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Mining Development in China.

The Chinese board of commerce has drawn up 24 articles for the investigation of mines and mining interests in the provinces; and these, having been approved by Imperial order, have been added to the mining regulations sanctioned some time ago. All offices in connection with mining, such as K'uang-wu, Tsang Chü, Ch'a Kuang, Kung Sô, and others, have been converted into mining bureaus for the sake of uniformity. The Tartar generals, viceroys and governors are to select and recommend officials of experience and uprightness, who are qualified to be directors and engineers of mining; these are to make surveys and detailed reports. They must also report on the workings of all mines, now being operated, whether by natives or foreigners.

Anyone hindering mining development or investigation, by force or by pleading Fengshui ("the interference of the heavenly spirits"), will be punished. Merchants or people who need the service of a mining engineer from the Imperial office are to provide all expenses. A laboratory is to be attached to each mining bureau, consisting of two departments, one for experiments, the other for commercial operations. For the purpose of prospecting on Government land, excavations are necessary; the occupier of the surface area shall be notified to this effect, and no resistance must be offered on his part. Should any damages be done to his possessions, he will be indemnified by the mining office. Full account of the mineral deposits and of the necessary steps

for developments must be filed with the board of commerce. All mining reports are to state the extent and value of all mineral deposits whether transportation is convenient, market prospects are good, coal or other fuel is procurable, and whether machinery can be erected at the mine. Full information regarding transportation facilities is required, as well as the nature and extent of the ore deposits. The methods of mining and treatment are to be described as fully as possible. Maps and plans should be furnished whenever obtainable, and the engineers are instructed to supply the fullest information which will enable investors to form conclusions regarding the mines described.

Mine Telephones.

BY WILLIAM HAHNMAN.*

At the mine of the Lilly Coal Company is installed a telephone system whereby the outside office can communicate with the inside foreman without sending a messenger or himself coming out, as formerly; this telephone system was, however, put in more particularly to meet another need. We are operating a drift mine and haul coal out by an electric locomotive. About 6000 ft. inside we operate an electric hoist, and the mine telephone was installed to enable the men at the bottom of the plane to communicate with the men at the top.

There are two underground planes of this kind; two more telephones for the purpose have recently been installed on the second plane. While installing these it seemed as well to complete the job by putting one in at the outside office and one in the engine room to provide means of communicating instantly from the inside of the mine to the outside. We have found these telephones of the utmost convenience and value, and the repairs since we have had them in, two or three years, amount to but little, about \$5 in that time. One of the telephones got out of order by contact with the haulage current, burning out one of the coils. We have, since that time, installed lightning arresters to avoid this sort of thing.

We are using rubber-covered insulated wire throughout. This was recommended by the people from whom we obtained the telephones. The wire is hung on ordinary porcelain insulators, which are fastened to mine props by iod. nails. The cost of the rubber-covered wire makes an underground system rather more expensive than a person would ordinarily think, until he finds out the cost of this wire.

*General manager Lilly Coal Company, Altoona, Penn

We have about four or five miles of it in use, and once installed, it does not appear to deteriorate and does not need replacing.

The system we find valuable in case anything goes wrong underground, where something is needed in a hurry. We have become so accustomed to the use of the telephones that we do not fully realize how much use we have for them.

Americans in Sonora.

The Mexican authorities furnish a military escort even for the individual traveller in the Yaqui zone, when they are so requested, and it is considered that such traveller has a good and valid cause for making the trip. This being the case, says the *Mexican Herald*, it is evident that Americans who come to harm in Sonora at the hands of the Yaquis have no one but themselves to blame.

The persons who recently complained to the State Department at Washington in regard to the insecurity in some parts of Sonora are not the representatives of substantial American interests in that State. As pointed out by Gov. Izabel, the complainants are in general promoters who, casting about for some explanation of the ill-success of speculative mining ventures which they have started, to offer to disappointed shareholders, find a convenient plea in the Yaqui troubles.

However, an erroneous impression is apt to be given by the advice to Americans to stay away from Sonora while the Yaquis are unsubdued. Certainly there have of late been some Americans in Sonora, who, if they went away and did not return, would not be missed either by their reputable compatriots in that part of Mexico or by the Mexicans. But in general there is no reason why either American capital or American enterprise should stay away from Sonora at present. They can both enter that State with security and they will find an excellent field there for conservative and legitimate endeavor.

The only conditions necessary for safety are that the advice of experienced residents be followed and that the safeguards freely offered by the Mexican authorities be taken advantage of. It will be remembered that only recently the representatives of reputable American concerns in Sonora went on record emphatically to the effect that they had no complaint to make, but on the contrary, every praise to bestow on the authorities of the State.

Brass or bronze solutions quickly corrode an anode with a green slime, and consequently require frequent cleaning.

The Colorimetric Estimation of Copper in Slags.

BY H. M. KIMBALL.*

In most copper smelters the slags formed in the process are closely watched as to their copper contents. Due to the high tonnage of slag made, each additional tenth of one per cent. of copper in the slag means hundreds of pounds of copper thrown over the dump each day, and lost. Quick daily copper determinations on the slags from different furnaces give warning of poor smelting in time to remedy the fault.

A simple method of running the daily slag samples for copper, is given below. It consists in securing all the copper in an ammoniacal solution (free from the insoluble hydroxides of iron and aluminum), and matching its blue color with the color of certain standard solutions containing known amounts of copper.

The scheme is essentially a technical method. I must admit that it possesses few of the refinements of fine advanced analytical work. It possesses accuracy, combined with speed, and hence the method commends itself to the smelter laboratory. Copper in slags can be determined to the nearest tenth of one per cent. I have frequently seen copper assays on 40 slag samples run and reported two hours after the samples were handed to the chemists. One assay can certainly be run in less than thirty minutes.

In brief outline, the assay is made as follows:

1. Weigh either one or two grams of slag into a No. 1 beaker.
2. Moisten with water, add 15 c.c. aqua regia, stir and boil ten minutes.
3. Dilute to 75 c.c. with hot water; break up any clots of SiO_2 .
4. Add 50 c.c. of dilute ammonia (one to one), stir and filter into a colorimetric bottle.
5. Wash back and re-dissolve the hydroxides in a little dilute HCl.
6. Precipitate again with dilute ammonia, and filter and wash into same colorimetric bottle.
7. Dilute the solution up to the mark on bottle and compare with the standards.

Notes on the Process—For slags that run from 0.1 to 0.5 of one per cent. copper, two grams makes the best weighing. For slags which run higher than five-tenths of one per cent., one gram is ample.

Aqua regia has been found to attack all slags (except certain rare refinery slags running about 50 per cent. copper), with sufficient success to take into solution all copper present. This is undoubtedly due to the fact that copper, occurring in slag is present as matte, as copper oxide, or as minute shots of metallic copper, no actual silicate of copper being formed. Hence the aqua regia will take into solution all

the copper, even when it will not completely dissolve the slag.

The double precipitation of the iron and aluminum hydroxides is absolutely necessary to make a complete separation of all the copper. The first precipitate will often hold up several tenths of copper, even if well washed; hence the need of the second solution and precipitation.

The standard solutions are kept in well stoppered 16-oz. white-glass bottles. They contain 2, 4, 6, 8 and 10 mg. of copper respectively, each in about 200 c.c. of solution; and at 12, 14, 16, 18 and 20, mg., respectively, each in about 400 c.c. of solution. In making up the standards one-half gram of copper foil is dissolved in a few c.c. of nitric acid, and made up to 500 c.c. of aqua regia and 10 c.c. of dilute ammonia, each c.c. will contain one mg. of copper. The solution is run into a burette, and the required number of c.c. respectively, is run into each standard bottle. To each bottle has been added previously six c.c. of aqua regia and 10 c.c. of dilute ammonia. This gives a standard copper solution similar to the solutions produced in the regular assay.

Matching the solutions—In order to



correctly match an unknown solution with the right standard bottle, several of the standards are placed against a white-paper background, leaving spaces between the bottles for the "unknowns," as shown in the sketch. Thus if the blue tint of the "unknown" is stronger than that of the 6/10 standard, but a fainter blue than that of the 8/10 standard, the copper is reported as 7/10 of one per cent., providing that one gram of slag was taken. If two grams were taken in the above case, the copper would be reported as 35/100 of one per cent. A few days' practice in matching the various blue tints of the solutions will enable one to perform this most important part of the assay with speed and accuracy.

The maximum amount of copper that can be estimated with the standards given above, is 2 per cent. If an "unknown" shows bluer than the 2 per cent. standard (20 mg. copper), the unknown solution should be carefully split, one-half diluted to its original bulk with water, and then carefully matched, multiplying the result obtained by two.

A few precautions to be suggested would be: 1. Use only clear white bottles of uniform shape and size, showing no blue or green tint when filled with distilled water. 2. Secure the best daylight obtainable for matching the solutions. Avoid side-lights as much as possible, using daylight coming over the operator's shoulder. 3. Make up the unknown solu-

tion to exactly the same volume as the standard, and shake well before matching. 4. Make up the standard solutions fresh at least every two months.

The Belgian Coal Market.

Consul-General Roosevelt, of Brussels, says that the effect of the recent disaster in the coal mines at Courrières, France, and the probability of no output from these mines for several months, is strongly felt throughout the industrial centers of Belgium. An abundant supply of soft free-burning coal has always been difficult to obtain, and in certain localities, such as Hautmont, Jeumont, Louvroil, Sous-le-Bois, and Tournai, manufacturers have largely depended upon the Courrières mines for their supply of coal, the daily extraction at these mines averaging about 2000 tons.

Since the Courrières disaster, directors of mines in the Charleroi and Borinage districts, Belgium, have been besieged by orders from works in the above-named districts. In view of the scarcity of soft coal and the pressing demand for coals of all categories, prices for new contracts have been advanced and are quoted as follows: Light close burning, \$2.70 per ton; light half-close burning, \$3.08; briquet type I, \$3.66; the briquet type II, \$4.05. Added to the present restricted soft-coal supply is the discontinuance of work for six months in a pit of the Grand Hornu mine, Belgium, which produced a daily average of 200 tons, for the purpose of carrying out indispensable work to avoid flooding several other pits.

The Transandine Railway.

Consul Mansfield, of Valparaiso, Chile, reports that the formal inauguration of the first section of the Transandine Railway took place on Feb. 12. The section is 34 miles in length, the first station being at an elevation of 2664 ft., and the last one at 7221 ft. From Juncal, the last station on the first section, to the summit there is a distance of nine miles, and the altitude increases from 7221 ft. to 10,365 ft. It is at this last height that the great tunnels are being opened to connect the Chilean and Argentine sections. The longest tunnel will be 3405 yds. long. This tunnel is now in course of construction.

Sufficient rolling stock has been acquired for the first section, and next spring locomotives will arrive at Portillo, the terminus of the second section, and thus the journey from Valparaiso to Buenos Aires will be shortened by several hours.

The Anglo-Sicilian Sulphur Company has decided to cancel its contract with the Sicilian mine owners, which terminates July 31, 1906. To replace it the mine owners are about to form a trust under government advice and control.

*Chemist, Boston & Montana smelter, Great Falls, Mont.

Hydraulic Mining in California.

BY J. P. HUTCHINS.*

Hydraulic mining in California has been largely responsible for the invention and perfection of many devices now in general use in hydraulic installations; particularly it has led to information concerning wrought-iron pipe, and the flow of water through long pipe lines and nozzles, previous theories and practice having been greatly modified by observations made at hydraulic mines. The daring and resourcefulness, which developed among the hydraulic miners, became manifest in the simple control of

As a result of hydraulic mining, the building in California of an inverted siphon to be nearly 1.5 miles long, and to deliver 100 sec. ft. across a depression 1500 ft. deep, is a matter of no particular surprise and comment. The impact water-motor was evolved from the hurdy-gurdy water-wheel, first used in hydraulic mining in derricking boulders. Saving devices for placer gold were perfected in this industry, which was the first to utilize water under heavy hydrostatic and hydraulic pressure. So it is that the possible rehabilitation of this industry is reviving an interest commensurate with its possibilities.

Sluice, rocker, pan and riffles, also illustrated in that book, are very like ours in many features.

Although aqueducts of large capacity had been constructed, and inverted siphons were used 200 years B. C., by the Romans (in one instance to cross a depression 338 ft. deep, showing a considerable knowledge of hydraulics and hydrostatics), the possibility of using water not only to wash gravel but also to excavate it did not appeal to anyone until an ingenious Connecticut Yankee, one of the many California gold-seekers, introduced it in 1852.

INVENTION OF HYDRAULIC MINING.

Necessity is the mother of invention,

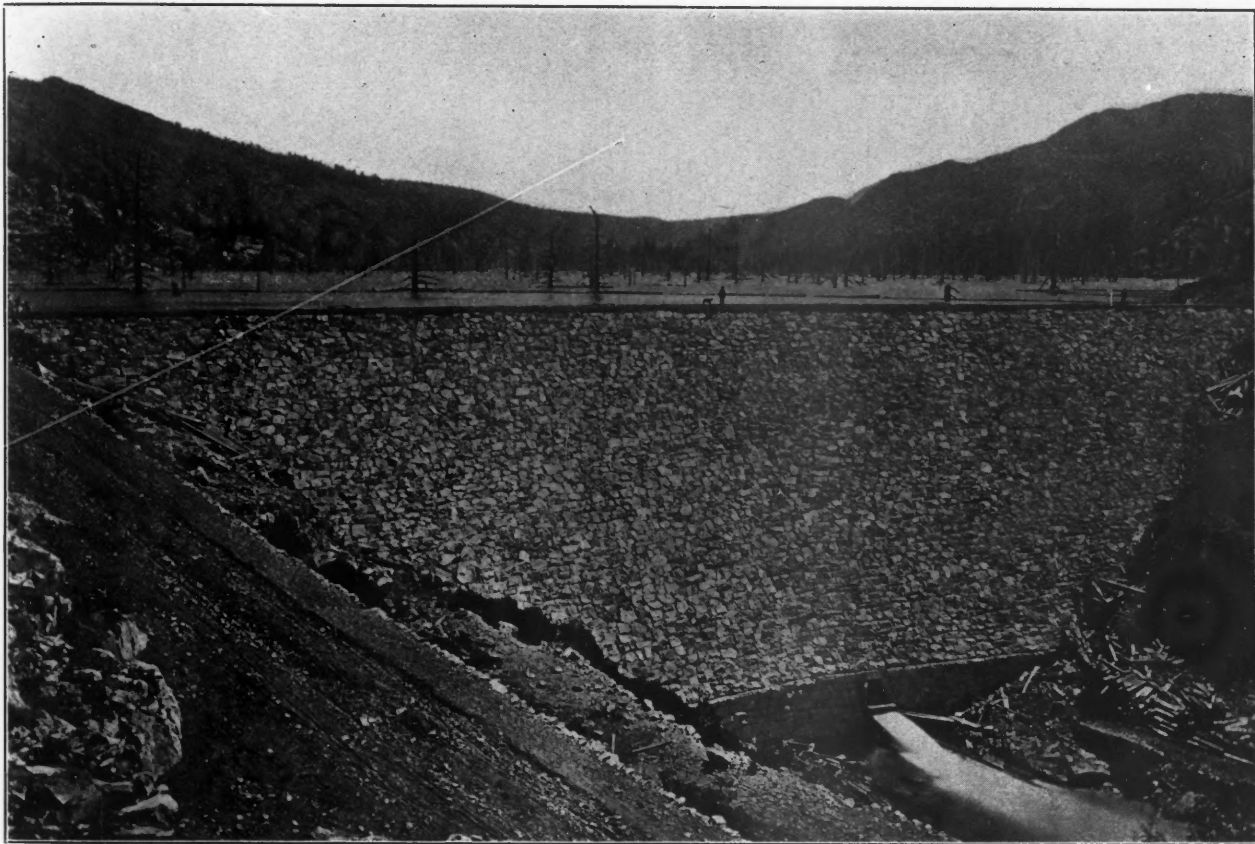


FIG. I. BOWMAN DAM.

ANTIQUITY OF PLACER MINING.

streams of over 1500 h.p., handled by one man as easily as a garden hose; in the construction of timber flumes on trestle work over 150 ft. high or hung by brackets on the faces of perpendicular cliffs; and in the installation of inverted siphons, like the one discharging 53 sec. ft. and bearing a bursting pressure of 384 lb. to the sq.in. The hydraulic battery was an instance of the ingenious devices introduced in hydraulic mining, and illustrates the daring and ingenuity (somewhat untempered, however, by engineering foresight). In it, the usual hydraulic stream was used; but boulders were fed into the inlet of the pipe to augment the effect of the stream on cemented gravel. The results were remarkable, but it was abandoned, as it was extremely dangerous to operate.

*Mining engineer, New York City.

Although placer mining has contributed more than one-half of the total gold product of the world, and is the oldest branch of gold mining, it was only a little over 50 years ago that hydraulic mining was begun. A method similar to ground sluicing, and another like booming, were used in ancient times. Pliny describes operations of such magnitude that the shores of the Mediterranean were extended to a considerable degree. Water was ditched, and material sluiced through bedrock sluices, after it had been prepared for washing by tunneling and breaking down. ("Natural History," Bohn's Edition, Vol. VI, Pp. 99.) In the "*De Re Metallica*" of Agricola (published in Latin in 1621, p. 270) an engraving shows ground sluicing similar to ours.

and it was the need of some method to get material from the gravel bank to the sluice at a more rapid rate than shoveling that resulted in the invention of hydraulic mining. Thus it was that, only four years after the discovery of gold in California, hydraulicking was begun with a rawhide hose and wooden nozzle. In 1853 light iron pipe was used; and in 1856 a pipe 40 in. in diameter was installed. Within a short time there were plants involving the expenditure of many million dollars, and with individual capacities, in several mines, of 10,000 cu.yd. per 24 hours. Ditches, flumes and inverted siphons with an aggregate length of more than 6000 miles were constructed where a rugged topography necessitated not only great ingenuity but required in addition, boldness and initiative of large caliber to

overcome natural obstacles of terrifying proportions. ("Annual Report," Chief of Engineers, U. S. A., 1882). Bedrock sluice tunnels more than 1.5 miles long, and costing more than \$500,000 were features of an expensive equipment. It has been estimated that an aggregate sum of more than \$100,000,000 was invested in hydraulic mining enterprises. Operations were at their zenith about 1875; by 1880, the industry was almost completely throttled by the injunctions of State and Federal Courts.

THE DEBRIS PROBLEM.

Some remarks on the physiographic conditions on the western scarp of the Sierra Nevada mountains, and of the great

heaviest precipitation is on the higher mountains, where erosion is greatest. It has been estimated that ordinarily there is about 1700 sq. miles of the valley more or less flooded each year. (*Trans. Tech. Soc. of Pac. Coast*, Feb. and Mar., 1887.) Some of this area (like the Yolo basin) acts as a reservoir for flood water, during the freshet, gradually emptying its content after the floods in the upper rivers have decreased and the lower river can accommodate it.

DIFFICULTY DUE TO PHYSIOGRAPHIC CONDITIONS.

These conditions have existed for ages, and the valleys of the Sac-

deep narrow cañons on steep gradients since the deposition of the Pliocene gravel channels (in several instances, more than 1000 ft. below them), and thus have usually supplied excellent outlets for tailing. The ancient alluvion is found in many instances on the extreme top of the divides (or "hogbacks," as they are colloquially called) where the elevation is about 4000 ft. These "hogbacks" are at right-angles to the backbone of the Sierras.

The slope of these divides is generally well suited for leading water in ditches and flumes on convenient grades, and at elevations great enough to give pressure essential for hydraulicking. It was seldom that topographic isolation necessitated



FIG. 2. NORTH BLOOMFIELD MINE.

valley of California, will make it easier to appreciate the unique conditions which, while favoring hydraulic mining to a greater degree than elsewhere in the world, also resulted in damage to other interests, and finally in the discontinuance of hydraulicking.

The great valley of California is about 450 miles long, 40 miles wide; it includes about 4700 sq. miles. The western slope of the Sierra Nevadas, with extreme heights of more than 11,000 ft., has an area of about 8843 sq. miles. The Shasta region of the north, having extreme heights of over 14,000 ft., has an area of 5600 sq. miles. The average rainfall over the entire Sacramento river watershed, an area of about 26,000 sq. miles, is about 30 in. ("Physical Data and Statistics of California," by Wm. Hammond Hall). The

ramento and its affluents (like those of many rivers) are flood-plain in character. Unmistakable geologic evidence of this exists; the material now being dredged on the Feather, Yuba and other rivers, in its characteristics, bears direct testimony to the effects of erosion in higher regions, and depositions in the lower area of the flood-plains. These alluvions also show that the process has been going on during a considerable geologic time, and that the alluvial flats of the Sacramento have always experienced the annual floods, probably to a greater degree in former geologic times, if, as is probable, there was then a considerably heavier rainfall.

The topographic features of the western flank of the Sierra Nevada are unusually favorable for hydraulic mining. The tributaries of the Sacramento have eroded

the installation of inverted siphons, as at the famous Spring Valley mine at Cherokee. In many instances, at elevations above the ditch intakes, the narrow gorges open out into meadows, and furnish ideal sites where large storage reservoirs may be formed by low, short, and inexpensive dams.

Enormous volumes of tailing had been deposited in the cañons up to 1875, and some of it had been transported to localities below the points where the tributaries of the Sacramento river debouch from the foothills on the flanks of the Sierra Nevadas. The river beds (notably that of the Yuba) were filled; and low lying area on the banks, some of which was agricultural and horticultural, was covered with material of a depth and coarseness depending upon the gradient of the adjacent river.

It is estimated that there were 120,000,000 cu.yd. in Bear river; 70,000,000 in Yuba river, about 1880; 43,546 acres suffered a depreciation of \$2,597,000 in 36 years. The loss in annual taxes to the State was \$7143. The total yield of the mines tributary to this section was over \$600,000,000. ("Report of State Engineer," California, 1880.)

RESULTS OF TAILING TRANSPORTATION.

That any industry of such magnitude as hydraulic mining should have had, as well as good results, was inevitable. Its colossal effects were commensurate with the \$100,000,000 invested in it; with the efforts of hundreds of the most efficient engineers and miners striving to "make the dirt fly," and with a set of topographic

of the old pits, the mine dumps, and the tailing (where it fills the rivers and spreads over the adjacent flats) can give a correct idea of its immensity. The navigable rivers of San Francisco bay were shoaled; and it was in this aspect that the Federal Government became involved.

AGRICULTURE A RESULT OF MINING.

As stated above, the Sacramento valley has been flooded yearly for ages. Until gold was discovered in California, much of this valley was divided into immense ranches held under Spanish and Mexican grant, and was used almost exclusively for grazing. Thousands of men stampeded to California after the discovery of gold; and, to furnish them food supplies, this rich valley was cultivated. The richest

possible, by State legislation) was neglected until the debris question finally became of sufficient magnitude to be a political issue. The farmers had organized an Anti-Debris Association; the miners banded together in a protective association, and bitter strife resulted.

THE ANTI-DEBRIS AGITATION.

This has been maintained particularly by the Anti-Debris Association. It was organized in the farming districts to prevent injury by the tailing from the mines. There was a need of some such organization; for the unrestricted exploitation of hydraulic mines was doing damage. Unfortunately, the association came under the control of those who prostituted its purposes for political aggrandizement.

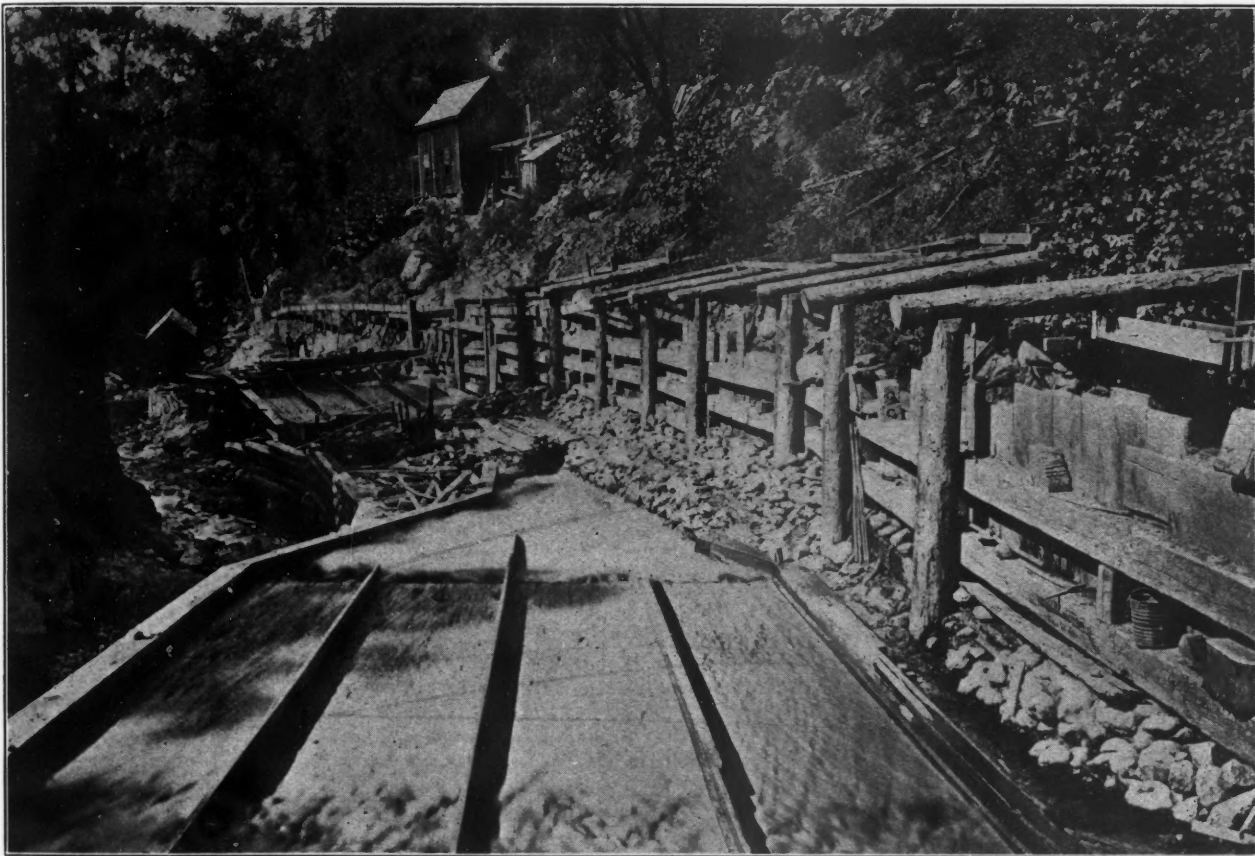


FIG. 3. HYDRAULIC MINING UNDERCURRENT.

conditions almost ideally favorable for transporting immense volumes of material from the ancient river channels through sluices to the dumps, by hydraulic power. It was estimated that on the watershed of the Sacramento river over 50,000,000 cu. yd. of gravel was washed in 1880. ("Report of State Engineer," California, 1880.) It is estimated that there are now over 300,000,000 cu.yd. in the bed of the lower Yuba river alone, where the river gradient is less than 15 ft. per mile. (*Proc. Soc. of Civ. Eng.*, Vol. XXXII, No. 2; P. 104.)

