	.02	Acacia.....	7½
Atlanta.....	.17	Black Bell.....	...
Booth.....	.31	C. C. Con.....	4
Columbia Mt.....	.17	Dante.....	6
Comb. Frac.....	1.34	Doctor Jack Pot.....	9
Con. Red Top.....	.12	Elkton.....	71½
Cracker Jack.....	.03	El Paso.....	49
Dia'ldfield B. B. C.....	.11	Findlay.....	18
Goldfield Belmont.....	.07	Gold Dollar.....	10½
Goldfield Daisy.....	.78	Gold Sovereign.....	3¾
Great Bend.....	.28	Isabella.....	26
Jumbo Extension.....	.20	Index.....	6
Kendall.....	.18	Jennie Sample.....	6
Lone Star.....	.07	Jerry Johnson.....	3¾
May Queen.....	.07	Mary McKinney.....	31½
N. Y. C. O. D.....	.02	Pharmacist.....	3¾
Oro.....	.12	Portland.....	1.06
Red Hill.....	.18	Un. Gold Mines.....	4
Roanoke.....	.12	Vindicator.....	80½
Sandstorm.....	.20	Work.....	7½

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.....	Jan. 8	Feb. 2	\$0.10
Blackjack Con., Utah.....	Dec. 15	Jan. 6	0.01
Caledonia, Nev.....	Jan. 8	Jan. 29	0.05
Challenge, Nev.....	Dec. 11	Jan. 5	0.05
Confidence, Nev.....	Dec. 9	Dec. 30	0.20
Ely Con., Nev.....	Nov. 28	Jan. 11	0.02
Exchequer, Nev.....	Dec. 30	Jan. 20	0.05
Julia Con., Nev.....	Dec. 21	Jan. 15	0.03
Little Chief, Utah.....	Dec. 15	Jan. 5	0.01
Lower Mammoth, Utah.....	Dec. 18	Jan. 8	0.05
Mountain Dell.....	Dec. 24	Jan. 12	0.02
New York Con., Nev.....	Dec. 18	Jan. 8	0.03
Oro Cobre, Cal.....	Dec. 31	Jan. 16	0.02
Overman, Nev.....	Dec. 2	Dec. 23	0.05
Prudential, Cal.....	Dec. 3	Dec. 21	0.05
Savage, Nev.....	Jan. 6	Jan. 28	0.10
Union Con., Nev.....	Dec. 23	Jan. 14	0.10
Washakie, Nev., Utah.....	Nov. 27	Dec. 18	0.10
Yellow Jacket, Nev.....	Dec. 28	Feb. 3	0.15
Zeibright, Cal.....	Dec. 1	Dec. 17	0.05

Monthly Average Prices of Metals SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January.....	68.673	65.678	31.769	25.788
February.....	68.835	56.000	31.852	25.855
March.....	67.519	55.365	31.325	25.570
April.....	65.462	54.505	30.253	25.133
May.....	65.971	52.795	30.471	24.377
June.....	67.090	53.663	30.893	24.760
July.....	68.144	53.115	31.366	24.514
August.....	68.745	51.683	31.637	23.858
September.....	67.792	51.720	31.313	23.877
October.....	62.435	51.431	28.863	23.725
November.....	58.677	49.647	27.154	22.933
December.....	54.365	.....	25.362	.....
Year.....	65.327	.....	30.188	.....

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

COPPER

Month.	NEW YORK.		LONDON.	
	Electrolytic		Lake.	
	1907.	1908.	1907.	1908.
January.....	24.404	13.726	24.825	13.901
February.....	24.869	12.905	25.236	13.098
March.....	25.065	12.704	25.560	12.875
April.....	24.224	12.743	25.260	12.928
May.....	24.048	12.598	25.072	12.788
June.....	21.665	12.675	24.140	12.877
July.....	22.130	12.702	21.923	12.933
August.....	18.356	13.462	19.255	13.639
September.....	15.565	13.388	16.047	13.600
October.....	13.169	13.354	13.551	13.646
November.....	13.391	14.130	13.871	14.386
December.....	13.163	.....	13.393	.....
Year.....	20.004	.....	20.661	.....

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

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January.....	41.548	27.380	July.....	41.091	29.207
February.....	42.102	28.978	August.....	37.667	29.942
March.....	41.313	30.577	September.....	36.689	28.815
April.....	40.938	31.702	October.....	32.620	29.444
May.....	42.149	30.015	November.....	30.833	30.348
June.....	42.120	28.024	December.....	27.928	.....
Av. year.....	.....	.....	.....	38.160	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January.....	6.000	3.691	19.828	14.469
February.....	6.000	3.725	19.631	14.250
March.....	6.000	3.838	19.703	13.975
April.....	6.000	3.993	19.975	13.469
May.....	6.000	4.253	19.688	12.938
June.....	5.760	4.466	20.188	12.600
July.....	5.288	4.447	20.350	13.000
August.....	5.250	4.580	19.063	13.375
September.....	4.813	4.515	19.775	13.126
October.....	4.750	4.351	18.531	13.375
November.....	4.376	4.390	17.281	13.978
December.....	3.658	.....	14.500	.....
Year.....	5.325	.....	19.034	.....

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

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January.....	6.732	4.513	6.582	4.363	27.125	20.563
February.....	6.814	4.788	6.664	4.638	25.838	20.876
March.....	6.837	4.665	6.687	4.527	26.094	21.076
April.....	6.685	4.645	6.535	4.495	25.900	21.344
May.....	6.441	4.608	6.291	4.458	25.563	19.000
June.....	6.419	4.543	6.269	4.393	25.469	19.031
July.....	6.072	4.485	5.922	4.338	23.850	19.350
August.....	5.701	4.702	5.551	4.556	21.969	19.563
September.....	5.236	4.769	5.086	4.619	21.050	19.760
October.....	5.430	4.801	5.280	4.651	21.781	19.760
November.....	4.925	5.059	4.775	4.909	21.438	20.875
December.....	4.254	.....	4.104	.....	20.075	.....
Year.....	5.962	.....	5.812	.....	23.771	.....

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