Much space could be devoted to the description of the great scale, the awe-inspiring workings, and the tremendous consequences; but only an actual inspection

land, in many instances, was close to the river, little if any above high-water mark, and this was first tilled. Soon mining debris began filling the rivers. The flood-plane was raised; land was flooded, and thus originated the strife which finally resulted (about 1880) in the complete closing of the hydraulic mines by injunctions of the State and Federal courts. Thus mining (which had not only made farming necessary, but had contributed largely to agricultural and horticultural prosperity) was finally stopped by the very industries it had conceived and nurtured.

A short-sighted policy, typical of early day mining, characterized the conduct of the hydraulic mines; and the difficulty (instead of being met and solved, as was

Blackmail and extortion were practiced, with the inevitable result of further antagonizing miner and farmer. Some of its members became mere parasites, using their connection with the association as a means of livelihood. It has been their pernicious activity that has prevented a quicker solution of the whole difficulty. It was their object to prevent the conciliation of farmer and miner, and their efforts have been worthy of a better cause. It was the direct result of their agitation that the Anti-Debris Association recently appointed a committee to control the watchmen who are to inspect the hydraulic-mining territory and map it, showing the location and condition of each hydraulic mine. This is properly the

work of the Debris Commission; not of the Anti-Debris Association.

Thus hydraulic mining is still harassed by an association for whose existence there was a positive need. Had it adhered to its first intention—that of preventing damage by debris—it would have done unquestionable good; but the controlling spirits and their methods have done direct injury to miners, and indirect harm to the very men in whose interest they were employed, by limiting the market for farm produce and by closing mines which were doing no harm to any interests and good to many. Under their urging (and as an ostensible means for protecting the valley area from damage) the valley counties contributed \$254,000; private individuals gave \$100,000; and Congress granted \$50,000—a total of \$394,000. Nearly all of this sum was devoted, not to any improving of conditions (by trying to solve the problem in a rational manner, that is, by allowing the mines to operate and by controlling the tailing) but to shutting down the mines in

rivers (hydraulic mines on other watersheds were discharging tailings into non-navigable rivers); all hydraulic mining was prohibited on these water sheds without a license or permit from the Commission. A maximum penalty of \$5,000 fine and one year's imprisonment was imposed for violation of the act.

The Commission was directed also to devise projects that would improve the navigability of the rivers above named, and their tributaries; to protect their banks from damage from mining tailings; and to restore, as far as required by the needs of navigation, the navigability of the rivers as it existed in 1860. It was suggested, at the time of passing the act, that at least one mining engineer familiar with hydraulic mining should be appointed on the Commission. It is unquestionably true that such procedure would have had a beneficial result. While the engineer officers who have been on the Commission have been extremely efficient, the fact remains that it was only in 1904 that a successful tailing barrier was installed, and

now 727, the greater proportion of which, however, are not now in force. It was thought that license from the Debris Commission would guarantee the hydraulic miner against molestation; such has not been the case. In numerous instances injunctions granted by courts of the valley districts have resulted in closing down hydraulic mines. Thus the hydraulic miner (even though operating under a permit from the Debris Commission, and following in all details, in letter and spirit the requirements for a license) is likely to be enjoined from operating. The precarious condition of all hydraulic mining resulting from this circumstance prevents the inception of new hydraulic-mining enterprises; and operation has only been undertaken in old mines where but little expense is necessary to begin piping.

In the illustrations published herewith Fig. 1 is the Bowman dam. This structure was installed to impound water for hydraulic mining. It is 100 ft. high and holds, when full, 9,000,000,000 cu. ft. of water. It cost about \$150,000.



FIG. 4. YUBA RIVER AND GOLD DREDGES.

a promiscuous way. They even included those mines which were operating in regions where fortunate topographic conditions permitted hydraulic mining without any damage.

Before any great good can result, the unfortunate enmity between miner and farmer must be terminated. The State Miners' Association is now making successful advances to accomplish what is primarily necessary.

THE PRESENT STATUS.

The Caminetti act (passed in 1893) provided for a Federal board of engineer officers, appointed by the President and confirmed by the Senate, and called the California Debris Commission. It is its duty, under the law, to devise plans that would permit the resumption of hydraulic mining, under such regulation as is necessary to prevent damage to the lower rivers and their adjacent lands. The Commission's jurisdiction was limited to the watersheds of the Sacramento and San Joaquin

restraining of the debris now in the Yuba river accomplished. Had an efficient hydraulic mining engineer been a member of the Commission, it is likely that this result would have been attained sooner. It was hoped that this act would allow hydraulic mining on a large scale, but this has not proved the case.

The Caminetti Act was harshly criticized in its beginning because it was slow and cumbersome in the method of acquiring a permit to mine. At first it required for preliminary consideration about seven days; for application to the Secretary of War, to advertise abstract of petition, 15 days; for advertising, 21 days; for the visit to the mine (pending the publication, hearing and deliberation) 20 days; for a second examination, 10 days; for a third examination (after restraining works have been completed) 10 days; 113 days in all, without counting the time necessary for constructing restraining works. This was under the most favorable circumstances; often six months to one year was needed.

The number of applications for licenses is

Fig. 2 depicts part of the famous north Bloomfield mine. About 60 sec. ft. of water was used under a pressure of about 200 lb. to the sq. in. The gravel bank is about 300 ft. high, and about 10,000 cu. yd. was washed every 24 hours.

Fig. 3 shows an hydraulic mining undercurrent. Fine from the main sluice is spread over wide surfaces and better opportunities are created for saving gold. "Gold-saving tables" used on gold dredges are modifications of this device.

Fig. 4 illustrates a part of the Yuba river, where its bed has been filled about 30 ft. with hydraulic mining tailing. Two gold dredges are seen in the left middle ground; they dig through the tailings and to an additional depth of 30 to 40 ft. in excavating the underlying pay gravel. The Yuba was formerly a narrow river, its great width, resultant from filling with tailing, is well shown. More damage was done here than elsewhere, but the total was only a few million dollars, whereas the mines tributary to it are said to have produced over \$600,000,000.

The Peregrina Mill, Guanajuato.

BY F. J. HOBSON.*

The ore as trammed from the mine is to be fed to two Gates breakers, feeding automatically to a belt conveyor running on an incline to and over the battery ore bin. The part of the conveyor over the bin will have an automatic self-propelling tripper distributing ore into the bin.

The ore will feed by gravity through chutes to 20 suspended Challenge feeders, delivering to ten 10-stamp batteries. The ore is to be crushed wet to pass a 40-mesh screen, and the pulp is to flow over amal-

with the Blaisdell machinery. The sands and slimes solutions carrying the precious metals are to run through clarifying and storage tanks to zinc boxes, where the content will be precipitated on zinc shavings in the usual manner.

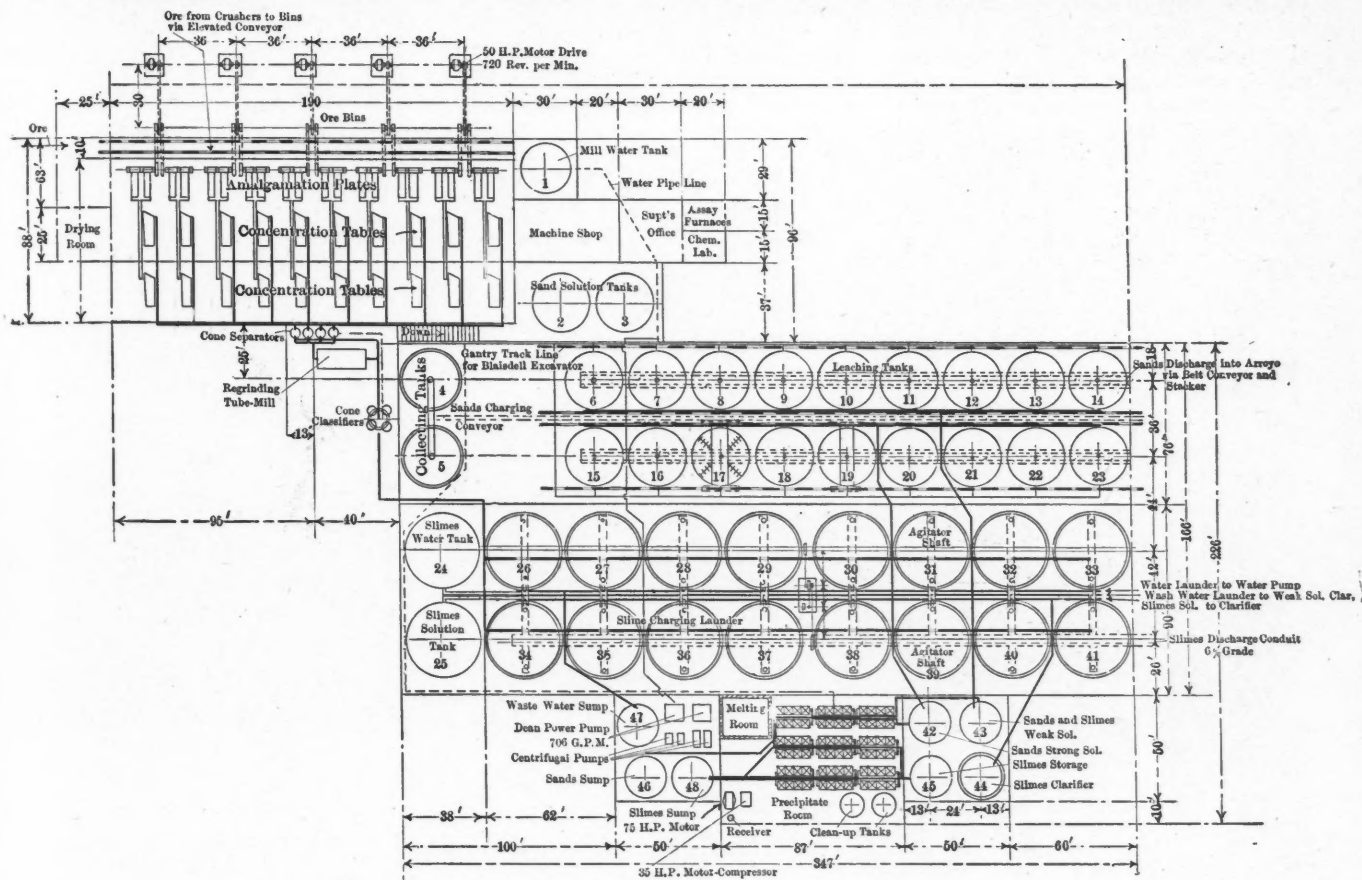
The entire machinery in the plant is to be run with electric motors, the power being brought 103 miles from Zamora.

There are two No. 4 Gates crushers with concaves set to deliver 1½-in. product. The belt conveyor (Robins) delivering and distributing into the ore bin from the breaker is 16 in. wide and runs at 235 ft. per minute. The ore bin is of sufficient capacity for six days' milling. The

sands collecting tanks are 6 ft. deep x 28 ft. in diameter; they are made of steel and each has peripheral overflow launders, filter bottoms and Mitchell bottom discharge doors. There are 18 steel leaching tanks of the same size as the collectors, each equipped with Mitchell doors and filter bottoms.

The Blaisdell machinery consists of an excavator for the 6x28-ft. tank, sands distributor and a system of belt conveyors for handling 100 tons of sands per hour.

The agitation tanks are made of steel, are 12-ft. deep x 36 ft. in diameter, have peripheral overflow launders, bottom discharge doors, and are equipped with de-



PLAN OF THE PEREGRINA MILL AT GUANAJUATO.

gamating plates to Wilfley tables. The tailings will run to a series of cone separators, for the separation of coarse sands, which are to be reground in tube mills.

The reground product will join the overflow from the cones, carrying fine sands and slimes, and go to a second series of cone classifiers, consisting of one large cone placed above four small cones. The overflow from the four cones join the overflow from the sand-collecting tanks and goes to the slimes cyanide plant, where the slimes are to be collected and treated with air agitation and decantation. The outlets of the four small cones deliver to Butters distributors in two collecting tanks. Collected sands will be charged into and discharged from leaching tanks

stamps (Allis-Chalmers) weigh 1050 lb.; cams, tappets and shoes are of chrome forged steel, stems and shoes of forged steel; mortars are extra heavy, set in concrete foundations; the thickness of material below steel liners in the bottom of mortars being 13-in.

The copper amalgamating plates are plated with 3 oz. of silver per square foot. The concentrator to be used is the Wilfley No. 3, with elevator. The coarse sands cone-separators are made of steel, and are each 5 ft. deep x 5 ft. in diameter. The tube mill was built by the Allis-Chalmers company; it is 5 ft. in diameter x 26 ft. long. The second series of cone-classifiers consists of one 10-ft. in diameter x 8 ft. deep, having an even peripheral overflow and bottom controlled outlet leading to the four 5x5 ft. cones underneath, of the same design as the upper one. The

canting pipes and aero-mechanical agitators, designed by H. P. Smith and Francis J. Hobson.

There are 18 steel zinc boxes, each 4 ft. wide, 5 ft. deep and 17 ft. long. Each box has four compartments, each compartment having a hopper bottom with a tapped flange for a 2-in. pipe for cleaning up. The sump solutions are returned to the upper sumps by vertical triplex pumps. The drain-water from collected sands and that decanted from collected slimes is to be returned to the mill-water tank for re-use. The pump for this purpose has a capacity of 700 gal. per minute. The slimes solution pump has a capacity of 1000 gal. per min., and the sands solution pump has a capacity of 300 gal. per min. All pumps are installed in duplicate, with interchangeable suction and discharges.

The metallurgical requirement is that

*Mining engineer and metallurgist, Guanajuato, Mexico.

the sands must be crushed to pass a 100-mesh screen. The ore makes approximately 55 per cent. of slimes and 45 per cent. sands. The leaching solution will be 0.3 per cent. KCy and the agitation will be 0.04 per cent.

Each rock-breaker is to be run by a 30-h.p. motor; five 50-h.p. motors will run the 100 stamps; one 30-h.p. motor, the Wilfleys; one 75-h.p. motor, the tube mill; one 15-h.p., the agitating machinery; and about 30 h.p. will be required for the Blaisdell machinery; the pumps are operated from a line shaft to be run by one 75-h.p. motor; the air compressor for agitation is direct connected to a 40-h.p. motor. This compressor has a capacity of delivering 800 cu.ft. of free air per min. at a pressure of 20 pounds.

The mill water is to be obtained from the mine and from a storage reservoir made by a dam 100 ft. high in the creek about one-half mile from the mill.

The ore will average about \$12 per ton as it comes from the mine, U. S. currency value, of which 60 per cent. is gold. Forty

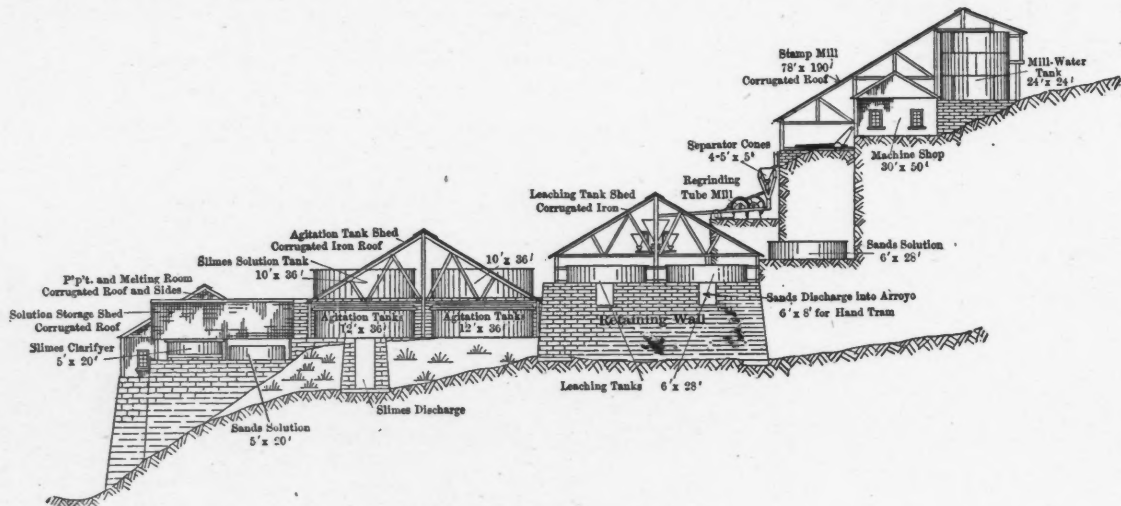
The Zinc Industry of Summit County, Colorado.

BY DAVID H. LAWRENCE.*

Of late years, zinc ore has become valuable in Colorado, and much attention has been directed to its production in Summit county. Mines which were in early days closed down because of too much zinc in the ore are now being reopened and separating plants have been and are still being erected. Summit county includes Breckenridge, Montezuma, Frisco, Kokomo, Wheeler and Argentine. The principal mines of these districts are now zinc shippers, with the exception of Frisco. Some of the mines ship raw ore; others concentrate. Of the former class Breckenridge has several of importance, viz: Wellington, Sallie Barber, Little Sallie Barber, Country Boy, Oro, Bullion King, Sultana and Fox Lake. In the latter class are Old Union, Minnie, Juniata, Abundance, Washington, Lucky, Puzzle, and Jessie.

is mostly found in the "resin" form, differing therein from the Breckenridge ore, which occurs mostly as "black-jack." Montezuma gives promise of large production, but lack of railroad communication is a drawback. At present there is no milling plant in this district. There are many mines here, which in earlier days have produced high-grade silver-lead ore, and now show zinc ore that was left behind. Some of the richer zinc shoots assay as high as 55 per cent zinc. The principal zinc properties are Silver Wing, Bullion King, Fisherman, Clarion, Saint John, Lucky Baldwin, Silver King and Waukegan. A large up-to-date custom mill, and railroad communication between Keystone (the present terminus of the Colorado & Southern Railway, 12 miles distant) and Montezuma, would materially add to Colorado's zinc production.

At Kokomo, the Summit Mining and Milling Company is producing mixed ore similar to that mined at Breckenridge. The mill is equipped with Wetherill magnetic separators.



CROSS-SECTION OF PEREGRINA MILL.

per cent. of the gold is amalgamated on the plates, another 10 per cent. is saved in concentrates, and about 30 per cent. of the silver is saved in concentrates. The tests from which the plant was designed were made on a milling scale. The total extraction by plating, concentration and cyanide was 94 per cent. of the total value.

The plant running at present consists of a 20-stamp mill with practically the same arrangement of cyanide annex as outlined, except that there are no facilities for regrinding. The total saving by clean-ups is approximately 85 per cent., the ore being crushed to pass a 30-mesh screen. This saving is slightly higher, but almost an exact parallel to that obtained by the same grinding in the mill-run tests.

The accompanying drawings show the general arrangement of the plant, with the exception of the rock-breakers. The metallurgical tests were made and the plant designed by Francis J. Hobson & Co., of Guanajuato.

The Wellington, on Mineral hill, is the most constant and largest shipper. It has been making shipments for the last four years, and now has ore reserves amounting to 80,000 tons. Besides this there is in the dump at the mouth of the main tunnel from 12,000 to 15,000 tons of lower-grade ore ready for milling. The Country Boy mine, on Nigger hill, has a ledge now exposed for some length in its main drifts, 4 to 5 ft. in width, of which 18 in. assays as high as 53 per cent. zinc. The Sallie Barber mine, on Nigger hill, is shipping a high grade of zinc ore for treatment at Canon City. The Bullion King, on Gibson hill, is also a producer.

The concentrating plants are working well. In the Breckenridge district, it has been proved that the Wilfley tables and slimers do excellent work on mixed ores. The Old Union mill produces zinc concentrate assaying 43 to 46 per cent. zinc.

At Montezuma, blende is abundant and

*Mining engineer, Breckenridge, Colo.

Nova Scotia Coal Trade.

Hon. Robert Drummond, of the Canadian Parliament, in a recent address on the coal trade of Nova Scotia in 1905, spoke rather discouragingly of the results. He said: There should be each year what may be called a natural increase of 10 per cent. in sales. This increase has not been forthcoming during the last two years. The shipments for 1904 went some 30,000 tons behind those of 1903, and 1905 will not show more of an increase over 1904 than 100,000 tons, or, say, 2½ per cent. only. And yet after all this is said it can be claimed for 1905 that it shows the biggest shipments on record. More than one company did not make profit sufficient in 1905 to pay fixed charges.

During 1905 Spain and Portugal produced 49,000 tons of copper.

Never thaw dynamite on a hot stone or shovel.

The Burning Gas Well at Caney, Kansas.

BY H. W. TALBOTT.

A natural-gas well, drilled in near Caney, Kan., Feb. 16, 1906, could not be closed in immediately because of the enormous flow and high pressure of the gas. On Feb. 23, it was struck by lightning, the gas being ignited. The fire was put out March 29, and on April 18 the well was successfully capped, it being 61 days from the time the well was brought in until it was capped, during which it is estimated that 3,721,000,000 cu.ft. of gas was wasted. All efforts to cap the well in the ordinary way failed, and a new idea was finally tried. Instead of putting the packer on

of the derrick being 70 ft., of the flame 217 ft., and of the hood 18 ft. A flow of salt water and sand came on about two hours later, and cut this hood out. The hood, which was made of 3/8-in boiler iron, was destroyed before morning. The cost of putting out the fire and capping the well amounted to a little over \$10,000.

Lake Ore Docks.

BY DWIGHT E. WOODBRIDGE.

The life of an iron-ore shipping pier on Lake Superior is about twelve years, as such piers are at present built. They cost, roughly speaking, \$2000 per pocket and single piers run up to 390 to 400 pockets, aside from long and costly approaches. There are at upper lake ship-

their longest face on the side line of the pier, and with the bottom of the load of ore so high above water that it will slide by gravity down a system of spouts and into the hold of the largest and highest vessels on the Lakes. With the immense mass of timber used in this construction, it is strange that no more disastrous fires have occurred. But it is a fact that in the history of the trade only two serious losses by fire have taken place; in one of these the ore pier was destroyed by a fire which was communicated to it from an adjoining commercial dock, and in the other a shelter shed, placed in the center of the ore pier, and filled with oils and inflammable materials, caught fire and burned the entire structure. All ore piers are now equipped with permanent and adequate fire protection.



FIG. 1.

(Copyrighted by H. W. Talbott.)

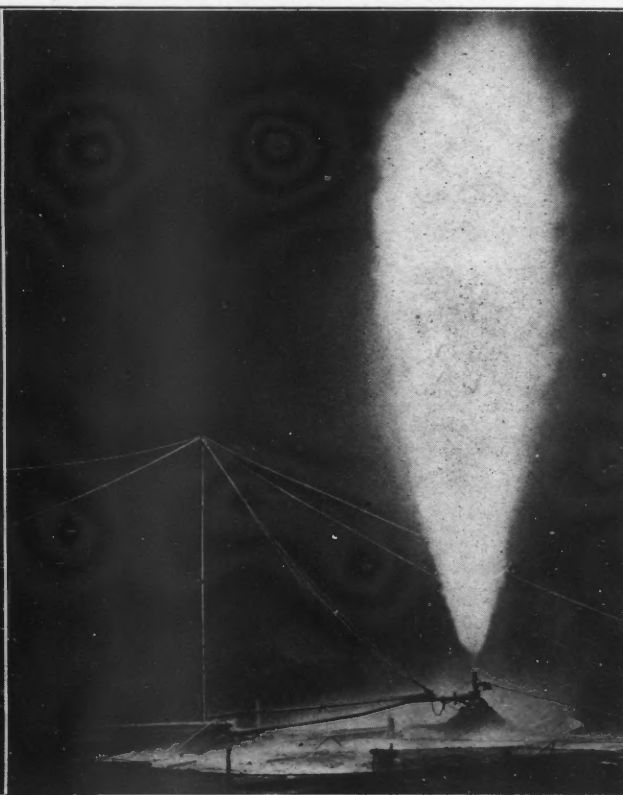


FIG. 2.

top of the pipe it was reversed, and put at the lower end of the 350 ft. of 8 1/4 in. heavy, line pipe, with a 6-in. shut-off valve. Seven attempts in all were made to hood the well, before success was achieved. The well is estimated to have a daily capacity of over 61,000,000 cu.ft., the pressure of open flow being 30 1/2 lb. through an 8 1/4-in. casing, while the rock pressure is nearly 700 lb. This is believed to be the largest natural-gas well ever drilled in.

Of the accompanying illustrations, Fig. 1 shows the well at night, March 28, the hood which was successfully used the next day being in the foreground. The height of the derrick is 70 feet; comparison with this gives a good idea of the height of the flame. Fig. 2 shows the first hood in position on the night of March 12, the height

ping ports 5741 pockets in the various ore piers, and these have a storage capacity for more than 1,000,000 gross tons of ore, and a seasonal shipping capacity for from 40,000,000 to 45,000,000 tons, depending on the dispatch given ships.

The type of construction of all these docks is fairly uniform. They have a pile foundation, driven to proper depth to support the weight of dock superstructure, together with its great weight of ore and of the trains moving to and fro on the top of the structure, at elevations ranging from 45 ft. in older docks to nearly 73 feet in the newer, above water level. The docks themselves are practically all timber, and about 160,000,000 ft. have been consumed in the piers now in use. The ore is carried in triangular bins, with

Considering the great cost of these structures, their apparently temporary character, and the assurance of long demand upon them for the handling of ores, the question of steel in place of timber has been brought up from time to time. Not long ago L. W. Hill, vice-president of the Great Northern road, which makes large ore shipments, stated to the writer that in his opinion his company would soon begin the erection of steel and concrete docks, but it is evident that this company is not yet ready to erect such docks, for it is now constructing a very large wooden pier, of design practically identical with those already in use. Some years ago the Duluth & Iron Range road had plans made for a composite ore pier, with substructure of wood piling, be-

low water, iron superstructure for the main members and wood lining for pockets and deck, walks, stairways, etc. The estimated cost of such a dock was two and one-half times as great as for timber alone. It is a fortunate thing that this pier was never built, for the evolution in size of ore vessels since the time it was planned has been such as would make it today absolutely valueless. Quite recently the engineering departments of the Duluth, Missabe & Northern and the Duluth & Iron Range roads, together with the American Bridge Company, worked out a series of specifications for a steel ore pier that was satisfactory, so far as engineering was concerned. But, in the construction of great docks since that time, these plans have not been adopted, and it is for no consideration of first cost, providing they would be ultimately economical, that they have been indefinitely postponed.

In a recent paper on the question of steel ore piers, Chief Engineer R. Angst, of the Duluth & Iron Range road, calls attention to these plans, and describes the various steel ore docks that have been built on salt water, under conditions essentially different from those that obtain on the Lakes. Small steel docks were built, says Mr. Angst, on the island of Cuba 12 or 14 years ago, and at that time were fully up to date. Today they are on a par with the 10-ton freight car in the United States, such has been the development of the industry elsewhere. Recently, after exhaustive studies in the United States, a steel pier was built on the west coast of Norway for the shipment of Swedish ores, and is said to be giving satisfaction. In 1902 a conveyor ore dock without pockets was built on the northwestern coast of Spain, near Vivero, for the Vivero Company. This plant was arranged with a cantilever arm for loading shipping anchored 400 ft. off shore.

Mr. Angst is not of the opinion that steel will be a suitable material for ore piers on the Lakes, on account of the heavy first cost and because he does not look for a sufficient saving in maintenance or in duration to offset this extra investment. He does not think that the "general experience with metallic bridges, so far, will warrant the assumption that the life of the steel structure will extend very much beyond 24 or 25 years." He finds that a steel dock, with average depth of substructure, will cost \$30 per ton of ore load, against about \$10 in wood, and that the evolution of the present makes it look as though reinforced concrete would have to be reckoned with as a factor in future consideration of the question of permanent structures.

The Broken Hill Proprietary's pig iron plant at Port Pirie, Australia, has successfully produced 2½ tons of iron of good quality. The plant is purely experimental.

San Francisco.

We reproduce on this and the next page some photographs received from our associate editor in San Francisco, Charles G. Yale. They give an excellent idea of the terrible desolation wrought by earth-

quake and fire; while the brief comments sent with them show the indomitable spirit of the residents of the city, who are already planning out its restoration. This spirit is indicated by the fact that our regular San Francisco correspondence

was only interrupted for a single week, although our associate's office and technical library were lost in the general wreck. The photographs are selected from a number, most of them taken by Mr. Prestor, of Oakland. No. 1 is a view taken



NO. 1. GENERAL VIEW FROM NOB HILL.



NO. 2. CLEARING A STREET.



NO. 3. ON MONTGOMERY STREET.

quake and fire; while the brief comments sent with them show the indomitable spirit of the residents of the city, who are already planning out its restoration. This spirit is indicated by the fact that our regular San Francisco correspondence

from Nob Hill, showing a general view of the business part of the city, which suffered most severely from the fire. The wreck in the immediate foreground is from a building blown up by dynamite in the effort to check the spread of the

fire. Perhaps nothing could give a better idea of the ruin and desolation than this view, which takes in a wide area.

No. 2 shows one of the first steps toward restoration—the work of clearing a street to permit the passage of persons and vehicles. In such cases as the one illustrated the whole community was constituted into an anti-debris association. Every able-bodied man available joined in the work, most of them willingly; while the few who did not volunteer were

Prospecting in Northern Canada.

BY CHARLES A. BRAMBLE.

Recent discoveries in New Ontario, and explorations in northern Quebec have given a great impetus to the North country, and this summer it will be full of prospectors, as far north as the Height of Land, and beyond. It must be remembered, however, that the prospector there must face very different con-

ditions of the position of its parent ledge. The great mineral-bearing formation, in Quebec and Ontario at least, is the Huronian, and it has been subjected to extensive denudation, so that it is found in areas of varying dimensions, and depth, overlying the usually barren Laurentian formation, upon which it rests unconformably. The Huronian is therefore the objective of the prospector, and as the series is complex and has been subjected to much metamorphism, especially near the intrusions of diabase, gabbro and other eruptives, a man needs be a fairly good petrologist, if he would know just what horizon he is examining.

The Huronian was named by Logan, who found it well developed on the northern shore of Lake Huron, and since his day it has been found to extend from the Lake of the Woods to Mistassini. Much work remains to be done, as the rocks composing the series are not identical throughout its range, but rather equivalent. For the Lake Superior region the succession of the formations immediately above, below and including the Huronian have been carefully defined by a commission, made up of Messrs. Frank D. Adams, Robert Bell, A. C. Lane, C. K. Leith, W. G. Miller and Charles R. Van Hise. These eminent geologists



NO. 4. RECENT GEOLOGICAL CHANGES.

obliged to work by the guards, in whose charge the city was for the time being. The opening of the streets, to make traffic possible, was the first necessity, and this was generally recognized.

No. 3 is a view taken on Montgomery street, in the business center. The tall fragment of wall on the right is the remnant of a fine building, which formerly contained the rooms of the San Francisco Stock and Exchange Board, and the offices of the California State Miners' Association. Both lost all their papers, records, furniture and other belongings. In the Miners' Association rooms there were valuable records and books, including Mr. Yale's technical library, the gradual accumulation of many years.

The other photographs show especially the work of the earthquake. No. 4, taken in front of the Post Office building, shows the upheaval of the ground, and Mr. Yale has aptly labeled it "Recent Geological Changes." Similar effects were noted in different parts of the city. No. 5, taken on East street, near the waterfront, shows one of the crevices opened by the earthquake, some in the city and others outside. Concerning the one shown, Mr. Yale asks, "Is it a fissure, or a true vein?"—a question open for discussion by our geological readers.

These engravings are of much interest, setting before us in a vivid way the extent of a catastrophe, the full extent of which those at a distance find hard to realize. In a short time, we trust, it will be only a memory, and a new and greater city will have arisen from the ruins of the old San Francisco.



NO. 5. IS IT A FISSURE OR A TRUE VEIN?

ditions from those he finds in British Columbia, and the Rocky Mountain region generally. Instead of the mule or burro, he will have the canoe; he must face the treacherous rapid, the laborious portage, the terrible scarcity of food, and last, but not least, a winter of merciless severity that occupies a full half of the year. The thomp line and the paddle must replace the pack saddle, and for months at a time moccasins must take the place of the long boot. Then the prospecting itself is more difficult, and needs finer judgment. Here there are no convenient outcroppings on the mountain side that may be seen from afar, and, owing to the usual flatness of the country, float does not travel far, nor does it as a rule afford easily read indica-

recognize the following nomenclature:

- PRE-CAMBRIAN.
- KEWEENAWAN (Nipigon) Unconformity.
- HURONIAN { Upper (Animikie) Unconformity.
- { Middle Unconformity.
- { Lower Unconformity.
- KEEWATIN—Eruptive contact.
- LAURENTIAN.

The cobalt-silver-nickel-arsenic ores of the new camp at Cobalt are found in the Lower Huronian. Professor W. G. Miller, who has made a special study of this area, states that the Cobalt series consist of conglomerates, breccias, quartzites, and greywacké slates. The veins occupy fissures formed by the disturbance which accompanied the eruption of the masses of diabase and gabbro that penetrated them in either Animikie or Keweenawan time. The lower Huronian, in this im-

portant field, is evidently, therefore, a fragmental series, deposited on the Keewatin and Laurentian, and later heavily eroded. Its thickness has not yet been ascertained, but is known to be at least 500 feet.

During the present summer prospecting will be carried on vigorously, even to beyond the Height of Land, as many new railroads are projected, and it is not likely that this country will remain much longer without development, seeing that there are known to be vast areas of agricultural land in the clay belt, north of the watershed, that are fit for settlement. Unfortunately the flat surface, and the bleak climate are favorable to the formation of bogs and marshes, and rock exposures are comparatively few, as compared with more broken regions. Prospecting will, therefore, be more than usually difficult, and it becomes essential for the prospector to have an intelligent conception of the geology of the region, so that he may not waste any of the short summer on unpromising ground. Another drawback is the enormous extent of the drift deposits which overlies so large a proportion of these northern lands.

To do much the prospector must travel light, and be expert with the paddle. Most of the streams of northern Ontario and Quebec are choked by boulders and gravel at frequent intervals, and these obstructions form rapids that must be passed by a portage. So the canoe needs to be unloaded many times in a day, and everything, even to the craft itself, carried past the obstruction. These portages vary in length from a few yards to miles, and the party that would travel in comfort and with fair celerity, must copy the Indian, who never encumbers himself with useless duff. An ideal party consists of three men. An 18-ft. canoe will carry everything they should need for a summer's work, but as such a craft will weigh 100 lb. at the start, and gain in weight every week it is in use, one of the party must be not only strong but accustomed to balance himself on bad and steep trails with a canoe of that weight on his shoulders, for the others will be better employed in packing the rest of the outfit, than in assisting with the canoe. This is where the Indian shines. He portages better than a white man, and he is especially clever at handling a canoe, whether on water or on land.

The best canoe for long journeys is the birch bark, but as there are not likely to be enough of these to supply half the demands, most prospectors will use the wooden canoes made by some of the many makers of these craft. The Peterborough model is the best known, and is that used by the officers of the Dominion Geological survey; those built by the William English Company are also used, and find much favor, especially in the

Lake of the Woods region. The bass-wood or cedar canoe is faster by a full mile an hour, and it does not leak, but it is not so handy in a rapid, will not stand so much sea, is less convenient to portage, and when it comes to grief is harder to repair. A birch bark may be doctored and tinkered with, and coaxed over hundreds of miles of river after having received injuries by which any civilized craft would have been rendered useless.

Mining tools are heavy, and on prospecting trips into distant regions the explorer must rely upon his hammer and blowpipe, together with a few bottles of reagents. He should, however, have a prismatic compass, aneroid, thermometer and tape line. But present conditions will not obtain for long. The great unexplored tracts are soon to be overrun by an army of eager men, and, though many will pay the penalty of ignorance, those who know the Northland best feel confident that mining will follow in the track of the prospector from the Atlantic coast of Labrador to the mouth of the Mackenzie, and much of the so-called barren land of Canada prove to be one of her most valuable assets.

Utilizing Blast-Furnace Gases.

The Carnegie Steel Company has contracted with the Allis-Chalmers Company, of Milwaukee, for the construction of four gas-driven blowing engines of 3000-h.p. each and one gas engine electric generator. The company has also contracted with the Westinghouse Company for the construction of two gas-driven blowing engines of 2000-h.p. each, and one gas engine electric generator. The Allis-Chalmers engines will be installed at Homestead, and the Westinghouse engines at the Edgar Thomson plant. The Allis-Chalmers generator at Homestead will be 2000 kilowatt, and the Westinghouse at Edgar Thomson will be a 1500-kilowatt generator.

To operate the new blowing engines and generators, it is estimated it will require 120 cu.ft. of gas per horse-power per hour. It is also estimated that a modern 600-ton blast furnace generates 61,000 cu.ft. per minute. At the Edgar Thomson plant, where there are 11 blast furnaces, the two new engines will develop 2000 h. p. each, thus requiring 4000 cu.ft. each, or 8000 cu.ft. altogether per minute, while the engine operating the generator will require an additional 4000 cu.ft., a total of 12,000 cu.ft., or one-fifth the producing capacity of one furnace to operate the three engines.

These installations will dispense with the boiler plants necessary to supply steam to the old type steam blowing engines, and the fuel to operate the new engines will cost nothing, save the initial cost, and maintenance charge of a gas-washing apparatus.

Splitting Granite by Compressed Air.

The use of compressed air for splitting granite to create working faces or ledges, is practiced by the North Carolina Granite Corporation, at Mt. Airy, N. C. The property covers a gently sloping hillside, consisting of a solid homogeneous mass of moderately hard granite. The stone shows no ledges or bed planes whatever, but splits readily in a straight line in almost any direction. In order to quarry economically, this feature is taken advantage of in the creation of artificial ledges to work to. Large sheets of laminations of granite are separated from the hill at a single operation in the manner in which an onion is peeled, by the use of powder and compressed air in combination. The stone is then split up into proper sizes for commercial purposes.

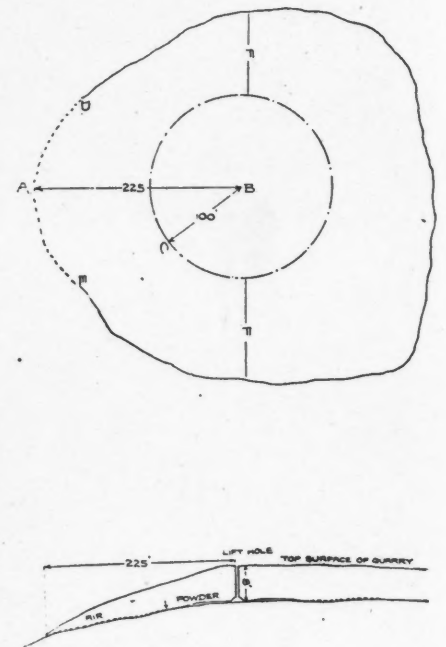


FIG. 1.

In the center of the area that is to be lifted, a 2 or 3 in. drill hole is sunk 6 to 8 ft. in depth, depending on the greatest thickness of stone required. The bottom of the hole is enlarged into a pocket by exploding half a stick of dynamite as indicated in the section Fig. 1. A small charge of powder, about a handful, is then exploded in the pocket, thus starting a horizontal crack or cleavage plane across its greater diameter. Charges increasing in size are now exploded in the cavity, the drill hole being plugged at each blast, to confine the powder gases and thus exert a more or less constant force upon the stone.

After the cleavage has extended to a radius of 75 or 100 feet in all directions from the lift hole, a pipe is cemented into the hole and connected through a glove valve to the air-pipe line from a compressor. Compressed air at 70 to 80 lb. pressure is gradually admitted and the cleavage rapidly extended until it comes out

upon the hillside in a thin edge, as seen in Fig. 1. A sheet of several acres in extent may be raised in this manner, affording a bed plane that is approximately horizontal, to this the quarrymen work, securing stone of any required thickness.

This method represents a gradual development. For a number of years, the company has followed the practice of quarries in the Lithonia and Stone Mountain district of Georgia in splitting ledges in the above manner by the use of powder alone. But this system was not entirely satisfactory, as the amount of powder required was necessarily considerable and the time required for splitting such a

air pipe was then attached once more and air admitted very gradually. The stone could soon be heard cracking in all directions and in about half an hour the cleavage came to the surface in a thin edge on the hillside some 225 ft. from the lift hole. The time required for extending the cleavage by powder for 100 ft. was between two and three weeks, while to split the larger area, between 100 and 225 ft. radius, required only half an hour when compressed air was used.

The sketch, Fig. 1, shows how the area covering nearly 2½ acres was raised by this means. Only a portion of the cleavage extended to the surface, owing to the

cylinders and cylinder heads are water-jacketed. The heat of compression is further removed by a large receiver intercooler between the high and low pressure air cylinders. The steam end is a heavy duty Corliss cross-compound condensing engine, to the rear of which the air cylinders are coupled in tandem. All cylinders, both steam and air, are made with loose liners, forced into the cylinder castings by hydraulic pressure. A steam receiver and reheater is situated between the high and low pressure steam cylinders, below the floor line.

The general view of the quarry, Fig. 2, shows one of the nine cableways by which the stock is handled between the quarry and the cutting shed and cars. There is also an incline for loading rough stock for shipment. The boiler and engine house is 112 x 53 ft. and contains two Heine 210-hp. boilers, a 150-hp. Ideal compound engine direct-connected to a 100-kw. Bullock generator, and the air compressor described. The cutting shed is 360 x 65 ft. Stock is handled by a 20-ton Pawling & Harnischfeger electric crane, with a 5-ton auxiliary hoist.

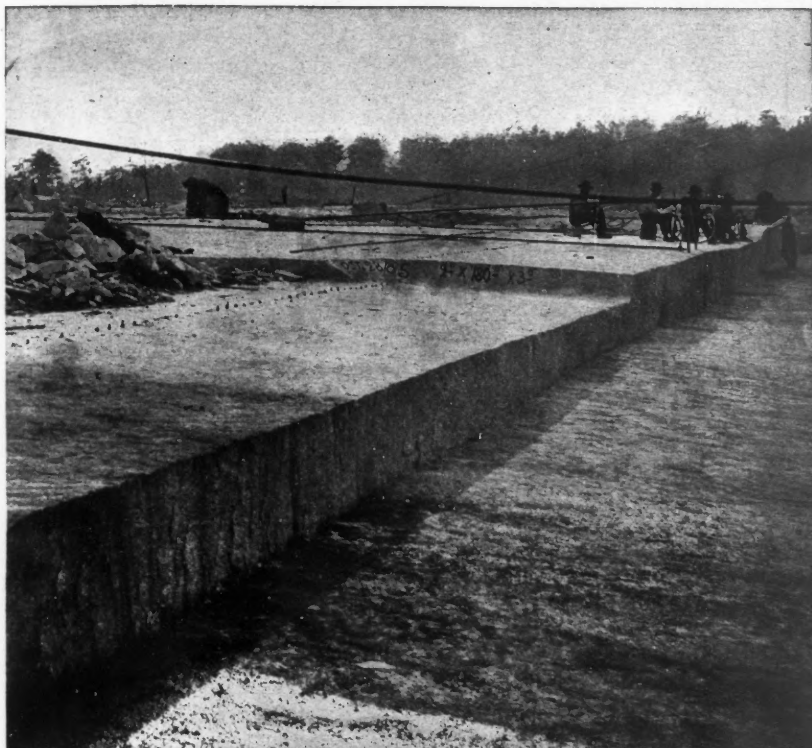


FIG. 2. GENERAL VIEW OF QUARRY.

large area of granite was long. Unless considerable care is taken, and time is afforded for the stone to split gradually with the aid of natural expansion and contraction, the force of the explosion brings the cleavage abruptly to the surface.

Some time ago, water under pressure was substituted for powder, after the cleavage had extended some little distance from the drill hole. This was an improvement but was itself surpassed in economy and convenience by compressed air.

When the compressed air was first tried, last season, a pressure of 80 lb. was admitted into the cavity, which had previously been extended to a distance of 100 ft. from the lift hole. The power of the air was too great for the easily splitting stone, and the cleavage turned abruptly to the surface. A new drill hole was sunk in another part of the quarry, and the cleavage extended by powder in the same manner as before. The compressed

thickness of the ledge on the up-hill portion of the area. The bed plane thus formed was reached at these points by quarry bars and drills in the usual manner. It is believed that this is the only quarry in which compressed air is used to split granite in this manner, and the process accomplishes a great saving of time and expense.

The equipment for quarry operation includes 35 plug drills, three Sullivan tripod drills, four Sullivan quarry bars, 15 surfacing machines and 60 small hand tools. These are all operated by air power from a Corliss air compressor, furnished by the Sullivan Machinery Company, of Chicago. This compressor is of the two-stage type, with a piston displacement of 2000 cu. ft. of free air per minute at 78 r. p. m. against 80 to 100 lb. terminal pressure. The compressor has steam cylinders, 16 & 28 x 42 in., air cylinders, 26 & 16 x 42 in., the standard Sullivan valve motion is employed. The air supply is drawn from outside the engine room, and the air

Iron and Coal Production in Germany.

The output of the German blast furnaces in March was 1,051,527 tons of pig iron, an increase of 115,533 tons over February. This is more than is due to the greater length of the month, the daily average being 33,920 tons in March, against 33,428 in February. For the three months ending March 31, the production, as reported to the German Iron and Steel Union, was as follows, in metric tons:

| | 1905. | | 1906. | |
|-------------------|-----------|---------|-----------|---------|
| | Tons. | Per Ct. | Tons. | Per Ct. |
| Foundry iron..... | 409,448 | 17.5 | 512,328 | 17.1 |
| Forge iron..... | 191,147 | 8.2 | 210,101 | 7.0 |
| Steel pig..... | 151,994 | 6.5 | 225,706 | 7.5 |
| Bessemer pig..... | 81,148 | 3.5 | 112,000 | 3.7 |
| Thomas pig..... | 1,500,853 | 64.3 | 1,945,847 | 64.7 |
| Total..... | 2,334,590 | 100.0 | 3,005,982 | 100.0 |

The total increase this year was 671,392 tons, or 28.3 per cent. The greatest gain was in Thomas or basic iron. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and other similar alloys.

The coal production of Germany for the three months was as follows, in metric tons:

| | 1905. | 1906. | Change. |
|----------------|------------|------------|---------------|
| Coal..... | 26,417,052 | 35,240,546 | I. 8,823,494 |
| Brown coal.... | 13,148,380 | 14,542,212 | I. 1,393,832 |
| Total mined. | 39,565,432 | 49,782,759 | I. 10,217,326 |
| Coke made.... | 2,587,619 | 4,818,132 | I. 2,230,513 |
| Briquets made | 3,037,571 | 3,705,463 | I. 667,892 |

The briquets are made chiefly of lignite, or brown coal. The total increase in coal mined this year was 25.8 per cent.

Season-cracking is sometimes confused with crystallization, for crystallization plays an important part in the formation of such cracks. When brass or other alloys reach the point of fatigue and break, the phenomenon is called "crystallization."

Chimneys and Flues.*

BY HERBERT PORTER.

The first point for consideration, after it has been decided to extend a plant, is the velocity and temperature of the chimney gases, and the velocity and capacity of the main flue to which such additional plant is to be attached. If the process to be added will contribute heat, there will probably be an increase in velocity, and an increase in velocity means greater friction, which is another factor to be taken into consideration. Also there may be loss of power or draft due to the sudden enlargement of a flue, or to sharp bends, or to the entrance of other flues at right angles, causing an eddy or whirlpool. Or, again, a new flue may be connected with the main flue, contributing a large volume of cold gases, which will reduce the speed and increase the volume beyond the capacity of the flues. As regards steam boilers and furnaces, an insufficiency of draft in a chimney means loss of heat, incomplete combustion, and consequently loss in fuel, while, on the other hand, too much draft means also loss of heat due to excess of air drawn through the fires, and also increased consumption of coal.

Any speed over 10 ft. per second is excessive in a works chimney. At many works with which I am acquainted the chimneys taking gases from various chemical processes, as well as the boiler-fire gases or furnace gases, seldom exceed 7 to 8 ft. per second. Taking seven of the principal works, where many processes are connected to one chimney, the average speed is 4.73 ft. per second, and these chimneys are all somewhat about the same height. The rule for calculating the power of a chimney is that the power varies as the square root of the height, but the temperature of the gases in the chimney also has an important relation to the power or speed. A tall chimney with a low temperature would be less powerful than a medium chimney drafting gas of the same temperature, because the question of friction and loss in temperature has to be considered.

It is generally assumed that inside all chimneys, of whatever dimensions, there is a lining of gases for a thickness of about 2 in. that is practically stationary, i.e., it has no upward velocity of any appreciable degree. A chimney 3 ft. 6 in. diameter has an area of 9.62 sq.ft., but the effective area is only 7.87 ft., allowing for the 2 in. of gas lining. According to Kent, such a chimney, 80 ft. high, is sufficient to cause the combustion of 120 lb. of coal per hour per square foot of area of the chimney, and if the fire-grate area is to the chimney as 8:1, a combustion of 15 lb. of coal per square foot of grate per hour. This is a fair quantity for a boiler of modern

type, with heating surface large enough in proportion to the rate of combustion. Taking this chimney to be 80 ft. high and 3 ft. 6 in. in diameter, and supposing the speed to be 5 ft. per second, the volume of gases would be 39.35 cu.ft. per second, or 142.26 cu.ft. per hour. Now, if to this chimney, which is only dealing with boiler-fire gases, we connect a flue which shall contribute some other gases from some other plant or furnace at some distance, there will be a certain amount of extra friction or pull added, and the speed of the chim-

ney employed to assist in the work, they were passing:

| | |
|------------------------------|--------------|
| No. 15 Chimney at 60° F..... | 1162 cu. ft. |
| No. 16 Chimney at 60° F..... | 178 cu. ft. |
| Total for both..... | 1330 cu. ft. |

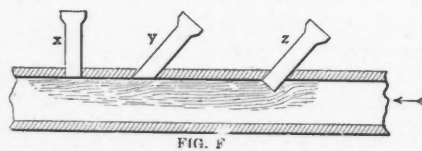
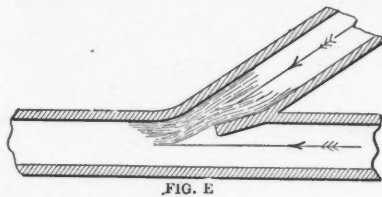
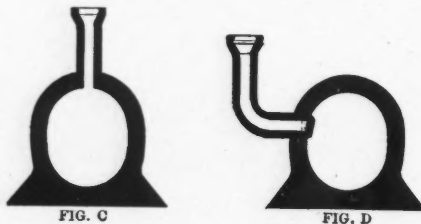
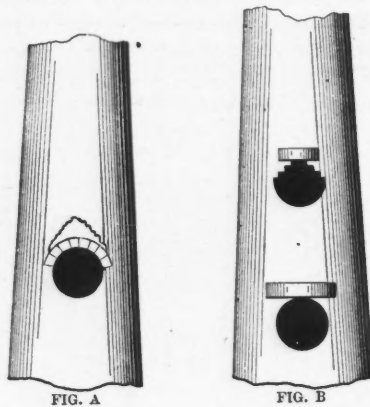
The total is sufficiently near to the former (1280) to indicate that the fault was not with the chimney but with the flues.

Coming to the flues connecting furnaces and plant to the chimney, we must first consider what is the action which goes on with them. This is somewhat like that in the chimney, but at the bottom of the flue and sides near the bottom there is quite a different motion. The reason for this is that the hotter portions of the gases rise to the top of the flue, while the cooler fall to the bottom and drag along the bottom until caught up by the draft of warmer portions coming on behind. So that, unlike the state of things in the chimney, there is a constant rising and falling and mixing of the gases in their horizontal travel through the flue.

The all-important question from a practical point of view is, in what proportion to the chimney should the flues be in an ordinary works where many contributions to the main processes are connected? This is a difficult question to answer. The most important parts are that sharp bends should be avoided, and that the flues should decrease in sectional area rather than increase as they draw near to the chimney. Nothing is more fatal for the purposes of drafting than to increase suddenly the capacity of the flues; by so doing, eddies are set up, and such eddies mean back draft, mixture, and confusion. Keep the gases moving and increase that movement as far as possible as it advances to the chimney; this can only be done by straight flues, so far as possible, and allowing, for condensation and cooling, a slight reduction in the size of the flue as it approaches the chimney bottom, so as to keep up the speed of the gases.

The area of a main flue should be greater than the area of the chimney at the top or outlet, though no law can be laid down, as so much depends on temperature and the position of the boilers, which are generally the main heat or power-producing factor. In many works the speed in the flue very greatly exceeds the speed in the chimney; this means more work for the chimney.

A few words as to the construction of flues and connections to chimneys. Fig. A shows an arched opening into a chimney that is often used in chemical works. This is to be condemned. The whole weight of the chimney above the arch is on the arch, and I have seen dangerous cracks caused by it. If such connections have to be made, let a stone be placed over the opening, or the brickwork taken out in an inverted V-shape (Fig. B), when the risk of splitting the chimney will be far less. Above all things, the bottom of the chimney should be drained, since wet in the base of a chimney will cause trouble



ney will be slightly lessened, while, owing to the increased volume of gases passing up the chimney, there will be a corresponding decrease in the quantity of air drawn through the boiler fires, and this will mean loss of heat, waste of fuel and black smoke, granting that the conditions were perfect for the boiler flues prior to the flue connection.

Davis in his "Chemical Engineering," Vol. 2, page 83, gives an illustration of this point. An original chimney under certain conditions was passing 1280 cu.ft. per second, and when another chimney was

*Abstract of an article in *Journal of Society of Chemical Industry*. Jan. 15, 1906.

in many ways in a chemical works; this applies quite as much to the flues.

The connection of flues to the main flue is also an important matter. Flues should never be introduced into the main flue at right angles, but always at an angle so that the gases enter in the direction they have to go as far as possible. In Fig. *F*, *x*, *y*, *z* show these pipes—*x* and *y* being examples of wrong construction; in Fig. *F*, *z* shows a small connection as it should be, the side of the pipe projecting into the main flue, and Fig. *E* shows the junction of two large flues of about the same size, in which will be noticed a partition wall or midfeather.

It is absolutely wrong to connect a flue into the top of the main flue, for at that point the velocity of the main-flue gases is greatest, and this will prevent the gases taken from the connection from entering, at least in the proportion they are required to do. (Fig. *C*.)

Flues drafting cold gases to a hot flue must be of a capacity fully equal to that enjoined by rules to be found in many works on the subject, and such gases should be conducted into the main flue at the side and above the center line or on it, level with the line of greatest speed, with a connection such as is shown in Fig. *D*.

One most important point should never be lost sight of: never attempt, as is sometimes done, to make cold gases go uphill if you value your chimney draft, or wish to avoid local escape, and do not try to make hot gases go downhill, for the same results will face you. When I say hot gases going downhill I do not mean fire gases in boiler flues, or furnace gases in a *plus* pressure furnace; but the gases from various processes after they have left their point of generation and are on their way to the main flue, when they are losing their heat or coming in contact with frictional surface.

Extruded Metal.

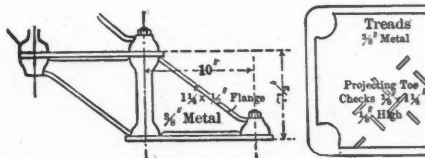
Extruded metal is made by forcing hot metal through a die by means of hydraulic pressure. The linotype machine is an analogous type. The shape of the die determines the shape of the extruded metal. The manufacture of extruded metal is confined to mixtures which will work hot, as the operation must be carried on while the metal is red-hot. For this reason common brass cannot be extruded, as it is not malleable at a red heat. A mixture of 55 per cent. copper and 45 per cent. zinc is soft while hot and hard and stiff while cold, so that it is admirably adapted for extrusion. The mixture cannot be cast in sand without the addition of aluminum and the following proportions are recommended for this purpose: Copper, 55 lb.; zinc, 45 lb.; aluminum, 4 oz. A mixture that will work well in machining can be made by adding 2 lb. of lead to the above mixture.

A Stairway of Adjustable Length.

BY J. H. GRANBERY.

The illustration shows details of a stair-horse and tread that possesses many desirable features. The idea is taken from the engine stairways used on the Manhattan type of Allis-Chalmers engine in the elevated and subway power stations in New York City. The design is capable, however, of many modifications, making it applicable to other situations than that for which it was originally designed. Its chief recommendation aside from the cheapness and ease of construction is its adjustability to different story-heights without change in patterns or castings: so long as the story heights are multiples of whatever rise may be adopted for the stairway, the same material precisely can be used for stairs of any height.

Only two patterns are required, one for the tread and another for the horses. The horses are alike on both sides and the pattern does not have to be paired. A stairway of 10-in. tread by 7½-in. rise is found to be about the easiest upon the men who have to climb it, and this is accordingly the size for which the details are given. Whatever rise and tread is

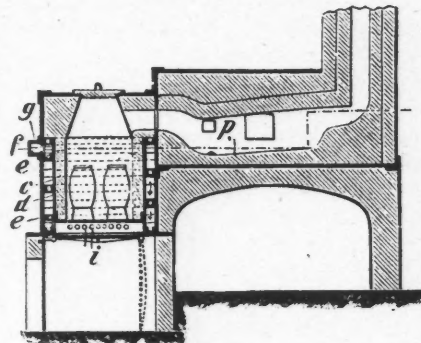


adopted as standard may be used throughout the plant in all stairways if the story-heights are made multiples of the rise; and a stock of these castings and the bolts necessary for them may be kept on hand and used without delay, such as would be required from purchasing new material whenever additions are to be made to existing works.

For story heights of not more than 15 ft. the stairway, as made, of ¾-in. metal and with ¾-in. bolts, is amply sufficient to be self supporting throughout its length during erection. It may, therefore, be built in the manner for which it is designed by setting the first pair of horses, placing on the first tread and bolting up, continuing this process with each pair of horses and each tread. There is thus no necessity for any shoring or support beyond the stairway itself. It might be termed a cantilever construction, in so far as its action is that of a cantilever until the upper connection to the floor is provided. The actual cost of castings and erecting does not usually exceed \$1.50 per rise, or for a 15-ft. stairway, \$2.50 per ft. This, of course, depends upon local conditions and upon the size adopted; the figures given are for a stairway 30 in. in width and made of ¾-in. metal, substantially as shown in the illustration.

An Improved Crucible Furnace.

The accompanying illustrations show a new crucible furnace, patented by R. Lindemann of Osnabrück, Germany, which is designed to utilize the waste heat of the furnace, the flames being conveyed over a reverberatory hearth, before escaping to the chimney. The reverberatory hearth can



be used for any desired purpose. The walls of the crucible furnace are enclosed by a steel, or iron, air jacket, which is divided by horizontal partitions *e*, so that the air entering at *f* is obliged to circulate through the jacket. The air preheated in this way enters the furnace through the opening *i*, serving for the combustion of the coke around the crucible.

The reinforced concrete bins of the Peavy grain elevator at Duluth, Minn., were subjected to a severe fire test recently by the burning of the adjacent timber working house. The elevator consists of a working house of the ordinary type standing adjacent to a group of 30 cylindrical reinforced concrete storage bins. The concrete building went through the fire intact. The two buildings are about 35 ft. apart and the heat from the dry timber in the wood house was so great that steel rails between the two were subjected to a welding and fusing temperature, while for hundreds of feet away it was so hot that men could not live in the glare. The 8 to 12 in. of cement between this heat and the wheat within the nearest row of bins in the concrete house were amply sufficient to protect the grain from injury.

Sand is a poor conductor of heat, and when molten brass is poured into a sand mold the heat contained in the metal is forced to the central portion of the casting by the cooling effect of the sand mold on its surface. If there is any free oxide in the molten mixture the increased temperature tends to deoxidize it; as this process is always attended by the formation of gases and as the cooled condition of the surface of the casting prevents their escape these gases remain in the body of the casting in the form of bubbles creating the porous or honeycombed condition that renders brass unfit for certain classes of work.

Mine Explosions.

BY J. T. BEARD.*

There is perhaps, at the present time, no subject relating to the protection of human life that demands the prompt, thoughtful and intelligent consideration that is daily being asked in behalf of mining. The importance of this great industry is acknowledged on every hand, but the increasing dangers of the work are not as generally comprehended or recognized. Even those most familiar with mining conditions often manifest a disinclination to regard those conditions seriously, and every day the reckless miner is permitted to engage in practices known and admitted to incur great risks, from which all men would shrink if contemplated in another atmosphere than that of the mine. This may be in part the result of ignorance, in many cases it is; but there is beside, a less responsible element in the make-up of the average mining man, an element for which there is no reasonable excuse, as there may be for some cases of ignorance.

In making these remarks I do not mean to imply for a single moment that mining work can be conducted without incurring great risks. Every occupation in life has its own risks that are the legitimate risks of that calling, and mining is no exception. Indeed the legitimate risks that must be assumed by every mining man would often chill the blood of the novice. The atmosphere of the mine is in more senses than one a dangerous atmosphere, and to mine and load coal at the face, and put it "on the bottom" in time to cause no delay in hoisting and loading at the surface requires nerve. The true miner knows not what fear is; there is no such word in his vocabulary.

In every mining report there is always a great deal of stress laid on the fact that the most prolific source of accident to the miner is that of falling roof and coal. It is not to be denied that this source of danger is yearly responsible for about 50 per cent. of all the accidents underground. The fact is overlooked, however, that these accidents generally injure or kill the ones who are directly to blame for their occurrence. Sad as it is, the miner, in this case, reaps the due reward for his neglect; the trouble rests where it belongs. How different from this is the sad fate of those innocent men who die yearly in consequence of the evil practices of some fellow who persists in shooting the coal as he would fire a blast in a stone quarry, or who enjoys firing the gas as he has been told was the custom in the early days of mining, when a fireman dressed for the occasion in a suit of heavy, damp canvas, or leather, would crawl on his hands and knees to the head of a chamber, and lying flat on the floor would raise a lighted candle attached to a long stick,

into a body of gas and allow the flame to pass out over him, after which, if he survived, as he sometimes did not, he would promptly follow to find fresh air. This is the man who tests for gas with his naked light, as they used to search for gas with a candle; looking for trouble, he finds it too often for the peace of mind of his fellow workmen. These conditions and others of a different nature increase the dangers of coal getting one hundred fold.

With a full appreciation of the dangers arising from falls of roof and coal, movement of cars, explosions of powder, and other accidents common to mining, I believe there is no class of mine accidents that calls for as careful regulation as explosions of gas and dust. The aim should always be to strive to reduce to a minimum the accidents of each class, and in the case of gas and dust explosions the means for their prevention call for more than a rigid enforcement of present regulations and laws, such as would be effective in the case of most other classes of accidents. There is much that must be learned in regard to explosions, and this calls for investigation, the sifting of facts, the application of scientific knowledge such as the best men in our country can give, and the careful formulation of methods that will satisfy both the requirements of science and the conditions of mining.

Mining in the United States, though not as old as in England and on the Continent, has still reached a stage where more coal is produced each year than in any other country. We cannot afford, therefore, to disregard longer the necessity that compels us, as other countries have done 25 years before, to do everything possible to safeguard an industry that measures the peace and prosperity of the country. No one can study the work and findings of the French Firedamp Commission, 1882; the Prussian Firedamp Commission, 1885; the Austrian Commission, the same year; the English Accidents in Mines Commission, 1886; and the Royal Coal Dust Commission of England, 1891, without being deeply impressed with the efforts these countries have made in this direction and the great good accomplished. Under our own Federal Government many of the States have acted on their own recognition and appointed commissioners for the purpose of investigating local mining conditions relating to this class of accidents. Such were the Iowa Commission, 1902; and the Kansas Commission, 1905.

Earnest and thoughtful men everywhere are asking, what is it possible to do to prevent these terrible catastrophes that transform a mine into the abode of death? The weeks come and go, and new disasters are added to the record till the mind tires of the heart-rending accounts. Their rapid recurrence within the past year is without precedent in this country. In the

early part of the eighteenth century, lesser disasters in the mines spread consternation in England and necessity led to the invention of Spedding's steel mill, which for a long time was supposed to be a safe means of lighting gassy workings. Previous to the adoption of the steel mill in the Whitehaven collieries, at Cumberland, England, the candle was the only seemingly practicable means for obtaining light underground. Men were driven to such desperation by the death-dealing flame that to avoid the possible ignition of the gas they preferred to work in the spectral light of such fairly luminous substances as the putrefying skins of fish, which were carried into the mine and hung up near the working face, only to make the darkness visible. Spedding, the inventor of the steel mill, was killed by an explosion of gas, in his own colliery, over which he had charge, in 1755, but this means of producing light was still considered safe, until the repeated disasters that followed in quick succession in the Wallsend colliery where this machine was used, at last (1785) destroyed confidence in its use. It was still, however, used in many collieries till the invention of the safety lamp in 1815, when it was finally abandoned as being inferior to the safety lamp.

A new era in the mining of coal at once began, but as great a boon as the safety lamp has ever proved to be, it could not wholly prevent the occurrence of explosions, which is chiefly due to the misuse of the lamp through ignorance on the part of the miner. Many miners today who use safeties betray ignorance or disregard or both, of their proper use. One of the first principles to be learned by one who is to use this lamp is that it is very unsafe when improperly used. One of the greatest evils in mining today and one which is probably responsible for many disasters and much loss of life is the official sanction of the use of "mixed lights." If safety lamps are at all necessary in a mine chamber, they are liable to be required at the moment when the miner is most absorbed and least suspects his danger. One might as truly expect a child to escape unharmed if allowed to play with dynamite as to expect the ordinary miner to avoid accident when permitted to use an open light in a chamber or heading known to be generating gas. For the safety of men and the security of property this statement should be made even stronger: Where safeties are required in any section of a mine, an open light should not be allowed in that section, and if open lights are in use in other sections of the same mine, the roads leading to the affected district should be guarded by a responsible person to prevent any one entering the same with an open light. The point to be emphasized here is that mine regulations should absolutely prohibit the use of mixed lights, under any conditions whatever. This rule should be inexorable, and the penalty for its infringement

*Mining engineer, Scranton, Penn.

should be severe. It is time that we arouse to the necessity of safeguarding this condition by some other means than leaving the question of the use of open lights to be determined indiscriminately by the judgment of the miner, or by the willingness of any official to allow a heedless miner to assume risks that reason condemns. The writer knows from experience these risks are often such as no man would willingly assume except in a spirit of bravado, which has no place in a mine.

The deplorable disaster of March 10, in the Courrières concession, Pas-de-Calais, France, is a terrible illustration of the uncertainty of mining operations in respect to gas. The concession embraced 13,489 acres, and had been operated for nearly 60 years, during which time 11 different mines had been opened, and coal was hoisted from depths varying from 1000 to 2000 ft., the total output from all the collieries at the time of the disaster being 12000 tons per day. So free had these mines always been from gas that open lights were the rule in practically all the workings. It is true that in the mine in which the trouble is supposed to have originated the engineers had been fighting a fire for about a week previous to the fatal morning, but the chief engineer who had been on duty the night before, had announced on coming to the surface, that the work was completed. This was but a few hours before the terrible roar, accompanied by convulsions that shook the country for miles around, proclaimed the peril of the 1800 men below. That all of these did not perish is little short of a miracle, since the explosion was terrific and its force completely destroyed the head-gear and buildings at the mouth of the fated shaft. About one-third of all the men below the ground were able to make their escape from what was now a charnel house containing the dead, burned and mutilated bodies of upward of 1200 of their comrades.

Can anything be conceived more pitiless than such a catastrophe, which in one fatal moment buries the hopes of half a thousand homes and three thousand hearts beneath 300 fathoms of earth, whence only their spirits shall rise to the call of the resurrection morn. It was reported as stated by one of the management of the ill-fated Courrières concession that the disaster would necessitate a draft of £1,600,000 (\$8,000,000) on the reserve fund, while another source placed the loss at one-fourth this amount. As a result of the terrible affair the stock of the company experienced a sudden drop of 33 per cent. in Paris. Viewed in the light of these experiences is it the part of wisdom to neglect any precautions that are reasonable, in respect to the operation of mines? It should be the earnest endeavor of every mining man to study this subject carefully in all its details, and systematic methods of investi-

gation should be adopted with a view of learning the true conditions that surround these occurrences through a close study of past experience. Experience is the only safe teacher in matters of so great moment.

In this connection it may be of interest to give a few brief notes enumerating the principal factors that influence and determine a mine explosion, as taken from the writer's notes made at the investigation of the explosion that occurred May 23, 1902, in the No. 2 mine of the Crow's Nest Pass Coal Company, at Coal Creek, five miles west of Fernie, B. C., Canada. The mine had been in operation five years when the explosion occurred that cost 127 lives. The company had taken every precaution to make the mine safe; an approved form of Clanny safety lamp was used at the face, but the explosion was possibly caused by the failure of one of these lamps, due to some untoward incident, which can only be surmised. Everything possible was done for the survivors and for those families bereft of their support, but a discussion was started by outsiders which resulted in claims being filed against the company, representing a total of \$800,000. Mining experts were summoned from England, William Galloway and James Ashworth, the inventor of the Ashworth-Heppleworth-Gray lamp. The investigation and the trial following consumed about two months and resulted in a complete vindication of the defendant company. The case turned on whether the explosion was a gas or a dust explosion, and developed the following facts:

The term "explosion" describes in a single word all the effects incident to the extremely rapid, almost instantaneous development of heat within a gaseous mass; such effects being primarily pressure and expansion, and incidentally all the destruction and mutilation that follow in their wake, the explosive force radiating from an initial point or center.

A gas explosion is distinguished from a dust explosion by the following features or characteristics:

1. Absence of evidence of alarm.
2. The maximum force of the explosion is developed at the initial point where ignition took place, or at but a short distance away.
3. Depending on conditions, a gas explosion will follow by preference the return air-current, which is laden with gas, but at times may be projected with great force into the intake and return airways alike. A dust explosion will never follow far the return airway, but will advance feeding on the intake air.
4. Other things being equal a gas explosion produces greater violence and heat, and less soot, and, perhaps, less coke than may be produced by a dust explosion.

The prominent factors that influence

and very largely determine an explosion are those relating to gas, dust, moisture, heat, air (oxygen), and the geological and physical character of the workings. They may be briefly summarized as follows:

Gas—Accumulation of gas: percentage of gas in air-current; emission of gas, feeders, outbursts; inflow of gas from abandoned workings, due to roof falls or sudden barometric changes; increase of gas, due to interruption of the ventilating current; kind of gas, admixture of other gases.

Dust—Accumulation of dust on roads and at the working face; suspension of the dust in the air, caused by the operations of the mine, a blown-out shot, a fall of roof, etc.; fineness of dust; character of coal, hardness, cleavage, inflammability; manner of mining the coal, pick, machine, blasting; system of working, longwall, room and pillar, pillar work.

Water—Wet or dry condition of roads and working places; location of water in strata, roof or floor; hygrometric condition of the mine air.

Heat—Temperature of airways and workings; general character of workings, size and plan; tendency of coal to fire; depth of seam below the surface; season of year, relative temperature of outside air.

Air—Quantity of air in circulation; velocity of air-current.

Geological Features—Character and material forming the roof and floor, hard or soft, presence of faults, slips, joints, or crevices, draw-slate, rock, shale, sand stone, or clay; gas feeders in roof or floor; water feeders.

Character of Workings—Thickness of seam; system of working, chamber and pillar, longwall, panel; inclination of seam; manner of mining the coal, pick, machines, wedging, blasting; open or standing area; tendency of gob to fire.

The influence of each of the factors mentioned should be studied separately, in relation to its tending to create or increase an explosive condition of the mine air. The bearing and connection of many of these factors can only be fully understood by those thoroughly acquainted with both the theory and the practice of mining.

A brief glance at the explosive energies of some of the mine gases, coal, powder, etc., which take part in mine explosions, will be both interesting and instructive. The tremendous energies that are tied up in these common substances are rarely suspected. The mine is in truth a veritable storehouse of energy, which breaks forth on occasion with terrible effect. Of the powders and other explosives used in mining, a single pound of ordinary black blasting powder when exploded develops 360 foot-tons of energy; gunpowder 500; guncotton 750; nitroglycerine 1100. A pound of fine coal,

in the form of dust suspended in the air, when converted into gas, as is the case in a mine explosion, develops 4800 foot-tons of energy for anthracite, or 4600 foot-tons for bituminous; a pound of carbon 5657 foot-tons. Of the gases, a pound of methane (23.4 cu.ft., 60 deg. F., 29.925 in. bar.) develops in explosion 9146 foot-tons of energy; a pound of carbon monoxide (13.5 cu.ft.) 1682 foot-tons; olefiant gas 8302 foot-tons.

The temperature of the explosion is calculated from the reaction that takes place at the moment of explosion, as expressed by the chemical equation. Thus, in the case of methane or marsh gas, the reaction is expressed by the following equation, and below each quantity is written its molecular weight, relative weight, and relative volume, which assist calculation.

$$\text{CH}_4 + 2\text{O}_2 + 8\text{N}_2 = \text{CO}_2 + 2\text{H}_2\text{O} + 8\text{N}_2$$

| | | | | | | |
|-------------------|----|----|-----|----------------|---------------|-----|
| Molec. wt. . . . | 16 | 64 | 224 | 44 | 36 | 224 |
| Rel. wt. | 1 | 4 | 14 | $\frac{11}{2}$ | $\frac{2}{2}$ | 14 |
| Rel. vol. | 1 | 2 | 8 | 1 | $\frac{2}{2}$ | 8 |

The relative volumes show there is no change in volume due to the reaction, which is of use in calculating the pressure resulting from the explosion. The relative weights are derived directly from the molecular weights, and these give the relative weight of each substance concerned in the reaction, corresponding to 1 pound of the explosive or combustible. The first step is to find the heat required to raise the weight of each of these products 1 deg. F. by multiplying the relative weight as found above by the specific heat of the substance; thus,

| Gaseous products. | Specific heats. | Relatives weights. | Heat required to raise temperature 1 deg. F. |
|-------------------|-----------------|--------------------|----------------------------------------------|
| CO ₂ | .1589 B.t.u. | 11 | .42225 B. t. u. |
| H ₂ O | .3419 " | 2 | .76275 " |
| N ₂ | .1735 " | 14 | 2.42900 " |
| Total. | | | .3.621500 B. t. u. |

As determined by experiment, the total heat produced when one pound of methane burns to carbon dioxide and water at 32 deg. F. is 23,513 B.t.u. From this must be subtracted the heat absorbed in converting water at 32 deg. F. into steam at 212 deg. F., which is practically 1146 B.t.u. per pound, or in this case, $1146 \times 9/4 = 2578$ B.t.u. The net heat produced in this reaction is, therefore, $23,513 - 2578 = 20,935$ B.t.u. per pound of gas burned. The resulting rise in temperature is then $20,935/3.6215 = 5780$; and if the original temperature before the reaction was 60 deg. F., the resulting temperature will be $5780 + 60 = 5840$ deg. F.

Since 1 B.t.u. is equivalent to 778 foot-pounds, the explosive energy of 1 lb. of methane is $23,513 \times 778/2000 = 9146$ foot-tons.

In considering a mine explosion there is a general willingness, not to say tendency, to consider the gaseous condition of the workings in any given case as varying only with the physical conditions in the mine, by which is meant those condi-

tions relating to the number of feeders active, extent of faults, area of abandoned workings standing, frequency of roof falls, etc. Sufficient attention has not been given to the variation of pressure of gas that may occur at irregular intervals in the strata. This variation of pressure has its origin within the earth and results in a more or less spasmodic outflow or emission of gas from the strata, which may be approximately called "earth breathings." The direct result of irregular earth breathings is a corresponding fluctuation in the gaseous condition of all underground workings. This theory if true, would give rise to periods of frequency of mine explosions, assuming an increased outflow of gas brings an increased liability of explosion. It is clear, however, that explosions may occur at times when the outflow of gas is less, and may not occur in the proper periods when the outflow is stronger, but these would not necessarily argue against the theory of periods of danger. At the most such errant explosions would only prove that periods of danger in mines are not always periods of frequency of mine explosions.

The fact is quite generally accepted that mine explosions often occur in groups, which would bear out the general idea expressed above that there are periods of frequency during which explosions multiply. During such periods mine officials and miners should exercise greater care and vigilance and should employ every precaution to insure safety. Such a period would seem to have occurred in 1902, when within less than three months 550 lives were lost in four mine explosions: Frayterville, Tenn., May 19, 184 lives; Fernie, B. C., May 23, 127 lives; Johnstown, Pa., July 10, 112 lives; and Mt. Kembla, N.S.W., Aug. 1, 127 lives. There were at the same time other smaller explosions; the fatality of the occurrence does not, however, mark its importance in this regard. It is a significant fact also, that the great eruption of Mt. Pelee in the West Indies, May 20, 1902, characterized this period. Then followed a period of quiet, the year of 1903 being marked by probably as few mine explosions as any previous year in the later history of coal mining. This calm was rudely broken by the terrible disaster in the Harwick mine, at Cheswick, Pa., January 25, 1904, costing 178 lives, followed October 28, by an explosion at Tercio, Colorado, which cost 19 lives.

The past year, 1905, was marked by much unrest, and in the United States alone over 300 lives were sacrificed in fifteen explosions. The most important of these were Virginia City, Alabama, Feb. 20, 116 lives; Ziegler, Illinois, April 3, 53 lives. In five explosions in West Virginia, 70 lives were lost during the year; in three explosions in Pennsylvania, 27 lives; and a single explosion at Diamondville, Wyoming, Dec. 1, cost 18 lives.

There is every evidence that the present time is still one of much unrest in the earth. In the United States nine explosions have cost about 152 lives. The explosion at Maitland, Colorado, Feb. 19, costing 14 lives was followed Feb. 21 by the terrible earthquake and tidal wave on the coast of Columbia, destroying 2000 lives and much property, accompanied with the reported activity again of Mt. Pelee. An explosion occurred at Piper, Ala., Feb. 27, costing 8 lives. March 10 will ever be remembered as the darkest day in the history of mining, because of the terrible disaster in the Courrières collieries, Pas-de-Calais, France, when between 1200 and 1300 human lives were wiped out in a moment. March 17 occurred the great earthquake in the island of Formosa, Japan, which destroyed \$45,000,000 worth of property and thousands of lives. March 22 occurred another mine explosion at Century, W. Va., costing about 30 lives, and Mar. 28 another mine explosion at Nagasaki, Japan, cost 250 lives. This was followed by the memorable eruption of Mt. Vesuvius a few days later, April 5, and a second earthquake at Formosa, Japan, April 7, which killed more than 100 people, and April 18 our own San Francisco disaster destroying \$200,000,000 worth of property, and April 21 another mine explosion 40 miles west of Trinidad, Colo., but a little distance from the Maitland explosion two months before, this latter costing 23 lives.

Such records point strongly to the probable connection between seismic disturbances and periods of danger in mines, if not periods of frequency of mine explosions. A study of these facts cannot but be suggestive in respect to the need of exercising greater care at such times in the conduct of all mining operations. The aim of every mine official should be at the present time to adopt every means that will tend to reduce the explosive condition of the mine.

Much has been written in reference to the growing need of a Federal Department of Mines. This would unquestionably be a great help in reducing mine accidents, which should be always the first and the chief aim of all legislation. Such a department would enlist the aid of scientific and practical men alike, and if properly conducted would soon rise to be the recognized authority on most matters relating to the health and security of mines.

A process and apparatus for producing a new gaseous mixture for gas engines and other purposes has been patented by C. K. Harding. The novel feature is the use of catalytic action to break up kerosene and heavy hydrocarbons of the same series. The destructive distillation and the partial oxidation of kerosene is effected by passing the vapor of oil, mixed with air, through a red-hot tube of some refractory material carrying metals of the platinum group in a fine state of division.

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*Illustrated.

To the Engineers of San Francisco.

The engineers of San Francisco, whose professional libraries and books of reference were destroyed in the conflagration, have appealed for aid to their brother engineers. Their need is urgent and we bespeak the co-operation of the profession in supplying so far as possible duplicates of pamphlets, maps, etc., which can not be obtained from publishers.

The publishers of scientific books have been requested to give a discount of 33 1/3 per cent. on their books. We will give the engineers of San Francisco a discount of 50 per cent. on any of the books that we publish, and they may take their own time in paying for them. Application must be made, however, through Edwin Duryea, Esq., president of the San Francisco Association of Members of the American Society of Civil Engineers, which has been formed to take charge of this library replacement.

Railroads and Coal Mines.

The transfer by the Baltimore & Ohio Railroad Company of its important coal interests to an outside syndicate has been noted in our news columns. It is, without doubt, a result of the present agitation against railroads and railroad ownership of and dealing in coal. The decision in the Chesapeake & Ohio—New Haven case, while it does not positively forbid the exercise of the double functions of carrier and dealer, militates so far against it, that it has been thought prudent to separate them in this case. That the coal interests pass into friendly hands goes without saying; and the railroad will not suffer in any way by the change.

The Joplin Zinc Ore Market.

The zinc ore market at Joplin having recently been in an unsatisfactory condition from the standpoint of the producers, with apparently little prospect for improvement, the suggestion is now being discussed to arrange a sliding scale for the determination of ore prices, based upon the price of spelter, with a view toward eliminating the ups and downs of the market, except so far as it may be affected by fluctuations in the price of spelter.

This would surely be a highly desirable result, if it could be satisfactorily achieved. The logical accompaniment of

a sliding scale settlement, however, is the sale of the ore on contract, so that the purchaser will know what he may expect for some period ahead. Heretofore, the producers at Joplin have not been well disposed toward contracting their output ahead; long prevailing custom having established a different method for the sale of their ore. Contracts and sliding scales are not a new thing in the Joplin district, but heretofore they have not proved generally workable, because sentiment has been against them. However, unless the operators are willing to contract their ore, we fear that the sliding scale settlement would prove a failure.

Coal-Dust Firing.

The article by Mr. McFarlane, which was published in our last issue, should serve to direct increased attention to this highly efficient and economical means of burning coal, which possesses many of the advantages of gas-firing and lacks certain of the disadvantages that limit the usefulness of the latter method. In cement-making practice, coal-dust firing is employed on an extensive scale, and is indeed the approved method of burning the clinker when neither natural gas nor petroleum are available, as they are only in exceptional cases. Commonly the coal dust is blown into the rotary kiln by means of compressed air. An improved method, of which something will doubtless be heard before long, has recently been tried experimentally, with highly promising results.

The possibilities of coal-dust firing in connection with many kinds of metallurgical work are so striking that it is a source of wonder that this way of burning coal has not obtained any footing in that art. The instructive paper by Mr. Sorensen, recently published in the JOURNAL, in which he described the successful experiments on the coal-dust firing of reverberatory copper-smelting furnaces at the Highland Boy works, near Salt Lake City, was highly suggestive of the possibilities.

Professional Specialization.

The importance of geological work in mining operations, and its increasing recognition by leading mining operators, is becoming more and more evident. This is entirely in the line of the tendency toward specialization, which characterizes

all professions. The big mining company now requires a mining geologist to study the evidence presented by nature as a guide toward the discovery of ore deposits; a mining engineer to extract the ore; a mill engineer to extract the minerals from the ore; a metallurgical engineer to extract the metals from the mineral; and finally a mechanical engineer to build the various plants and maintain them in good running order. In the various branches there is further specialization. However, it is only the large companies that can afford such a thoroughly organized staff, and the majority of mining companies must content themselves with the general practitioner, who combines in himself the functions of geologist, mining engineer, mill-man, metallurgist, and mechanical engineer.

There is need for all kinds of professional men, and there always will be. The jack-of-all-trades has done great things in the past, and will continue to do great things in the future. In this age of specialization, it is well to remember that the idea may be carried too far. It is not a good thing for the geologist to limit his study to geological problems alone; he will be the better geologist, if he know also something about engineering, and something about metallurgy. Similarly, the mining engineer and metallurgist will be better in their own lines of work if they direct some attention to the related branches. Broadness of view is always important. When, however, the generalizer is baffled by a special problem, he will always go to the specialist. The mining geologist is a new kind of specialist, who has developed because there has been an actual need for him. It has been a case of demand and supply, the demand coming first and the supply naturally following.

Drilling in Colliery Development.

The more progressive coal companies are now thoroughly drilling the properties before finally developing the coal. This greatly reduces the chances of large preliminary expenditure without any certainty of satisfactory returns. Many mines have been opened by carelessly sinking a shaft at a point most detrimental to the after development of the property; the only reason for the location being its excellent position with reference to the surface plant and railway sidings.

One company in sinking its shaft in this hap-hazard way struck the coal at what proved to be the highest point, and ever since it has had to haul all the coal up grade to the foot of the shaft. Furthermore the water drains to the entry faces instead of to the shaft.

Where there is any irregularity of the seam, or any doubt as to the pitch of the coal, the property should be carefully platted and laid off into square sections containing about 160 acres each, and then drilled at the corner of every square; a careful record of the entire core being carefully kept. Several anthracite and bituminous coal companies have found this so beneficial, that they now keep regular drill-crews constantly at work developing ahead of the underground work in most of their mines. Many companies have run an entry into a squeeze or fault and not knowing what was ahead, continued to develop until the money spent in rock work would have purchased a drill and perhaps sunk the hole.

In northern Michigan the iron companies also drill their properties very extensively; but here they meet many more complicated problems, besides sometimes going to great depth and having to survey carefully and plot the hole, showing its deflection from the vertical.

Under ordinary conditions where the cover is not too great and the character of the strata too hard, one or more drills should certainly be owned by every mining company whose operations are at all extensive. Smaller concerns may employ an independent driller on contract terms.

Production of Copper in 1905.

In our issue of April 28, we published our statistics of the production of copper in the United States, the total amounting to 871,634,245 pounds. As explained in the text the figures represented the direct production of the mines, being based upon the reports of fine copper contents of blister copper, and in a few comparatively insignificant cases upon the copper content of ore produced. This is the proper representation of the output of our mines.

We are now able to present approximate statistics of the production of refined copper, according to class, these figures being based upon direct reports from the refiners except in the case of one large interest, which did not report. For this in-

terest we have used an estimate, but this being based upon our knowledge of the refining capacity controlled, and the approximate amount of the crude copper received for refining, is probably reasonably close, although it throws some doubt upon the precise division between electrolytic and casting copper. Our figures are as follows:

| Class. | Pounds. |
|------------------------------------|---------------|
| Prime Lake..... | 175,457,000 |
| Arsenical Lake..... | 43,542,000 |
| Electrolytic..... | 760,000,000 |
| Casting..... | 46,000,000 |
| Pig copper exported..... | 33,495,000 |
| Copper in by-product sulphate..... | 4,000,000 |
| Total..... | 1,062,494,000 |

According to our statistics of crude copper production, previously published, plus the imports (210,724,685 pounds), minus the copper exported in matte and subsequently re-imported into the United States (12,146,200 pounds), the total supply of raw material for the refiners of this country was 1,070,212,730 pounds. The total now reported on the basis of refined copper production is 1,062,494,000 pounds. The difference between these totals is to be explained by the fact that the production of the mines increased considerably during the latter quarter of the year, and the increased production was partly in transit and partly in process of refining, being thereby temporarily withheld from the market.

Deducting from the total the amount of pig copper exported, and the amount of copper turned out in by-product sulphate it appears that the total production of marketable copper in the United States in 1905 was about 1,025,000,000 pounds. The production of casting copper was really greater than indicated by the above table, because a good deal of second-hand copper is turned out in this form. Our statistics refer only to the new copper produced in 1905.

Coal-Mine Explosions.

The article on "Mine Explosions," in this issue, appears at a time when there is much discussion about the concurrence of mine disasters, earthquakes, etc., and coming from an engineer who has devoted a great part of his professional life to the study of this subject, it will be sure to attract the attention which its importance deserves. Mr. Beard shows, by statistics, that there have been periods of danger when extraordinary care should be exercised by the mine manager. The coincidences which he points out are certainly highly suggestive.

No one thing that can be done by the operator, the miner, or the state will, alone, eliminate coal-mine explosions. It will require the careful observance of the many fixed rules, and proper action on the part of all, before the whole danger will be corrected. We may remove much dust from the mine and still have a dust explosion; we can send in a large current of air, and yet many things may happen to cause a gas explosion; spraying our mines will reduce the chances, but not eliminate these disasters. It is evident then that the care exercised for the protection of the miner, on the part of the coal operator, must consist of a uniformly well balanced regard for all the essential safeguards, and not a radical observance of some especial one, and a laxity toward all the others.

Mr. Beard, in characterizing the features that distinguish a gas explosion from a dust explosion, states some interesting facts, which, if borne in mind by those who attempt to gather evidence as to the cause and character of an explosion, will undoubtedly throw light on the true nature and origin of these disasters. However, agreeing that when conditions are equal a gas explosion may produce more violence than a dust explosion, we do not believe that this is often the case, for a dust explosion will carry further and gain terrific force as it rushes to daylight. A great many, if not the majority of dust explosions, start as a small gas explosion and gather intensity as they travel. Much depends on what is meant by conditions being equal and in this connection, the dryness of the mine and the percentage of carbon in the coal must be considered.

Many explosions of gas have happened in mines, and confined themselves to a local area, when, if the coal had been high in carbon, and the workings dry, the entire mine would have been destroyed and all the lives lost. Recently a small body of gas was set off in the remote workings of a large colliery and, gathering up the dust, hurled itself not only throughout the entire mine, but blew out a wall, which filled a dog hole, and, passing into the adjacent property tore up this mine, which was not gassy, as badly as the first. Not one soul lived to tell the verified story of this disaster, but later investigation proved that there was not much heat as the victims were unburned; also that the force of the explosion followed the intake and not the return airways, all of

which confirms the theories advanced by Mr. Beard; however, it is impossible to conceive of a quantity of gas that could accumulate sufficiently to do the damage done at these two mines that night. The points raised by Mr. Beard, in his excellent article, furnish a wealth of subject for discussion that is of the utmost importance to coal miners. We hope that our readers in this branch of mining will contribute their own ideas and experiences.

A San Francisco View.

The newspapers in New York and elsewhere have put before their readers the extent of the devastation wrought in San Francisco by earthquake and fire as fully as can be done by description and photographs. We present some very interesting photographs elsewhere in this issue. It is impossible, however, to convey by mere words, or even by a few photographs, the appearance of this ruined city, especially in the business district, where the larger brick and stone buildings are mere heaps of ruins, and even the tall first-class structures yet standing have been gutted by fire. Some of the streets have been cleared by throwing the debris back to one side to allow team and pedestrian traffic, but most of them are piled with loose brick and debris to a depth of four to six feet. There are no sidewalks left, the falling walls having crushed them in.

It is safe to predict that it will take fully a year to clean up the debris and remove it. Of course, in a few instances men have commenced clearing up their lots with a view of putting up temporary structures, but generally speaking, the ruins have no one to work among them. A recent walk from the water front to the western end of the burned district led through some eight miles of ruins. Looking from the hills as far as the eye could reach to the confines of the city, the place seems a devastated waste, except westward from Van Ness avenue, where the residences were not burned. But from the bay front back to that street, and from North Beach to Mission bay, it is all a vast ruin.

Where the money is to come from to pay men to clean away all these millions of tons of loose brick, intermingled with blocks of stone, gas and water pipes, wires, masses of iron, abandoned safes, and indescribable material, remains to be seen. The incomes of the property owners have

been suddenly cut off. The banks holding mortgages will get most of the insurance money, and no one knows whether they will loan on unimproved lots sufficient to erect buildings. If all this burned district is fully restored in ten years, it will be a wonder indeed. The wealthier class can readily reconstruct their large buildings, but a far larger class, which owned the thousands of lesser structures, are in no financial position to rebuild for some time to come. The loss of population must necessarily be very large, and there are not dwellings to accommodate over half of the former city. Though some weeks have elapsed since the disaster, there are still 200,000 people being fed at public charge in San Francisco, and all outlying towns have their thousands to feed also. In Oakland alone, 60,000 refugees are being cared for. These people in time must look out for themselves, and there is not sufficient employment for them all. So many thousand businesses have been wiped out that there is no need for employees. Even the big buildings which will take a year or more to construct, need nothing but mechanics, artisans and laborers at present.

Regular banking business will not be resumed until June 1, by which time the insurance companies will be prepared to say what they can do about prompt adjustment of claims. Depositors may draw up to \$500 on their accounts and no more; hence money is short to pay the laborers at present employed. The mining stock exchanges will reopen when the banks resume, but ready money for speculating is apt to be rather scant. The people are exceedingly hopeful, but they cannot help seeing danger in the prospective multitudes of idle and homeless persons. How to provide food, shelter and employment for these persons for a long period is the problem now to be solved. It has been easy for a few weeks, thanks to the generosity of the American people, but the pressure is every day becoming greater and promises to increase with time. At least one or two hundred thousands of San Francisco's population must go elsewhere to gain a livelihood. They are now being herded together into great camps, for economic and sanitary reasons, but these cannot be maintained for a year or two, while the city is being rebuilt. All these problems are pressing on San Francisco, and must be worked out in some fashion very soon.

Metallics.

Boiling with formaldehyde gives no coloration with natural asphalt, but practically all substitutes give color to the solution. The action of alcohol and acetone is similar.

The production of aluminum in Great Britain amounts to about 2250 tons per annum, which does not, however, meet the present consumptive demand of that country, wherefore additional plants are being constructed.

Telephones are extensively employed in the larger mines of Australia, where their utility has been abundantly demonstrated. The miners in Victoria and Tasmania hold a high opinion of the advantage of signaling in this way.

The rapid development of the motor-car industry is said to be chiefly responsible for the great expansion in the demand for aluminum, which has not yet been accompanied by a corresponding increase of production, the producers having miscalculated the rate of progress.

At modern silver lead smelting works, the slag sample is taken by removing a ladle full from the overflow pot every hour, granulating the molten slag in water, and combining the hourly samples to represent the average of the 24 hours' run. The slag sample taken in this way is readily decomposed by hydrochloric acid.

Venezuela, like Mexico, has a dynamite monopoly. In June, 1905, the exclusive right to import explosives was granted to E. A. Rendiles, who grants consumers the right to import dynamite for the consideration of 19c. per kilogram. This fee, together with the custom duties, transport charges, etc., makes the cost of dynamite at the gold mines in the Yuruari territory come close to 66c. per pound.

In the construction of the Scranton tunnel of the Lackawanna & Wyoming Valley Railroad, in 1904 and 1905, the following were the contract prices for the tunnel proper: Shaft excavation, \$7 per cu. yd.; tunnel excavation, \$3.35 per cu. yd.; back filling, over timber and behind masonry, \$1.50 per cu. yd.; overhaul, per 100 ft. in excess of 1000 ft., 1c. cu. yd.; concrete, \$8.60 to \$9 per cu. yd.; long leaf yellow pine, \$45 per thousand feet board measure.

In examining a new rope for hoisting, elongation should be carefully noted. When a rope does not stretch much at the beginning, it is fairly good evidence that the strands are not bearing properly upon the core, and in that case there must be some acute internal friction. When the rope ceases to elongate, it is an indication that it has reached its elastic limit, and that the physical properties of the wires are so altered that the deterioration in the strength of the rope must be considerable.

Rusty and corroded chemical apparatus, such as ring stands, Bunsen burners, etc., may be satisfactorily cleansed from rust, etc., by the use of a 2- to 5-per cent. solution of hydrofluoric acid, which readily dissolves and loosens the rust. Greasy or fatty matter must be previously removed. The articles are soaked over night in the acid, and then are brushed or rubbed off. Acid of the strength mentioned readily removes iron stains from linen or cotton goods, without affecting the strength of the fiber, and also is harmless on the skin of the hands.

In the Mines Act of Victoria, amended in 1904, it is not compulsory for mines to adopt telephones, but it is provided that there "shall be some proper means of communicating distinct and definite signals from the bottom of the shaft, levels, etc. to the engine room. . . and no verbal signals or communication shall be made up or down a shaft. . . except through speaking tubes or telephones in the pump or ladder compartment of such shaft, and every person employed in a mine shall make himself acquainted with the system of signals provided thereby."

In Great Britain aluminum has come very prominently into use for castings, such as are necessary in electrical work, and an immense impetus has been given to the industry by the adoption of the metal for crank cases and gear boxes in automobiles. Aluminum is also said to be largely displacing copper for the manufacture of pans, such as are used in wax refining, jam boiling, etc. It is plain that where brass can be used, aluminum is, with rare exception, equally applicable, is equally economical, and has the great advantage of being only one-third of the weight of brass.

The large reverberatory furnaces in use at the Washoe smelting works, Anaconda, Montana, have the following dimensions: Length of hearth, 102 ft.; width of hearth, maximum, 19 ft.; hearth area, 1767.7 sq. ft.; length of grate, 16 ft.; width of grate, 7 ft.; grate area, 112 ft.; ratio of hearth area to grate area, 15.8:1; weight of charge, in tons, 15; charge per 24 hours, in tons, 250 average, 350 maximum; ratio of concentration, 4.5:1; tons of charge per ton of coal, 4.67 average; increase of labor due to larger size of furnace, none. One furnace has a hearth 112.5 ft. long, the other dimensions remaining the same.

The Mt. Bischoff tin mine, of Tasmania, has produced 64,775 tons of concentrated tin ore since the formation of the company, this figure being stated up to the end of 1905. The cost of mining, including dead work, maintenance, and other expenses, is about 78c. per long ton (2240 lb.). The ore is crushed by stamps, which handle 4.24 tons of ore per head per 24 hours. The cost of crushing, dressing, and maintenance of plant is about 23c. per long ton. These are very low figures, which will compare

favorably with the best mining practice in any part of the world. The percentage of mineral recovered from the ore during the last quarter of 1905 was 1.384.

In testing asphalt, distil 10 to 15 grams of the sample. The distillate is always oily. Wood pitch gives also water in the distillate, which reacts strongly acid; however, it scarcely colors carbon tetrachloride on shaking with it. If the distillate dissolves in absolute alcohol and glacial acetic acid, the presence of coal-tar pitch may be asserted. If the distillate does not completely dissolve in alcohol and acetic acid, lignite pitch, petroleum pitch, asphalt, or a pitch from fat may be present. If natural asphalt is the substance under examination, the residue is never black. If it be black, or coal like, lignite or petroleum pitch is present.

The report of the Pioneer Tin Mining Company, operating at Bradshaw's Creek, Tasmania, for the second half of 1905, gives an idea of the cost of alluvial tin mining in that country. The quantity of gravel sluiced was 222,200 cubic yards, which yielded 185 long tons of black tin, or 1.875 pounds of black tin per cubic yard. The cost of production was £42.8 per ton of black tin, against £48.78 per ton during the previous half year. The gravel is lifted from a depth of 110 ft. Since the beginning of sluicing, in June, 1900, 1,565,600 cu. yd. of drift, averaging 2.214 lb. of black tin per cu. yd., have been pumped and sluiced for a yield of 1547.5 tons of black tin, at an average cost of £31.165 per ton.

The old blast furnaces at the Washoe smelter, Anaconda, Mont., were 72x180 inches at the throat, and 56x180 inches at the tuyeres. The single charge was 9000 to 10,000 lb., and the average smelting in 24 hours was 452 tons, 9 per cent. of coke being used. In the management of the furnace there were required 24 men, including charge loaders, coke wheelers, and miscellaneous labor, as well as the actual furnace attendants. The air required per ton of charge was 45,000 cu. ft. The furnace had 26 four-inch tuyeres, and a single forehearth 16 ft. in diameter and 5 ft. across, shell dimensions. The new furnaces are 72x612 inches at the throat, and 56x612 inches at the tuyeres. The single charge weighs 36,000 to 40,000 lb., and approximately 1600 tons are smelted per 24 hours. The furnace crew comprises 60 men. The consumption of coke is 8.6 per cent., while the consumption of air per ton of charge is the same as in the case of the old furnaces. The new furnaces have 90 four-inch tuyeres and two forehearths, each 16 ft. in diameter by 5 ft. deep. The water-jackets of the large furnace are of the same general type as in the older one, i. e., sectional jackets, sheet steel throughout, with tee-iron stiffeners riveted to the back plate instead of stay-bolts.

Colliery Notes.

When sulphur occurs in coal as gypsum, it cannot be removed either by washing or burning.

All coal that is to be charged into ovens, and passed through rolls first, should be reduced to $1\frac{1}{2}$ in., or smaller.

A coke high in sulphur cannot be used in an iron furnace, but it may be used in lead and copper smelters, where a high percentage of sulphur is not so detrimental.

A heavy fall of roof may create such tremendous percussive force as to ignite the coal dust, when firedamp is entirely absent. Likewise, a fall of rock may so act on mine air containing firedamp that an explosion will ensue. That gas, however, need not necessarily be present, or if present, be lighted to cause an explosion, is borne out by the fact that several explosions have occurred when there was no one in the mine.

A coal that is useful to blacksmiths, or better known as a "smithing" coal, should be very low in sulphur, in order to enable the smith to make a good weld. Such a coal should also coke well so as to form an arch of coke over the fire in the forge, which permits a uniform heat in this oven-shaped chamber. A good smithing coal should also be low in volatile matter, so that the flame from the fire will not be excessive, and the workman can approach close to handle his irons.

In driving a rock entry in hard rock, it is found more economical and satisfactory to charge the hole with high explosive, and have the diameter of the holes $1\frac{1}{4}$ in. If the rock is weak, it is best to drill 2-in. holes and charge with cheap, low explosive. The distance between the holes should equal about $\frac{3}{4}$ the depth, and each hole should be so placed and timed that it will receive the greatest benefit from the free sides formed by firing the previous holes.

Since oxygen will expel carbon monoxide from the hemoglobin of blood five times more rapidly than pure air, and is therefore the best antidote for the toxic influence of carbon monoxide, it is suggested that a supply of oxygen could be established along the entries of a mine, and be so arranged that an explosion would automatically open the nozzles in the affected district, and allow the oxygen to escape with a whistling noise, so that in the darkness the victims could creep to the nozzles of escaping oxygen, and there wait for the rescue party.

In determining the horse-power necessary to hoist any load out of a shaft, it is found by experiment that after dividing the product of the gross weight in pounds and the speed in feet per minute by 33,000, in order to get the theoretical horse-power, this result must be increased by 45 per cent. to insure allowance for fric-

tion and other contingencies. In hauling a load up an incline track in mine work, where the track and cars are not in as perfect condition as on surface planes, at least 50 per cent. is added to the theoretical horse-power to get the necessary working horse-power.

Several western coal companies have installed aerial tramways and are handling the waste rock from their washeries at a cost not exceeding one-half cent per ton. One of these tramways 2200 ft. long, with continuous bucket system, has cost after installation about \$9000. A 2-bucket tramway of the same length, however, with heavy $1\frac{1}{4}$ in. wire cable, $\frac{1}{2}$ in. wire traction cable, five or six towers, including tail tower and loading terminal bin, self-dumping devices, and all excepting the motor or other driving power, will cost installed about \$7200. This tramway requires only one man to operate.

In southern West Virginia, where the coal is very high in carbon, and the mines dry, it has been thought advisable by the managements of several mines to curtail the use of the machines in their mines; it being claimed that machine mining causes too much dust, and thus renders the workings more liable to a dust explosion. Further arguments are advanced that machines make more slack, and that the coke made from machine-mined coal contains more ash, due to the machines loosening and mixing bottom rock or clay with the coal, and since there are no washeries in the district, the dirt shows up in the coke.

It is not generally recognized that the character of the roof covering a coal measure has considerable to do with how gaseous the seam is. If the strata above the coal seam is impervious to gases, the occluded gases remain pent up and wait for the first opportunity to escape into the mine workings or to the surface. Wherever there is a crevice or pocket in the adjoining strata, the gas accumulates and forms what are called gas feeders. These occluded gases exist under a pressure that is proportionate to the weight of the overlying strata; experiment has proved that the pressure of occluded gases has in some cases reached 32 atmospheres.

To drive all entries water level is certainly the most inexpensive way to develop a coal mine; but it is absolutely necessary to the future systematic development of the property, that the driving of all entries and rooms conform as nearly as possible to some generally accepted plan. When the coal seam is irregular and full of rolls and dips, it is often hard to drive on line, and sometimes expensive, but generally a little grading will more than pay for itself, and quite often when an entry is driven around a roll to avoid any cut, it is necessary later on to return and straighten the road to facilitate the haul.

Correspondence and Discussion.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of this JOURNAL.

Letters should be addressed to the Editor. We do not hold ourselves responsible for the opinions expressed by correspondents.

Short Methods of Squaring.

Sir—The article by Mr. Boush in the correspondence column of this JOURNAL (May 12, 1906, p. 912), on account of the short method he gives of obtaining the sides of various triangles, brings to mind the facility with which the operation of squaring certain numbers can be performed.

The method to which I refer is practically an example of the application of the binomial theorem to the squaring of arithmetical, and not algebraic, quantities. The square of any binomial being equal to the square of the first term plus twice the product of the first and second terms, plus the square of the last, we may take, for instance, the number 1425; squaring, by the method to which I call attention, is performed by first squaring 14 as one term, then multiplying the first term, 14, by the second term, 25, twice, and then squaring the last term, 25.

Of course as the squares of numbers up to 25 are remembered by most of the people who have occasion to do much figuring, it is an easy matter to carry on this process. In the illustration given it is recalled mentally, that the square of 14 is 196, and we therefore place upon the paper the figure, 196, with four ciphers after it, for two places follow this term (14) in the number, 1425; 25 being one-fourth of a hundred, to obtain twice the product of 25 and 14 we do not multiply 14 by 25, but divide 1400 by 2, which gives us 700 to be added to the 1,960,000 previously obtained. The square of 25, as we know mentally, is 625, and this is added, so that we have, instead of a long process of multiplication, with additions to be made from time to time, simply three additions; for selecting the squares of the numbers up to 25, when they are stored in the memory, is shorter than the process of setting them down on paper.

J. H. ROBINSON.

New York, May 15, 1906.

Mines vs. Prospects.

Sir—In a recent discussion with some mining friends, I found them very pessimistic on the probability of floating even a good proposition in the East, and in New York in particular. Probably there are many promoters who have brought to the metropolis what were supposedly good ventures, only to find that their offerings were merely ventures—prospects in other words, not mines; and a prospect must be judged as

a prospect. This sort of venture is usually turned down by the New Yorker; and the result is all the more surprising in view of the well known recklessness with which the New Yorker frequently buys mining stock. But perhaps the reason is not hard to find; is it not this?

When a man buys mining stock, he may do it on the spur of a reckless moment, or on the basis of some supposed tip, or the like; but rarely or never on the advice of a reliable mining engineer; however, in matters of this kind, there are the usual elements of human confidence or credulity, and with the usual results. But when the New Yorker, and especially the man of large means, meets a really important mining proposition, he consults some well trained, experienced and trustworthy engineer; and the engineer examines the proposed mine on its actual merits. In fact, he usually clings to the ultra-conservative side of the question. As the result, a good mine (or many times, even a good prospect, but one which is only partly developed) is rejected by the engineer who has his reputation for accuracy to maintain.

The moral of this is that it does not always pay to come East with even a good prospect that is only partly developed; but I believe that developed mines which show good ore rarely wait long for buyers. Another feature which appeals to the New Yorker is the willingness on the part of the mine owners to bear the expense of an examination, the examination being made by an expert selected by the prospective investor. By studying the conditions, it is possible to sell almost any really good mine to the right people even in the East. I am speaking only of real mines, or really good prospects.

AGRICOLA.

New York, May 7, 1906.

Shaft Sinking on the Mesabi.

All shaft sinking on the eastern Mesabi, near Biwabik, has been much troubled by quicksands, and every shaft has been more or less delayed in consequence. In some cases shafts have been abandoned and new ones started, and in others various devices have been adopted for sinking. At the shaft of the Syracuse mine, of Pickands, Mather & Co., patent interlocking steel piling was tried, and the shaft, after many discouragements, has almost reached the ledge and the timbers are now going down inside. Cement is being forced down to the bottom through pipes, and this is expected to form a coating around the irregular rock, so that bedrock can be reached without trouble.

Brass, copper or bronze anodes frequently become covered with a green slime while in use and this should be removed by dipping in order that the conductivity of the anode may not be reduced.

The Ithaca Meeting of the American Electrochemical Society.

SPECIAL CORRESPONDENCE.

The ninth general meeting of the Society was called to order at 9.30 a.m. May 1, in the large chemical lecture room of Morse Hall. President Schurman, of Cornell, was introduced, and extended to the Society the welcome of the University; he dealt particularly with the reputation of the Society for the original investigation of truth, and instanced the evidence that the University had worked in sympathy with the Society. To this Dr. Bancroft replied appropriately for the Society.

The report of the managers and of the secretary, in view of later publication, were read by title; but the tellers' report was made public, showing the election of Carl Hering, of Philadelphia, as president; and S. S. Sadtler, of Philadelphia, as secretary.

The first paper was by Dr. W. H. Walker, of Boston, on "An instructive laboratory experiment in applied electrochemistry"; it was an instructive application of graphical methods of recording efficiency, as in the production of bleach solution; the paper was valuable mainly for teachers.

The next paper by C. L. Collins, of the Acheson Graphite Company, Niagara Falls, on "Some principles of the resistor furnace design," was a long and elaborate analysis of the principles of heat conduction in refractory material surrounding the resistor; the paper involved the use of calculus, and though exceedingly valuable from a theoretical standpoint, was singularly deficient in definite practical recommendations, dimensions, or designs.

The next paper by Lamar Lyndon on "Electrolyte density in storage cells" was read in abstract; one point established was the necessity of greater density of electrolyte with thicker plates.

This was followed by a practical paper by Dr. Maximilian Toch, of New York, on "Electrolytic corrosion of structural steel;" the substance of the tests of steel, encased in several varieties of cement and tested by electric currents, was to the effect that electrolytic decay of grillage beams may be prevented by coatings of cement and other insulating material. [Discussion brought out a diversity of opinion, but a unanimity for the necessity of preventing corrosion of iron beams, both from natural electrolysis and also from the leakage of large electric mains; as by the use of insulating material around the beams, or by the protection of masses of metallic zinc buried nearby.]

The next paper, by Prof. H. M. Goodwin and R. D. Mailey (Mass. Inst. of Technology) on the "Physical properties of fused magnesium oxide," was read in abstract by Dr. W. H. Walker. This substance is pure white, hard and crystalline,

resembling porcelain; sp.gr. 3.493, or a little lighter than periclase (3.679); m.p. 1890 to 1940 deg. C.; in conductivity, a better insulator than porcelain below 1100 deg. C.; co-efficient of expansion close to that of platinum, which suggests a valuable application in making joints of these two materials. In chemical properties not acted on by silver, sodium or potassium nitrates; sodium or potassium chloride, bromide, or sulphate; zinc chloride or barium nitrate, in the fused salts. Sodium carbonate, potassium-sodium carbonate, potassium hydrate, or cryolite, when fused, attacked the oxide energetically. It is also attacked in the cold by dilute sulphuric, nitric, or hydrochloric acid, and slowly; but more rapidly than by concentrated acids. [In the discussion Carl Hering brought out the fact that some authorities state that at 1500 deg. C., porcelain conducts injuriously, and it would be well to establish the relative conductivities of porcelain and magnesium oxide at high temperatures.]

"The cathode disintegration of carbon in a fused chloride electrolyte," by G. I. Kemmerer, was read in abstract by Prof. C. F. Burgess, of the University of Wisconsin; the action referred to in the title is obscure, not obeying Faraday's law. [Discussion suggested that it may be due to the sodium chlorate that is formed.]

The paper by O. P. Watts, on the "New molybdenum silicide" (also read in abstract by Professor Burgess) describes MoSi_2 (as distinguished from the one formerly known to exist Mo_2Si_3).

The paper on "The reduction of metal sulphides" (by arcing current), by O. W. Brown (also read in abstract by Professor Burgess), brought out the fact that a fairly pure molybdenum is obtained from fusing molybdenum sulphide with lime and carbon; other metals as lead (from galena) and antimony (from stibnite) were less docile in reduction to a product free from sulphur.

The next paper (not on the printed program) was presented by E. A. Ashcroft, of London, England, on "Electrolytic metallic sodium"; the paper, which was illustrated by several lantern slides, described a unique combination of two cells. In the first cell, fused sodium chloride is electrolyzed, the cathode being a fused alloy of sodium-lead; the contents of this first cell are also mixed mechanically by an electro-magnetic coil about the cell. The cathode of the first cell (i.e. the fused sodium-lead alloy) is in direct connection (by a short tube) with the second cell (which is four times as large as the first), where it serves as the anode. From this anode the sodium is transferred electrolytically to the electrolyte, fused caustic soda (just as copper is transferred to copper sulphate in a refining cell), and through it to the cathode. The cathode has an insulated hood for carrying off the free sodium.

[The discussion, which was long and active, was in the best tone and spirit, and was participated in by Messrs. Hering, Acker, Carrier, and others. The substance of this criticized the method of stirring; the difficulty of keeping the sodium and chlorine apart; the difficulty of using sodium hydroxide in the second cell (which Mr. Ashcroft maintains has the advantage of an unchanged electrolyte), etc. The process as described by Mr. Ashcroft was prefaced by some interesting figures on production and costs of metallic sodium (approximately an annual world total of 3500 tons). In this connection C. F. Carrier, Jr., of Elmira, exhibited an alloy of lead and sodium (containing about 1 per cent. of the latter) which was very soft but which rang like a bell when struck].

The afternoon was spent in inspecting the laboratories, especially those devoted to electrochemistry in its various phases; the school of engineering, with the steam and electrical laboratories and workshops.

In the evening, the retiring president of the Society, Dr. W. D. Bancroft, gave the annual address. The subject was "The electrochemistry of chemistry." It was an able and convincing attempt to explain ordinary chemical reactions on the basis of the well known primary reactions occurring at the anode and the cathode of the electrolytic cell. Most of the apparent inconsistencies can be explained, but there are a few reactions which still seem anomalous. In particular, attention was called to the advantage of utilizing electrochemical decomposition in the study of corrosion of metals, results being often obtained which otherwise would require weeks or even months. The extension of the field to organic compounds was also emphasized. After the lecture, the Society was entertained at a smoker given by the Town and Gown Club.

On Wednesday morning, the formal session was continued, and many short practical papers were presented. The first one, by C. R. White, of Ithaca, concerned "Laboratory resistance furnaces," in which he showed that such substances as carborundum, calcium-carbide, etc., may be made under simple conditions, and with comparatively small (175 amp.) currents.

The next paper, by E. A. Sperry, of Brooklyn, showed the advantages which might be obtained by the use of various "Electrochemical processes as station-load equalizers." The peak load represents investment; the mean load revenue; but the valley load means loss. The utilization of the unproductive condition represented by the valley load may be employed in some chemical processes which are intermittent; but the trouble is that most commercial electrochemical processes must be continuous in their operation and cannot depend on the 5 to 8 hours (in 24) of the valley load available at most stations. [In the discussion on this paper, certain

rates were brought out; Mr. Carrier, of Elmira, thought the possible rate of about one cent per kw. hour would not be low enough in an 18-hour day. Mr. Sperry quoted from 0.28c. per kw. hour (corresponding to \$18 per h.p. year) up to 0.4c.; 0.31c. per kw. hour corresponds to \$20 per h.p. year (the Buffalo rate). The figures were also stated to be the average of several large cities (Cleveland, Detroit, Brooklyn and New York).]

The next paper, by W. C. Arsem, of the General Electric Company at Schenectady, described certain advantages of "The electric vacuum furnace." In this furnace a unique feature is the helix resistor, made by sawing a spiral line around and through a cylinder of graphite. This helix cylinder resistor surrounds a narrow insulated cylindrical crucible of graphite. There is considerable leakage of current due to the so called "Edison effect." The resistor and crucible are placed within a strong steel box which carries the vacuum. The life of the heater seems to be long, if kept below 2100 deg. C.; but falls to nine hours at 2500 deg. C.; and to three hours at 2700 deg. C.; which seems to be the practical limit.

The next paper, by B. E. Curry, of Cornell university, was a remarkably fine experimental analysis of the "Electrolytic corrosion of copper-tin alloys." The method used was that referred to in Professor Bancroft's address; it was fully illustrated by lantern views of a complete series of phase diagrams. The regularity of the limiting curves was remarkable.

Prof. C. F. Burgess, of the University of Wis., presented a paper by himself and S. E. Engle, on "The corrosion of iron by acids." Electrolytic iron is unique in that it corrodes six times as fast as cast iron, four times as fast as steel, and nearly 40 times as fast as transformer iron. Also electrolytic iron, when freed from occluded hydrogen by heating, resists corrosion better; purity alone is a factor, but the crystalline or granular structure seems to be influential. The possible use of electrolytic iron is valuable in comparison with zinc, which would be more costly in quantity. Arsenic in the acids used seemed to protect the electrolytic iron from corrosion. [Discussion suggested that this arsenic might act as a protecting outside film, as Professor Burgess had tested a homogeneous alloy of pure iron and arsenic, but with negative results; Professor Burgess thought that a film of oxide formed by driving off the hydrogen might be responsible for the difference.]

The next paper, by Dr. Isaac Adams, of Cambridge, Mass., on the "Development of the nickel-plating industry," was read in abstract. In substance it was historical, and contained the astonishing statement that practically there had been no change in the art since 1870, which statement, though challenged, was

not refuted. [In the discussion, Professor Bancroft noted the opportunity for improvement in nickel electroplating processes. As pure nickel becomes passive, the anodes usually contain iron, with the resulting impurities in the product and the attendant rusting. This may possibly be avoided by the use of chlorides as of nickel or ammonium.]

The next paper, by R. C. Snowdon, of Ithaca, on "Electrolytic precipitation of lead from acetate solution," described a lead anode, rotating cathodes, and recommended low current-density (one-half amp. per sq. dm.); with high current density, the lead deposit becomes flaky; colloids in the solution improve the deposit. The reason was not ascertained.

The next paper, on the "Microscopic study of electro deposits" (by Prof. C. F. Burgess, of Madison, Wis.) was mainly illustrated by lantern slides. The figures largely concerned deposits of electrolytic iron (which may be obtained 1 in. thick, and homogeneous;) these deposits showed pitted and mammillary surfaces, with a peculiar stratified and radiating crypto-crystalline structure, resembling that of certain natural minerals. The best deposits were obtained with 5 to 15 amp. per sq. ft.

The paper on "The cadmium standard cell," by Prof. G. A. Hulett, of Princeton, N. J., was an elaborate and exhaustive study of the equilibrium conditions of the cadmium-amalgam cadmium-sulphate system. The results showed that the cell cannot yet be accepted as a standard, in view of observations extending over many months.

The next paper, by B. E. Curry, described "The electro-deposition of bronze." The anodes were of copper-tin; the mixed solutions were various, but a slightly acid tartate solution, with a little ammonium oxalate serves well. The proportions of copper and tin in the deposit of bronze were not the same as those in the solution. A good deposit was not obtained with less than 80 per cent. of copper. [In the discussion, Professor Bancroft called attention to the fact that the process as described was not reversible; the corrosion of the anode depended on the concentration of the anion; but the cathode deposit depended on the proportions of the metals in solution.]

The paper by G. R. White, of Ithaca, on "Ferro-manganese anodes in caustic potash," discussed methods which were illustrated in the Cornell laboratories as inspected by the Society. The paper was essentially a report of progress.

Dr. H. E. Patten, of the Bureau of Soils, Department of Agriculture, Washington, D. C., described "The migration and flocculation of colloids, considered as absorption phenomena." The paper treated certain facts, such as the filtration of colloids under pressure, with the attendant electric charge; the migration of colloids in the electric field, etc. No final explanation

was given of the electrolytic character of colloids.

After a lunch served by the University, the Society inspected Rockefeller Hall (the new physical laboratory), the filter plant which supplies Cornell university, and the electric power and lighting plant. In the evening a banquet was served at "The Dutch Kitchen" of the Ithaca Hotel.

On Thursday morning formal sessions were opened with the paper on "Fused sodium peroxide for the regeneration of air in submarines," by R. von Foregger, of New York, and G. F. Brindsley, of Niagara Falls. The value of this substance for the use indicated was shown in the good supply of oxygen and the control of carbon di-oxide. [In the discussion, Mr. Carrier suggested the possible necessity of the use of a catalytic for the regulated control of decomposition of the peroxide. Mr. Howard, of the Merrimac Chemical Company, of Boston, mentioned a case of saving the life of an asphyxiated person, and after the heart had stopped beating, by the use of oxygen obtained from sodium peroxide.]

The paper on "Alternating-current electrolysis with cadmium electrodes," by G. R. White, of Ithaca, described the production of cadmium sulphide in a solution of sodium thio-sulphate (and as illustrated in the laboratory). The efficiency is independent of the current, of the temperature, and of the stirring; but depends on the active electrode surface which is made irregular by conditions not understood. The efficiency is too low to be used commercially.

The paper on "Electrolytic chromium," by Prof. M. Le Blanc, of Karlsruhe, Baden, Germany, and read in abstract by Mr. Carrier, was a reply to certain criticism made at a former meeting, and turned on the point of actually obtaining a thick and coherent plating. Professor Bancroft stated that this had been obtained, though in thin films, and from chromic-acid solution.

The paper on "The free energy of some halogen and oxygen compounds, as computed from potential measurements," by M. deK. Thompson, Jr., of Boston, was abstracted by Prof. W. Lash Miller, of Toronto. The results, though interesting, were unsatisfactory; silver iodide offered a unique case of large deviation.

"The electrolysis of caustic soda" by Prof. J. W. Richards, was mainly historical. Incidentally the fact was brought out that Davy used the current both for fusing and electrolysis. [In the discussion Mr. Forssell stated that he had found globules of metallic sodium in a concentrated solution of caustic soda; these globules, even when cut through, did not react with the solution. Professor Richards stated that sodium had been plated from a water solution; and Dr. Patten stated the same for calcium. Much was said by Mr. Carrier and others relative to the action of water present, or produced by electrolysis;

the water may not react if the salt or solution be sufficiently concentrated.]

The paper on "Differences of potential between peroxides of lead and manganese, and various aqueous and non-aqueous solutions," by Prof. L. Kahlenberg and A. S. McDaniel, of Madison, Wis., was abstracted by Dr. Patten. The measurements were made in solutions of acetone, pyridine and amylamine, both hydrous and anhydrous. The electrode was the normal calomel. The results indicate a potential or chemical strain between the electrode and the liquid.

The paper on "A new electrolyte for the silver coulometer," by Prof. H. S. Carhart and F. W. Willard, of Ann Arbor, Mich., was abstracted by Mr. Sadtler. The new electrolyte is silver perchlorate, made by adding perchloric acid to silver nitrate. A porous diaphragm of filter paper is used.

The paper on "Errors in pyrometry," by E. S. Shepherd, was abstracted by Professor Bancroft. The points emphasized were: Variations in viscosity of segar cones; contamination of the thermocouple by furnace vapors, occasioning hysteresis or temperature lag; the necessity of keeping the temperature of the cold junction uniform; the assumption of the law of radiation from black bodies, while in the carbon-tube furnace the carbon flame may involve a difference of 200 or 300 degrees. The errors may affect both research and commercial work, the latter are often based on differences which are only relative. [In the discussion, Mr. Schultz, of New York, described the new Bristol pyrometer, and noted its advantages; several others who had tried it, also spoke of its value.]

This closed the formal program, and after the usual resolutions, which were heartily voted, the sessions were declared adjourned.

In the afternoon, the Society visited the Remington Salt works. Later E. G. Acheson (of the International Acheson Graphite Company, of Niagara Falls, N. Y.) gave a lecture before the Sibley College of Cornell University, on "Discovery and Invention." Mr. Acheson used Faraday as the type of the discoverer of new principles; Bessemer as the inventor of new application, and Goodyear as the combination of the discoverer and the inventor. The lecture was profusely illustrated with the products which Mr. Acheson has discovered and produced commercially. A large throng of students and visitors were in attendance.

In the evening Dr. H. W. Wiley, of Washington, lectured on "The adulteration of foods." The lecture, which was largely attended, was well illustrated by lantern slides, showing the method of testing foods and the results.

The German syndicate of manufacturers of thorium nitrate has reduced its sale price from 53 to 27 marks per kilogram.

New Publications.

"Railways in the United States in 1902." Part V. By the Statistician to the Commission. Pp. 462. 8 by 12 in.; cloth, \$3. Washington D. C., 1903: Interstate Commerce Commission.

"Treatise on Ore and Stone Mining." By Sir Clement Le Neve Foster. Sixth edition, revised and enlarged by Bennett H. Brough. Pages, 799; illustrated. 6x9 in.; cloth, \$10. London, 1905: Charles Griffin & Co., Ltd. Philadelphia, J. P. Lippincott Company.

Contents—Occurrence of minerals. Discovery. Boring. Breaking ground. Supporting excavations. Exploitation. Haulage. Hoisting. Drifinage. Ventilation. Lighting. Access. Dressing. Legislation. Condition of the Miner. Accidents. Principles of employment of mining labor.

In the preface to the fifth edition of this work, published in the spring of 1905, Sir Clement Le Neve Foster stated that he had repaired a few defects, but that he hoped to rewrite the work by the time another edition was required. This hope was unhappily not fulfilled, for on April 19, 1904, his useful, distinguished and honored career was brought to an end. Mr. Brough undertook the editing of the new edition, at the request of Lady Le Neve Foster. He has preserved the logical arrangement arrived at by Sir Clement, as the result of 14 years of teaching at the Royal School of Mines and 29 years of Government mine inspection; but he has made the necessary additions required to bring the work up to date.

As he states in his preface, "the additions and alterations describing recent changes and improvements in the mining industry, although somewhat extensive, are those which, in my opinion, would have been adopted by the author himself had he survived to carry out the work." We consider that this praiseworthy intention has been fittingly carried out.

We are glad to have the new edition of this standard work, because of all the books on mining, printed in English, it is unquestionably the best. It is both a text book and a treatise, which serves the purpose of the student as a guide, and that of the engineer in practice as a convenient work of reference. There is no other which is so convenient, and at the same time so complete and authoritative. Its merits are now so well known that it is unnecessary to enlarge upon them; the fact that a sixth edition has been required is the best testimony to the practical recognition that it has won. In the revision the work has been well brought up to date, although we remark some recent improvements in mining practice that are not touched upon; however, it is impossible, and unfair to expect, that a treatise of this magnitude can be kept quite abreast with the latest technical literature.

A valuable addition to the new edition is a bibliography of the important memoirs and standard works of reference, which is appended to each chapter. With the information in the treatise itself and this guide to further research, the student, or investigator, is able to find most of what he is likely to require.

"Metallurgical Calculations." By Joseph W. Richards. Part I. Pp. 208. 6x9 in.; cloth, \$2. New York, 1906: McGraw Publishing Company.

Contents. The chemical equation. The application of thermochemistry. The use of the thermochemical data. The thermochemistry of high temperatures. Thermodynamics of chemical compounds. Artificial furnace gas. Chimney draft and forced draft. Conduction and radiation of heat.

This is the first part of the great treatise by Professor Richards, which has been running serially through *Electrochemical and Metallurgical Industry*. It deals especially with general introductory matter, and a discussion of chemical and thermal principles, and general problems in combustion. To the matter which has already appeared in print, there has been added the statement of a number of problems for practice, which increase the usefulness of the work. In expressing our high appreciation and cordial approval of the highly valuable work which Professor Richards has been doing for the metallurgical industry, summarized conveniently in this book, we cannot do better than repeat certain paragraphs from his preface, as follows:

"To those who are practically conversant with metallurgical operations, no argument need be offered as to the value of properly made calculations concerning the running of a process. To those who are engaged in teaching, it need only be said that if the value of metallurgical problems as a means of teaching metallurgy is doubted, try the plan and see how wonderfully it succeeds. To artisans or students working alone, it may be said that the mastery of such problems and their working principles constitutes the practical mastery of metallurgy as a science, and leads inevitably to a strong and commanding grasp of the subject.

"If ever rule-of-thumb is to be replaced in a metallurgical process by scientific operation, the change must be based on experiments, classification of results, and calculations therefrom. The principles involved are physical, chemical and mechanical; the scientific metallurgist must master these, use them as tools, and overcome brute nature by their skilful employment.

"Every metallurgical problem is an exercise in pure logic and mathematical reasoning; the premises are observed facts—all that can be learned of the process by direct observation and meas-

urement; the conclusions desired are everything which can be deduced from the premises by hook or by crook, by direct logical process or by inference. In this way data and information are obtained which cannot be directly observed or measured, and which are of the most essential value for thoroughly understanding the process.

"To the study of this hitherto somewhat neglected and yet amazingly fruitful side of metallurgical work, the author invites the reader, and hopes that the work here presented may in itself reward everyone who spends time in reading and effort in mastering its contents."

To the above we extend our cordial assent. We know from our own experience how little there is of rational design in the laying out of metallurgical furnaces and their accessories, and how much there is of mere blind following of precedent. We know how often furnaces fail to operate to the best advantage, because of insufficient flue or chimney area in comparison with the volume of gas to be passed, and we know how, even in the highest type of regenerative furnaces, the thermal efficiency can be further increased, which means that the consumption of coal can be decreased, by a careful consideration of the ways in which heat is lost. The day of rule-of-thumb work in metallurgy is going by; the sooner it can be considered a thing of the past, the better it will be. We must measure and record what we are doing with the same precision that the book-keeper keeps his ledger of commercial accounts. It is entirely feasible to do this as Professor Richards shows. We cannot hope to make improvements until we know where are our defects. In the kind of analysis that Professor Richards outlines, and in the study of physical chemistry, are the future of metallurgy.

Professor Richards' book is not one for casual reading, but it is one that every metallurgist ought to possess, and ought to study. It will show how to avoid mistakes in practice, and it ought to be an inspiration toward improvement.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

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

Week Ended May 8, 1906.

- 819,723. EXCAVATING CUTTER.—John B. Cantwell, Watertown, N. Y. Filed March 8, 1905.
819,755. ROCK DRILL.—Henry Hellman and Louis C. Bayles, Johannesburg, Transvaal. Filed Aug. 10, 1904.
819,756. ROCK-DRILLING MACHINE.—Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. Filed Aug. 12, 1904.

- 819,899. PLANT FOR DRAWING, QUENCHING AND CONVEYING COKE.—Howard E. Mann, Cleveland, O. Filed Oct. 6, 1905.
819,978. DRILL.—Flfer Caudle, Shattuck, Okla. Filed Jan. 3, 1906.
820,031. PROCESS OF REDUCING CALCIUM OXIDE.—Thomas L. Willison, New York, N. Y., assignor, by mesne assignments, to Union Carbide Company, a corporation of Virginia. Filed Jan. 28, 1896.
820,039. PROCESS OF RECOVERING AMMONIA FROM GAS.—Edward J. Duff, Liverpool, England. Filed Feb. 10, 1905.
820,055. EXCAVATOR.—John H. W. Libbe, Toledo, Ohio. Filed Dec. 4, 1905.
820,065. DISTRIBUTOR FOR BLAST FURNACES.—Albrecht B. Neumann, Joliet, Ill., assignor of one-half to David Baker, Philadelphia, Pa. Filed Jan. 19, 1905.
820,087. DRUM MILL.—Richard Beneke, Bromberg, Germany. Filed Jan. 18, 1905.
820,088. ORE ROASTER.—Jas. W. Boileau, Detroit, Mich., assignor to Louis C. Sherwood, Detroit, Mich. Filed June 13, 1903.
820,090. MINE GATE.—Newton K. Bowman, North Lawrence, Ohio. Filed Mar. 10, 1905.
820,101. UNDERREAMER.—Edward Double, Los Angeles, Cal. Filed March 25, 1905.
820,116. CYANIDE-TANK GATE.—John Ike, Deadwood, S. D., assignor to Herbert Z. Peters, Deadwood, S. D. Filed Sept. 27, 1905.
820,133. FURNACE FOR SMELTING ORES. Eifego Riveroll, Los Angeles, Cal. Filed Oct. 10, 1905.
820,134. PROCESS OF SMELTING ORES. Eifego Riveroll, Los Angeles, Cal. Filed Oct. 12, 1905.
820,138. ORE-ROASTING FURNACE.—Ignazio Sanfilippo, Casteltermini, Italy. Filed Sept. 10, 1903.
820,189. AMALGAMATOR.—Chas. E. Gard, Ord, and John W. Lynn, Omaha, Nebr. Filed Nov. 23, 1903.
820,193. GRINDING MACHINE.—Harriet A. Higbee, Worcester, Mass., assignor to Henry D. Perky, Glencoe, Md. Filed July 8, 1904.
820,196. ARTIFICIAL FUEL AND PROCESS FOR MAKING SAME.—Stanislaus J. Hon, South Bend, Ind. Filed Oct. 6, 1905.
820,210. CUPOLA.—John H. Koons, Delphos, Ohio. Filed March 22, 1904. Renewed Sept. 14, 1905.
820,234. ORE SLIMER.—Ira F. Monell, Boulder, Colo. Filed March 9, 1905.
820,236. PROCESS FOR THE UTILIZATION OF PULVERULENT FUEL.—Aman Moore, Portland, Colo. Filed July 12, 1905.
820,237. GAS-WELL APPARATUS.—Fred J. Moser, Kane, Pa. Filed April 8, 1905.
820,283. PROCESS AND APPARATUS FOR SEPARATING MIXED GASES.—Charles Clamond, Paris, France. Filed Aug. 31, 1905.
820,288. BRIQUETTING MACHINE.—Constantine Demetrak, San Francisco, Cal., assignor to American Briquetting Co., San Francisco, Cal., a corporation of California. Filed Sept. 30, 1903.

GREAT BRITAIN.

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

Week Ended Apr. 23, 1906.

- 6784 of 1905. AGGLUTINANT.—Lord Armstrong, Newcastle-on-Tyne. The use of brewers' refuse as a binding material for briquetting coal and iron ores.
7004 of 1905. ELECTRIC FURNACE ELECTRODE.—A. Reynolds, London. In electro-metallurgical furnaces, using an electrode of a conductor encased in a shield of highly refractory and non-conducting material, such as magnesite or silicic acid.
8382 A of 1905. COAL CUTTER.—Baddely, Stringer & Dugdale, Wakefield. In coal cutters of the disk type, improvements in the traverse gear.
13,018 of 1905. CONVEYOR TRAP.—J. Shaw, Pontefract. In belt conveyors used in washing coal, a series of traps for catching material heavier than coal and conveying it away.
19,638 of 1905. ELECTROLYTIC COPPER REFINING.—W. Borchers, F. E. Gunther and P. R. Franke, Aachen, Germany. Improved process for electrically refining rich copper matte.
3252 of 1905. ZINC REFINING.—J. Callmann and R. Bormann, Berlin. A continuous process for refining zinc produced in the distillation furnace.

Personal.

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

P. P. Hamilton, of Tucson, Arizona, is in Mexico on business.

Guy Elmore, of Joplin, Mo., was a visitor in New York recently.

Dwight E. Woodbridge, of Duluth, Minn., has been at Butte, Montana.

P. R. Forbes, of New York, is attending to his mining interests in Oaxaca, Mexico.

R. H. Rose, of Globe, Arizona, has been at Duluth, Minn., on professional business.

Andrew Carnegie has given \$100,000 to Lehigh University to build a dormitory for students.

Rensselaer Toll, of Mancos, Colo., is examining mining property in the Cripple Creek district.

George R. Dabney, of Newport News, Va., has been examining mining properties in Durango, Mexico.

J. V. N. Dorr has just returned to his home in South Dakota, from a visit to Salt Lake City and Denver.

Frank R. Field, of the Jeffrey Manufacturing Company, of Columbus, Ohio, was in Salt Lake City recently.

B. B. Thayer, assistant to President H. H. Rogers, of the Amalgamated Copper Company, is in Butte, Montana.

F. M. Simonds and E. Z. Burns, mining engineers of New York, are in Mexico on professional business.

W. H. Staver, a mining engineer of Chicago, has been at Idaho Springs, Colo., in the interests of Ohio investors.

W. J. Calkley, manager of the Peñoles Mining Company, of Oaxaca, Mexico, is in the United States on business.

A. G. Brownlee, manager of the Stanley Mine Company at Idaho Springs, Colo., is making a business visit to the East.

J. W. Boyd, a well known mining man of Idaho Springs, Colo., has returned after a visit to Wyoming and Idaho.

John G. Kirchen, consulting engineer of the Oregon Smelting and Refining Company, Sumpter, Oregon, has resigned.

Daniel M. Burns, general manager of the Candelaria mines at San Dimas, Durango, Mexico, is in San Francisco.

Harold C. E. Spence, of Steeple Rock, N. M., sailed from New York last week, on a business trip to London and Paris.

H. M. Layne, of Butte, Montana, has accepted a position with El Oro Mining and Railway Company at El Oro, Mexico.

G. Aarons, of London, England, is at Black Hawk, Colo., looking after the Clay County mine in Gilpin county, Colorado.

J. R. Elgan, of the New Era Mining Company at Idaho Springs, Colo., is ab-

sent on a business visit to New York and Eastern points.

Abbott Morris, of Norfolk, Va., has returned to the United States, after investigating some mining properties in Durango, Mexico.

L. J. Mountz, of Apex, Colo., manager of the Imperial Mining Company, is making a business visit to Kansas City and other Missouri points.

Frank Jenkins, mine superintendent of El Oro Mining and Railway Company, has returned to Mexico from a visit in the United States.

David Kennedy, of Georgetown, Colo., is making a business visit to Eastern points in the interests of the Kennedy Gold Mining Company.

W. H. Davis, manager of the Monarch Consolidated Mining Company in Boulder, Colo., has been looking after some mining interests in New Mexico.

G. Weaver Loper, a mining man of New York City, is at Republic, Wash., examining the Anonymous mine, in which he has a financial interest.

D. W. Shepard, manager of the Anglo-Saxon Mining Company operating at Georgetown, Colo., is making a business trip to St. Paul, Minn.

S. A. Worcester has returned to Victor, Colorado, from a professional visit to the Liberty Bell Gold Mining Company's properties at Telluride, Colo.

O. B. Thompson, manager of the Fifty Gold Mines Corporation, operating in Gilpin county, Colo., left this week on a business visit to New York City.

F. O. Blackwell, of New York, consulting engineer for the Mexican Electric Light and Power Company is in Mexico in the interests of the company.

H. P. Lewis, vice-president and general manager of the National Metal Company, has returned to Mexico from a flying trip to the United States.

E. A. Jackson and C. C. Todd, of Houston, Texas, have been looking at their mining interests in the Eldora section of Boulder county, Colorado.

George Vivian, who has been mining in Mexico for several years past, has returned to look after mining interests in the vicinity of Georgetown, Colorado.

W. K. Hatt has been appointed professor of civil engineering at Purdue University, Lafayette, Ind., to succeed W. D. Pierce, with the University since 1893.

Chas. Kirchen, metallurgist at the Oregon Smelter, Sumpter, Oregon, has resigned, in order to take charge of a smelter in California for the Guggenheims.

T. F. Schwartz, a well known mining engineer of Denver, has been making examination of mining property in Gilpin county, Colo., in the interests of Chicago capitalists.

Alfred Frank, consulting engineer for F. A. Heinze, left Butte, for Bingham, Utah, May 3 to represent Mr. Heinze in the Bingham property, in which the latter is heavily interested.

T. Worth Bowen, who had been with the Federal Mining and Smelting Company since 1904, has accepted the position of superintendent of the Nevada Company's mines at Berlin, Nevada.

C. F. Moore, of Salt Lake City, chief engineer for the Pachuca and Real del Monte mines, in Pachuca, Mexico, has returned to Salt Lake, after a thorough investigation of the Mexican properties.

B. T. King, who is interested in copper mining enterprises in Montana, has returned to Butte, from a visit to Patrick Clark's Furnace Creek property in Inyo county, Cal., and mining districts in Nevada.

Hallet R. Robbins, has accepted a position with an English gold mining company operating in Korea. He is at present accompanying a prospecting party in the mountains in the northern portion of Korea.

Thomas W. Gibson, for many years director of the Ontario Bureau of Mines, has been appointed Deputy Minister of Mines for the Province. Mr. Gibson has done excellent work, and his promotion is well earned.

Donald R. Morgan, of Monterey, Mexico, has resigned as superintendent of the mining department of the Compania Metalurgica de Torreón, Mexico; but remains with the company as consulting engineer.

Nick Treloar, manager of the Yampa mine and mill in Bingham, Utah, and the Britannia mine in British Columbia, spent May 8 and 9 in Butte, Montana. Mr. Treloar was formerly in charge of the Rarus mine in Butte.

Alfredo Lotti, formerly director of the works of the Société des Bormettes, at La Londe, Var, France, is now the director of the Société "Elba" at Follonica, Italy. He continues to be consulting engineer to the Bormettes company.

William Fleet Robertson, provincial mineralogist, British Columbia, has been elected a member of the council of the American Institute of Mining Engineers. He is the first non-resident of the United States to have that distinction conferred upon him.

G. B. Wilson, formerly consulting engineer for the Chinese Engineering and Mining Company, Ltd., of Tientsin, China, has been retained by the American Smelting and Refining Company as consulting engineer for its Utah-Nevada branch, with headquarters at Salt Lake City.

S. J. Mertz, who holds a position with the Carnegie Steel Company, has been visiting the Grand View mine and mill at Loomis, Wash., and has returned to

Pittsburg, Penn. J. W. Morgan, of Sharon, Pa., and Dr. W. W. Lewis, of Prescott, Arizona, are visiting this property, in which all three are interested.

Madame Curie, the co-worker and widow of Pierre Curie, who was recently killed in Paris, has been appointed to the chair of chemical research in the Sorbonne, Paris, formerly occupied by her husband. Mme. Curie is the first woman to hold a professorship in the Sorbonne, and in this appointment the ancient institution has recognized her work in the discovery of radium.

Horace V. Winchell, of Butte, Mont., whose resignation as chief geologist of the Amalgamated Copper Company, to accept a similar position with the Great Northern Railway Company, was mentioned by us in a recent personal note, does not entirely sever his connection with the Amalgamated company, inasmuch as he remains therewith as consulting geologist. Mr. Winchell has been largely instrumental in developing mining geology as a practical science, and it is pleasant to note that he is entering upon a new and broad field, while at the same time retaining his connection with the old one, the work being done at that institution.

Obituary.

Frederic Claudet, metallurgist and assayer, of London, died at Cannes, France, April 19, aged 80 years. Mr. Claudet had not taken any active part in his profession for 20 years, and the business he has founded has been carried on by his son, Arthur C. Claudet, who is, this year, president of the Institution of Mining and Metallurgy. The late Mr. Claudet was the inventor of the modification of the Henderson process, in which he used potassium iodide as a precipitant of silver from sodium chloride solutions. This process is too expensive nowadays, and has never been used with success in the United States, but we believe the inventor made a large sum of money by its use in early days.

Israel Cook Russell, chief of the department of geology of the University of Michigan, died May 1, of pneumonia. Professor Russell was well known, not only from his many publications in connection with the United States Geological Survey, but also from his works on the volcanoes, the lakes and the glaciers of North America. He was educated at New York University and Columbia, serving later as assistant professor of geology at the Columbia School of Mines. He had a long and fruitful practical experience, acting as geologist for the series of reports called "West of the 100th Meridian." He was prominent in a large circle of geologists; and his death is a distinct loss, not only to his profession but also to the world of education and science at large.

Sir David Dale, of West Lodge, Darlington, England, died in York, April 29, at the advanced age of 77 years. He was one of the most prominent of the iron smelters and colliery owners in England, and a man of great wealth. He was born in 1829 at Moorshedabad, Bengal, where his father was judge. As a youth he entered the offices of the old Stockton & Darlington Railway, became afterward one of the partners in the Shildon Works Company. In 1872 he became managing partner of Joseph Pease & Partners' colliery and of J. W. Pease & Co.'s iron mines. When these were converted into a limited company, Sir David Dale was vice-chairman, succeeding to the chairmanship on the death of Sir Joseph Pease. He was also chairman of the Consett Iron Company, the Consett Spanish Ore Company, the Oconera Iron Ore Company, the Dunderland Iron Ore Company and the Weardale & Consett Water Company, and a director of the North-Eastern railway and the Barrow Hematite Steel Company. He was one of the founders of the Board of Conciliation and Arbitration for the Manufactured Iron and Steel Trades of the north of England; in 1869 he was its first president, and afterward for many years the official referee. Up to 1895 he was the honorary treasurer of the Iron and Steel Institute, and was elected president in 1895-7. He was a prominent member of the Durham Coalowners' Association, the Cleveland Mineowners' Association and for many years chairman of the Durham Coal Trade Conciliation Board. He served on the Royal Commissions on Depression of Trade, Mining Royalties and Labor, and was one of England's representatives at the Berlin Labor of Conference in 1890.

Societies and Technical Schools.

Colorado Section Western Association of Technical Chemists and Metallurgists—At the last meeting the Committee on Uniformity in Methods of Analysis made its first formal report. As a whole, the results, covering determinations of copper, lead and zinc in a complex ore, may be considered satisfactory. The values of the different metals, as reported by various analysts, were fairly uniform. The committee adopted as its standard, the determinations of the Bureau of Standards, which were obtained by the use of several different methods. The chairman of the section, Dr. F. W. Trap-hagen, tendered his resignation because he expected to be absent from Denver for a considerable time. Dr. W. D. Engle, professor of chemistry in the University of Denver was elected to fill the unexpired term.

Appalachian Engineering Association—The association held its regular quarterly meeting at Holden, W. Va., on May 5, where the members of the association and their visitors were most generously and

hospitably entertained by the officers and associates of the United States Coal and Oil Company. The afternoon was spent in an inspection of the plant and mines of the company. The meeting was held in the evening in the opera house, J. F. Kent, of Dingess, W. Va., president. Dr. I. C. White, State Geologist, of Morgantown, W. Va., was present as a visitor, and was unanimously elected an honorary member. Dr. White, after thanking the association for the honor conferred upon him, gave a very interesting outline of the history of the West Virginia State Geological Survey, the benefits to be derived therefrom and the vital necessity for the earnest support of all, more particularly of the scientific and professional fraternity, with whom it was really in the nature of a duty. Dr. White was heartily supported by G. C. Wilkins, of Pittsburg, Penn., and by Professor Boughton, of the State University at Morgantown. Prof. W. H. Boughton, who is head of the Civil Engineering Department at the University, gave a clear and concise outline of the work being done at that institution.

W. G. Wilkins, consulting engineer, who had charge of the planning and erection of the Holden plant, gave an informal talk on the subject of "Consulting Engineering." After pointing out the great savings and advantages of proper plans, Mr. Wilkins presented some interesting cases in point. A paper on the "Polar Planimeter" was presented by H. L. Handly, of Washington and Lee University. It will be issued in printed form as one of the regular bulletins of the association.

A vote of thanks was then extended the company, its officers and associates for their hospitality. Welch and Charleston were spoken of as a location for the next meeting, which will take place in August or September, but no decision was arrived at.

Industrials.

The Stanley-G. I. Electric Company's temporary headquarters in California are at 67 Blake Block, Oakland.

The office of Smith, Emery & Co., chemists and chemical engineers, of San Francisco, is temporarily at 1104 Broadway, Oakland.

In order to secure adequate quarters, the Electric Cable Company, formerly at 42 Broadway, moved May 1 to 17 Battery Place, New York.

The controlling interest in the Engineering Agency, Incorporated, Chicago, which was organized in 1893 by Frederick A. Peckham, has been purchased by A. G. Frost.

"Albany" grease, made by Adam Cook's Sons, New York, has been successfully used for lubricating bearings of a high-speed turbine shaft at the Maxfield mine, Argenta, Utah.

The Byron Jackson Machine works were completely destroyed in the San Francisco conflagration. They will be rebuilt at an early date. Temporary offices have been opened at No. 18 Telegraph avenue, Oakland.

The Abner Doble Company, San Francisco, having lost its office and shops, has opened temporary offices at 2611 Broadway, and has permanent shops under construction at Seventh and South streets, which will be equipped for work.

The Crane Company's San Francisco store was entirely destroyed. The company's Oakland branch, however, was not injured. It carries a varied stock, which is equal to immediate demands, and additional supplies are being hurried from the eastern branches.

The Pacific Tank Company, of San Francisco, reports that its mills escaped destruction, and that, having 150 cyanide tanks on hand, it will be prepared to resume business as soon as the military authorities withdraw their restrictions. The company's temporary office is at 518 Eleventh street, Oakland, Cal.

William Clegg, Jr., who has been special agent of the Westinghouse Electric and Manufacturing Company, in the St. Louis territory, has just received the appointment of acting manager of the St. Louis office. D. E. Webster, formerly manager of the office, has been transferred to Chicago. J. S. Tritle has been appointed acting manager of the new district office of the company in Kansas City, Mo.

John A. Traylor & Co., of Denver, Colo., have completed the 60-ton cobalt concentrator for the Standard Consolidated Mines Company, of Oregon, and the mill was started on April 17. This mill is equipped with steam power, crushers, Elspass mills, Wilfley tables, Traylor screens and pumps. A Bartlett table is used for separating the concentrates of cobalt and copper resulting from the concentration on the Wilfley tables. This firm also reports a number of sales of their Imperial screens.

The Westinghouse Electric and Manufacturing Company reports recent orders for 55 electric locomotives. The Youghiogheny & Ohio Coal Company, Cleveland, has ordered 5; the Ziegler Coal Company, Zeigler, Ill., 3; Berwind-White Coal Mining Company, Windber, Penn., 4; Copper Queen Consolidated Mining Company, 12; Mammoth Copper Mining Company, of Mayville, Cal., 1; Seattle-Boston Copper Company, of Seattle, Wash., 1; the Pennsylvania Salt Mfg. Company, Natrona, Penn., 3; Pocahontas Colliery Company, of Pocahontas, Va., 3; Tennessee Copper Company, of Isabella, Tenn., 3.

Producer gas power has been adopted by the Norton Emery Wheel Company for extending its present steam plant at Worcester, Mass. The horizontal, double-acting, heavy-duty type gas engine built by

the Westinghouse Machine Company, of Pittsburg, has been adopted, with Loomis-Pettibone producers using bituminous coal. The new gas engine will be 500 h.p. rated capacity, direct-connected to a Westinghouse 250-volt 300-kw. generator running at full speed of 150 rev. per min. This unit will operate in parallel with two belted steam units, the entire plant supplying current to the various motor drives in the factory, and also for lighting.

The Colorado Iron Works Company, Denver, reports the following shipment of milling and smelting equipment; Ross Mining Company, Silverton, Colo., 12 mounted slag cars, one combination trap spout for smelter; S. S. Fowler, Nelson, B. C., one Simplex table; St. Joe Lead Company, Bonne Terre, Missouri, 4 pneumatic ore gates; Boise Gas Light Company, Boise, Idaho, 3 impact screens; American Smelters' Securities Company, laboratory crushing rolls for Matehuala, La Paz, Mexico; Federal Mining and Smelting Company, Wallace, Idaho, set of 27x14-in. Humphrey rolls; five dome-top, ball-bearing turntables for Japan; Arizona-Mexican Mining and Smelting Company, Needles, Cal., one three compartment set jigs.

Trade Catalogs.

Receipt is acknowledged of the following trade catalogs and circulars:

Garvin Cyanide Extraction Company, 186 Morrison St., Portland, Oregon. Bull. No. 2, Pp. 16, illustrated; paper, 6 by 9 in. 1906.

The Vulcan Iron Works Company, Toledo, Ohio. Catalog "D", Steam Shovels and Dredges; Pp. 23, illustrated; paper, 5 by 9 in. 1905.

R. L. Boyle & Co., Keller, Wash. Catalog, Report of the Progress of the Keller Industries; Pp. 16, illustrated; paper, 5 by 9 in. Jan. 25, 1906.

George Anton & Bros., Foot of Seventh St., Monongahela City, Penn. Catalog of the Star, Globe and Miners' and Drivers' Lamps; Pp. 14, illustrated; paper, 5 by 7 in.

Gardner Machine Company, Beloit, Wis. Catalog, "Gardner's Improved"; Pp. 9, illustrated; paper, 6 by 9 in. Bull. A-4, Opening a new field; Pp. 6, illustrated; paper, 6 by 9 in.

The D. T. Williams Valve Company, 904-910 Broadway, Cincinnati, Ohio. Catalog and price list; Pp. 60, illustrated; paper, 6 by 9 in. 1906. Catalog, Cookson Steam Traps; Pp. 16, illustrated; paper, 6 by 9 in.

Allis-Chalmers Company, Milwaukee, Wis. Catalog No. 9, Concentrating Machinery; Pp. 119, illustrated; indexed; paper, 6 by 9 in. Bull. No. 1702, Carriage Feeds; Pp. 11, illustrated; paper, 8 by 11 in. December, 1905. Catalog No. 127, Sampling Plants and Equipment; Pp. 54,

illustrated; paper, 8 by 11 in. Catalog No. 122, Accessory Equipment; Pp. 55, illustrated; indexed; paper, 8 by 11 in. Catalog No. 126, Hoisting Engines and Accessories; Pp. 78, illustrated; indexed; paper, 8 by 11 in. Bull. No. 1409, McDougall Roasting Furnaces; Pp. 8, illustrated; paper, 8 by 11 in. Nov. 1905. Bull. No. 1407, The Bennetts Pouring Spoon; Pp. 4, illustrated; paper, 8 by 11 in. Nov. 1905. Bull. No. 1404, McDougall Roasting Furnace. (Inclosed Fire Box Type); Pp. 4, illustrated; paper, 8 by 11 in. Oct. 1905. Bull. No. 1403, The Hancock Jig; Pp. 12, illustrated; paper, 8 by 11 in. Oct. 1905.

Construction News.

Georgetown, Colorado—The owners of the Clift mine propose to put in machinery. Charles Estell, Georgetown, Colo., is manager.

Goose Creek, Oregon—It is proposed to build a matte-smelting plant on the Cox claims in the Goose creek district in Baker county. C. C. Cox, Baker City, Oregon, is manager.

Yankee, Colorado—The Oro Verde Mining Company is talking of putting in a concentrating mill of 50 tons daily capacity. G. P. Goodier, Yankee, Colo., is manager.

Kennebec Gulch, California—The Mountain Craggy Company proposes to put up a five-stamp mill on the Ely group. James H. Tibbitts, Yreka, Cal., is superintendent.

Punch Creek, California—The Mono Mining Company intends to add five stamps to its mill at the Mono mine, in Punch Creek district. The company's address is at Yreka, California.

Pluma, South Dakota—The Horseshoe Mining Company will put in an electric plant and a tramway, also electric, at its Snowstorm shaft. The Consolidated Power and Light Company, at Pluma, will do the work, and will need material.

Loomis, Okanogan County, Washington—Plans are talked of for an aerial tramway from the top of Palmer mountain to Sinlehekin valley, as soon as the Washington & Great Northern railway extends a branch of the Victoria, Vancouver & Eastern to Loomis. It is probable that the Copper World and Copper World Extension mining companies will join in the construction. Address both at Loomis.

Nighthawk, Okanogan County, Washington—The Prize Mining and Milling Company will install an additional Wilfley concentrating table. Address H. E. Dunham, manager.

A 40-h.p. boiler, air compressor and power drills are to be installed at the Mountain Sheep mine, and perhaps a gasolene engine. Address Peter Berg, Nighthawk, Washington.

Special Correspondence.**Butte.** May 12.

North Butte is branching out. Since its organization it has been gradually acquiring additional territory and now has an area that makes it a prominent factor in the production of copper. Its latest acquisitions are the Lynchburg and the John Emmit claims, which adjoin the Berlin on the east. It paid \$100,000 for the former and \$50,000 for the latter. Among the mines now owned by the company are the Speculator, Jessie, Miners' Union, Edith May and the Berlin group of five claims, with the new purchase. It has ore in the first four named, and is reported to have struck a vein in the Berlin group. The company is now producing between 900 and 1000 tons of ore a day, and expects to double this quantity inside of 60 days, when its new hoisting engine is in operation. The engine is going into place rapidly under the direction of Steven Blovaunt, erecting engineer for the Nordberg Machinery Company, who has sent here to put up this engine, also the one at the Leonard for the Boston & Montana. All of the machinery for both has been delivered. These engines will work to a depth of 3500 ft. of shaft.

Butte Coalition is not making much headway with its crosscut between the 1800-ft. level of the Diamond mine and the Valdemere, one of the east claims of the Alice group. The face of the opening is in more than 4000 ft., but the rock is hard and the gas generated by powder smoke interferes with the work. It is estimated that the cut is within 300 ft. of the Valdemere vein.

Amalgamated is maintaining its lead in ore production and will soon increase its output. It is considering the placing of a new hoisting engine on the Pennsylvania mine and the resumption of operations through the shaft of the Berkley, which property was once a large producer, but had to be closed on account of litigation with F. A. Heinze. The Washoe smelter is receiving more than 8000 tons of ore a day. It can handle more.

Original Consolidated, a Clark asset, is not doing much at its plant, but the mines are giving the Washoe between 300 and 400 tons of ore a day. A new furnace is building in the plant. It is about ready to be tested.

East Butte Copper has finished its shaft to a depth of 350 ft. by upraise and is sinking. Tributaries are still working in all holes save the main shaft. They are taking some good ore from the upper levels. The veins are small.

Butte Coalition is extracting a lot of ore from its claims and will eventually increase the production materially. It has announced its intention of keeping the old plant of the United Copper Company in operation.

Joseph A. Coram, the organizer of the American Consolidated Copper Company,

has bought the interests of F. A. Heinze and the Davis heirs in the Davis estate mines, and will add them to the assets of the company. There are about 14 claims, some of which are considered good. Mr. Coram is in Utah, but is expected in Butte May 10 to complete arrangements for beginning work on the properties.

Reins copper is finishing its station on the 1200, and Raven is mining between 100 and 200 tons of ore a day. The latter has large ore reserves blocked out on the 1500 level and will increase shipments to the Washoe as soon as the railroad company receives its new cars.

Salt Lake City. May 12.

The Daly Judge mine led all other Park City producers last week in shipments; sending out 1,688,000 lb. of crude ore and concentrate, and in addition 473,000 lb. of zinc middlings. The Silver King mine was the next heaviest producer, with 1,579,000 lb. of crude ore and concentrate; the Daly West sent out 1,500,000 lb., and the Kearns-Keith, 64,000 lb. of ore.

The deal that has been pending for consolidation of the Comstock and California mines at Park City has been consummated; resulting in the organization of the C.-C. Consolidated Mining Company, with a capital stock of \$1,000,000, of \$1 each. H. A. McCornick is president; W. F. Snyder, vice president; S. A. Whitney, treasurer; Gideon Snyder, secretary. All are of Salt Lake City.

The shareholders of the Woodside Mining Company are to meet at Park City May 28, to consider the transfer of all the company's real estate. To whom, has not yet been divulged.

Although nothing official has been given out to that effect, it seems to be quite generally conceded in Salt Lake that F. Augustus Heinze is now a controlling factor in Bingham Consolidated affairs. It is said this company's smelter at Bingham Junction is to be thoroughly overhauled and modernized.

The foundations for the first section of the Utah Copper Company's Garfield concentrating mill are finished, and the raising of steel for this building will begin next week. The excavations for the second unit of 3,000 tons daily capacity, which is to be a duplicate of the first section, have begun. According to the contract, the first unit is to be under cover June 1. The office, machine shop and power-house are finished and equipment is being installed.

The Daly Judge Mining Company has paid off \$129,000 of the bonded indebtedness. It still has outstanding \$80,000 bonds. These will be called in before June 1.

The Draper Coal Company has been organized to operate coal deposits near Draper, Utah. H. W. Brown, of Draper, is president.

The Lost Packer mine in the Loon creek district, Idaho, has been bonded to

J. A. Czizek, of Salt Lake, and associates, for \$1,000,000. The Lost Packer Mining and Smelting Company has been organized.

On account of delay in the laying of track on the spur, which will connect it with the main line of the Oregon Short Line Railroad, the construction of the smelter near Ogden, by the Utah Smelting Company, has been retarded.

The Nevada Consolidated Mining Company, operating at Ely, Nevada, has established headquarters in the Dooly block, Salt Lake City. Heretofore the company has maintained offices in San Francisco. It is announced that the concentrating mill to go up at Ely is to be increased to 3,000 tons daily capacity.

The Tintic Mining & Development Company, owner of the Yampa mine, at Bingham, has completed the purchase of a right of way for an aerial tramway 12,000 ft. long, which is to connect the mine and smelter in Lower Bingham.

At the new Garfield smelter of the American Smelting and Refining Company, the bins are now being filled with ore, and by the middle of June a supply will be on hand.

The Yampa Smelting Company, at Bingham, has placed an order for five additional McDougall roasters, making 11 in all at the plant. There are also two Edwards roasters in operation.

Cripple Creek. May 14.

There is still considerable talk of the commencement of the drainage tunnel, but so far nothing definite has been arranged for as to the time of beginning work.

The directors of the Doctor-Jack Pot this week declared a dividend of one-half cent per share on the outstanding capitalization of 3,000,000 shares, making \$15,000 to be distributed among the stockholders. No work is being done at present on company account, but considerable work is being done by lessees. The Smith-Altman lease, which has produced a large amount of ore for some time past, was extended for two years with the proviso that the shaft should be immediately deepened from 700 to 800 ft. The company is controlled by McAllister & Gandy, of Colorado Springs. The Marsh & Hodges lease on the Work property continues to ship a large quantity of good ore. This is on the Little Clara, and is being operated through the Gold Exploration tunnel.

The principal part of the holdings of the Rocky Mountain Gold Mining Company were sold this week to Gehm and associates to pay the indebtedness of the company, which is about \$11,000. The price paid for the property was \$11,010. Some time ago an effort was made to raise the money from the stockholders of the company, but without success.

Socorro, N. M. May 5.

If the talk of building a railroad from the south into eastern Socorro county ma-

terializes, it will enable those who are now insisting that the copper resources of the Mogollon district excel those of Bisbee or Clifton, to prove their statements to the world at large. The few mines equipped with concentrators are now shipping, but much quiet development work is being done by other owners, who do not care to ship at the present high freighting cost, and have money enough to await the railroad's arrival.

Shipments from Kelly have been increasing of late. Jacobson & Co., of Denver, are now working the whole Kelly mine on a lease from the Tri-Bullion Company, the owners, and employ about 85 men, who get out most of the four to six carloads of ore that leave the camp daily. The Graphic mine is shipping little, preferring to wait to enjoy the economy in extraction cost, that the completion of its new adit will insure. This adit is being pushed with air drills, and not long ago cut a water stratum that flooded the tracks; if such a flow persists all the year, it will abolish the water scarcity, which has hitherto been a drawback to the camp.

George Christlow, a prospector around Kelly since the middle eighties, recently sold three claims to Missouri capitalists for a good sum. He retained a third interest, and now has charge of the active development work inaugurated by the owners. The only cloud on the Kelly horizon is the one that appears usually in a Western mining camp when it is proved valuable. I refer to title litigation. It might be thought that flat non-continuous bedded deposits, such as these, would give little hope to the backers of the apex bugaboo, but till a test case has been settled in court, the doubt, caused by the well known ambiguity of the mining law, is apt to retard new development.

In western Socorro county, the Sierra Oscura mountains contain what may some day become a southwestern Menominee range. The ore lies in the Jones and the Ojo de Dios districts, on both sides of great igneous dikes; the minerals are chiefly magnetite and hematite, with much of good bessemer grade. The orebodies occur along one dike at intervals for 10 miles, and some of the prominent outcrops are 300 ft. long by 60 ft. thick. If the plans of the Santa Fe Central people for a railroad from Willard, N. M., to El Paso had not been thwarted by the Enterprise bank failure, this ore would soon have been on the market; for the range lies only four miles on an easy grade from the railroad as surveyed.

Twelve miles east of Roswell, drilling for oil has been begun by the Roswell Oil Company. The hole was started 24 in. diameter, with the intention of reaching a depth of 3000 ft. before giving it up without striking oil. As yet no producing oil region has been developed in the territory; though several places are likely geologically, their remoteness has prevented development.

Joplin, Mo. May 12.

A company of Carthage and Joplin parties, who have been prospecting on the Phelps, Davey & Brinkerhoff land situated about a half mile east of Duenweg, have encountered a good run of lead in a drill hole at a depth of 160 ft. Drilling will be continued.

A company, composed principally of Milwaukee parties, is opening up a good lead and zinc prospect on T. C. Carey 50-acre tract at Villa Heights.

A drill discovery has been made at Springfield on the J. P. Reit farm, five miles west of the city.

A company of Joplin prospectors operating on the Cunningham land in Joplin, has encountered ore at a depth of 40 feet.

B. Smith, owner of a tract of land near Peoria, I. T., has struck zinc ore in a shaft at a depth of 40 feet. He will immediately proceed to open up what he hopes will be a new mining district.

A party of Galena men who recently took a lease on some lots on the Joplin-Consolidated Mining Company's land north of the city are opening up a good lead prospect at a shallow depth.

The Mutual Mining & Prospecting Company, composed of Carthage men, has made a strike in a drill-hole on its lease on the Teel land at Porto Rico.

The McAboy & Reno lead mine at Duenweg, has been sold to E. Z. Wallower, of Harrisburg, Pa.; Ward Frey and Dave Sayers, of Joplin, for \$51,000. This is a lead property.

Platteville, Wis. May 12.

The Kearns Mining and Development Company was organized last month to operate in the vicinity of Benton. The leases controlled are considered valuable, and consist of the Kearns, Flynn and adjoining lands. J. V. Swift, of Benton, is at the head of the company.

The management of the Kennedy mine, near Hazel Green, is installing a 10-drill Ingersoll compound steam air compressor.

The Dall mill has resumed operations under the management of Chas. Burroughs, one of the principal owners. Just previous to shutting down several important changes were made in the roasting and separating plant. The mill is now averaging 30 tons cleaned concentrates per shift of 10 hours.

A report from Carroll county, Ill., states that there is good prospects of a drilling company being formed to look for zinc. Years ago considerable lead was found in the hills surrounding Mt. Carroll.

The John Ross mine re-organized last week. The new company intends to install machinery at once, including compressor, hoist and gasolene engine. It is owned principally by Mineral Point business men.

The Milwaukee-Highland Mining Company has let a contract to the Galena Iron Works Company for a concentrating

plant, to be operated by a Corliss engine. One of the drawbacks of this mine is the lack of water. It will be necessary to drill a deep well in order to secure enough to clean the ore.

The biggest strike of the week was made at the Flat Sheet mine, near Galena camp. The drillings upon assay showed 40 per cent. blende.

Work will be started at once on the foundations for the 60-ton concentrating plant that is to be erected for the Cook Mining Company at the Cuba City camp. It is to be of the Galena-Platteville type.

Duluth. May 10.

As the result of the combination of firemen's and Lake Erie longshoremen's strike for minor recognition, every iron ore shipping port is ceasing business and every upper lake mining district is quiet. Underground mines in general are still busy as ever, and are stocking ore with speed, but the Mesabi open-pit mines are all idle, all shovels in stocks at other points are down, and every iron-ore road has cut off its extra equipment and is running road and docks with the smallest crews possible. Ore receipts at Duluth, which had reached from 50,000 to 60,000 tons per day, are now but a mere dribble. At Two Harbors they had been cut at the close of the week to less than 25,000 tons daily, with a surety of a far deeper cut the coming week, if the strike is not settled at once. There is some talk of all-rail shipments of ore, but this is generally considered far too costly. The strike is not expected to last very long, and there may be a settlement in a few days. The trouble, while serious enough in its way, will be a factor in maintaining quiet on the ranges during the remainder of the season.

The big Hoover & Mason ore-grab installed at the Grant mine, Mesabi range, is being tested this week and should begin mining surface very soon.

In the Menominee district, at Iron Mountain, the Dessau Company has cut bessemer ore in its new workings at the Millie end of the Pewabic mine. This ore runs about 50 per cent. iron and the company thinks there is a considerable deposit.

The Pewabic Iron Company has started its concentrating plant, which has been idle for the past seven years, and proposes to treat a large quantity of lean ore that has been unmerchantable. In times past the Pewabic has experimented extensively with the concentration of part of its ore, and has succeeded both from the mechanical and metallurgical points of view. The ore treated has been found in small lenticular masses, intermixed with a gangue of sandstone, and the process of concentration is entirely wet mechanical, for crushing and the washing out of the sandstone. There is a jaw-crusher first, followed by cornish rolls, and the ore is passed through jigs and the lighter material

washed out. About a third of the material washed comes out as high-grade bessemer ore. As the ore is cheaply mined and the process of concentration is easy, it is possible when ore brings a good price to utilize it.

At Crystal Falls the Kimball exploration is being re-timbered and sinking has been carried on so that the old shaft is straightened out. The same company is working at the Baker, and has the shaft ledged in a formation that runs about 40 per cent. iron. This shaft has been in very difficult sand, and has been put down in excellent time under severe conditions. At the Tobin, also belonging to Corrigan, McKinney & Co., the old Tobin shaft is now used to the exclusion of the Hennepin, which has been the main hoisting avenue for several years. Ore cut under the Hennepin, and it had to be abandoned at once. The Fairbanks property is now shipping some ore, and will make a small product this year. All ore shipped is that taken out in the course of development of the mine.

Calumet, Mich. May 12.

Michigan mines produced practically the same amount of refined copper in April as they did in March. The product last month was 18,700,000 lb. of ingot copper. As lake brands averaged a good price last month, the April output sold for approximately \$3,480,000. Undoubtedly last month's output of the Michigan district would have been a record breaker had it not been for the fire in the Tamarack, which necessitated the suspension of work at three shafts.

Within a few days the permanent Nordberg hoisting engine at No. 8, or Mesnard, shaft of the Quincy Mining Company will go into commission, and by the end of the month it is expected the daily rock shipments from that source will average 750 tons. Within another month the product will average 1000 tons daily. There will be a corresponding decrease from Nos. 2 and 6 shafts.

The Calumet & Hecla Mining Company is shipping copper by rail, something very unusual at this period of the season. This action is necessitated by the strike on the Great Lakes.

After much delay the new air compressor for No. 2 shaft of the Baltic mine has been delivered and is now being installed. It is expected that No. 2 shaft will be able to start producing in July, when an increase of nearly 20 per cent. in the mine's total production will be possible. No. 2 shaft penetrates ground which compares favorably with the average of the mine in copper contents.

At the Globe property, which adjoins the Champion mine on the south, and part of which is under option to the Copper Range Consolidated Company, the exploratory shaft has reached a depth of 150 ft. Work is difficult, owing to the overburden, but it is expected that the

shaft will be bottomed on the ledge shortly.

The Winona Copper Company has let a contract for a new air compressor, which will be used jointly by it and the King Philip, which is under the same management. As soon as it is ready for service the Winona will increase its underground force and prosecute development work in the bottom levels of No. 3 shaft, where the showing is encouraging. A steel shaft and rock house will be erected at No. 3 to replace the frame structure there now, and it is planned to resume production as soon as practicable. Arrangements will be made with the Adventure or Atlantic for the services of one stamp-head at either of these mills.

An innovation in local methods in the Lake Superior copper district is about to be made by the Calumet & Hecla. This corporation uses many millions of feet of timber annually in its work on surface and underground, the cost of the material constantly increasing owing to the growing remoteness of available supplies. Experts have been engaged and steps will be taken toward the re-forestation of some of the cut-over lands owned by the company in Keweenaw county. The company owns an immense area of denuded timber lands, and possibly the re-forestation work will be enlarged to include all of these tracts.

President Alexander Agassiz, Q. A. Shaw, Jr., and R. L. Agassiz, of the Calumet & Hecla, were in Calumet several days, inspecting the corporation's interests in the lake district. James Gayley, of New York, first vice-president of the Steel Corporation, who delivered the annual class-day address for the Michigan College of Mines, accompanied by Thomas F. Cole, of Duluth, Walter Fitch, of Salt Lake City, and others, visited the Michigan Smelting Company's plant on the south side of Portage lake.

The Keweenaw Copper Company, which is building the Keweenaw Central Railway, has let a contract to J. J. Byers & Co., of Houghton, for the grading of the line from the Cliff mine southward. The work is to be completed by August.

Hartshorne, Ind. Ter. May 12.

The strike situation in the Southwest is practically unchanged, both sides playing a waiting game. Very few operators are trying to do anything, except a little improvement or repair work. In most cases they are unsuccessful, especially inside of the mines. At most mines, everything is extremely quiet, the miners not going near the mines. In most cases, little or no trouble is being experienced in keeping the mines pumped out. Very few operators are making any attempt to run, and are not disturbing men living in their houses. At Bucks, I. T., however, the McAlester Coal Mining Company is ejecting the men from their houses, and has imported about 20 col-

ored men, and started one of its mines without paying any advance. It is loading about 50 tons a day. The miners' district officials endeavored, by peaceful methods, to persuade these men to stop, but without success. Contrary to expectations no trouble has yet been experienced, although operations have been going on for a week.

At Wilburton, I. T., the Degnan-McConnell Coal Company started one of its mines with some of the colored employees, but after two days they stopped on account of promises of food from the organization.

Indianapolis. May 14.

The recent discovery and test of the new coalfield on the Clay and Greene county border line, said to comprise an area of from twelve to thirteen thousand acres, equivalent to sixty millions of tons of coal, has aroused much interest and hope of the development of a new Brazil in the south end of the county. The New Monon railroad, which crosses this area, will afford the facilities for getting the product of the new field into market. A number of new shafts are being sunk in the field. •

In reversing a judgment recovered by James Neal against the Indiana-Chicago Coal Company, the Indiana Supreme Court held that the law requiring some person to be provided to open and close the trap doors in a coal mine when cars pass through was not designed to aid or protect the drivers of the cars. Its purpose, the Court said, was to prevent any doors from being left open so as to interfere with the ventilation of the mine. Neal was injured while driving a car of coal through the door and contended that he would not have been injured if there had been someone else present to open and close the door for him.

The Climax Mining Company, of Indianapolis, has incorporated with a capital stock of \$25,000. The company will maintain a home office in Indianapolis, and acquire and operate mining properties. Wm. A. Brisler, John W. Haltzman, A. W. Coble and L. B. Millikan are the directors.

Scranton May 15.

Peace has settled on the anthracite region. John Mitchell has departed for Indianapolis, to rest after the conflict, and the operators are hurrying the cars to the mines, to resume work on Monday. Practically but one company resumed work on Thursday, that being the Delaware, Lackawanna & Western Railroad, which had more than one-half its collieries in operation that day.

It is remarkable that many of the operators were not prepared for the peaceful ending of the convention in this city, and had not taken the necessary steps to prepare the collieries for the resumption. In many instances advantage had been taken

of the suspension to effect some repairs in the mines, which have not yet been completed.

Now that a strike has been averted, it is in order to refer to the predictions of two men who stand pre-eminent in the anthracite region, and who, throughout, have declared that there would be no strike, and when affairs looked most threatening, declined to recede from their position. They are William L. Connell, president of the Conciliation board, and R. A. Phillips, superintendent of the coal department of the Lackawanna.

Mr. Connell in an interview with the correspondent of THE ENGINEERING AND MINING JOURNAL, about four months ago, gave his reasons for the position taken by him, and his belief that the miners would accept the agreement of three years ago. At the time many thought that Mr. Connell was too sanguine. He is, however, a warm personal friend of John Mitchell and it is no secret that some little time before giving the interview referred to, he met Mr. Mitchell in New York. Mr. Connell has rendered most valuable aid in averting a costly strife in the anthracite region. It is said that he is averse to serving another term on the Conciliation Board. It will be most unfortunate should this be true. He has the entire confidence not only of the mine-workers, but of their representatives on the board as well. His presence on the board during the next three years will be a guarantee that much friction will be avoided.

Should Mr. Connell insist upon withdrawing from the Conciliation Board his successor will probably be General Superintendent Phillips, of the Delaware, Lackawanna & Western Company. The Lackawanna has in a manner no claim to be represented upon the Conciliation board, as it has proved a very poor patron of that institution during the past three years, having but two cases from its employees, both being decided in favor of the company, one upon the motion of the mine workers' representatives. It is suggested that if Colonel Phillips has proved so capable in settling the grievances of the men under his supervision, he should prove a decided acquisition to the board. He declined all through the suspension to admit that there would be a strike, and kept the collieries of his company in readiness for operation, so that each mine, with the exception of the Taylor, was ready on Thursday for the resumption. During the month of April the company mined 165,000 tons, more than the tonnage of any other company. Colonel Phillips is in very close touch with his men and knows, by sight, the majority of the adults in the 15,000 under his supervision. This has been made possible by his long service as district superintendent in every district of the company, and previously as foreman in a number of the collieries. He received assurances from so many of the men that there would be no strike,

that he proceeded with the preparations for resuming work the day following the close of the convention.

Mine Inspector P. J. Moore, of the First anthracite district, issued a timely notice to the miners and laborers in this district, as soon as it was decided to resume work. He pointed out that a number of fatalities occurred when work was resumed after the two previous strikes. He pointed out in the letter, that during the six weeks' suspension many changes had taken place in the working places, so that it would be necessary for the miner to ascertain that they were in a safe condition for working. Some miners leave powder and squibs in their chambers and would find them in a dampened condition. Under no circumstances should they endanger their lives in using powder or squibs in this condition. He also warned them most earnestly of the danger from falling roofs. In his district these fatalities increased fully 50 per cent. during 1905. He attributes this increase to two causes; incompetency and carelessness. The incompetency is due, in a large measure, to the manner in which a great many of the miners obtain their certificates of competency. Many of these, to his personal knowledge, are unable to speak a word of the English language. They have no conception of the dangers to which they are exposed and it is absurd, he declares, to believe that such a man can take adequate care of the laborer, who is placed in his charge.

Carelessness, he found, existed among the miners who have had the most experience. Notwithstanding that their attention is called to a dangerous roof, they will invariably answer that they intend to attend to it. He urged that in the small veins they should not attempt to blast the roof for height. This always increases the dangers. Fully 95 per cent. of the accidents due to the fall of roofs, he pointed out, took place within 6 or 8 ft. of the face of the workings. This was explained by the carelessness of the miners in not placing more temporary props close to the face.

Notwithstanding that there is general peace in the anthracite region, a strike is still in force at the Jermyn collieries in Rendham. The men left work two months previous to the suspension, owing to a reduction in payment for yardage, and strenuous efforts were made to effect an amicable adjustment. As the men are not at work their grievance cannot be taken to the Conciliation Board, and Joseph Jermyn, the principal proprietor, is indifferent as to whether the difficulty is settled or not. It was generally thought that the men would return to work with the other miners, but the efforts made last week were altogether in vain.

The United Mine Workers are living up to the resolution of the convention to participate in politics and every district in the anthracite region will in all proba-

bility have a miners' candidate for the State legislature.

Negotiations are pending for the sale to a syndicate of Eastern capitalists, of the properties of the Anthracite Coal Company, at Natalie, the consideration, it is said, being about \$4,000,000.

A breaker is rapidly approaching completion on the Berry farm, in East Plymouth, where an excellent vein of coal has been found. The place is out of the way for mining purposes, and the coal will be hauled over the mountains in wagons.

The water in West Pine Knot shaft is being removed as rapidly as possible but work will not be resumed for some time.

The Kaskawilliam colliery, near Middleport, is under water, and strenuous efforts are being made to pump out the water.

Owing to the exodus of foreigners, in the early days of the suspension, there are complaints from all parts of the region, regarding the scarcity of labor. Thousands of these men left for Europe, under the impression that there would be a long strike. Word has been received from a number that they will return immediately.

New York. May 16.

Mining prospects generally continue good, as reports from all quarters show. In California, some set-back was expected from the heavy losses at San Francisco, where so many of the mines are owned; but this feeling seems to have been exaggerated, and the results will affect mining only in a moderate degree. Reports from a number of mines show that the shock of the earthquake was not felt in underground workings. With a good water-supply assured for the season, and other favorable conditions, mining promises well for this year.

In the Northwest the prospects are also good. In Oregon there is a revival of mining interest; old properties are being re-opened, and there is much prospecting going on. In Idaho the spring shows renewed activity in many districts. The same is the case in the outlying Montana districts. In the Black Hills there is steady work in the Homestake and other established mines, and development is going on at many prospects.

In Colorado, the Cripple Creek district is doing well. The second drainage tunnel for the district now seems assured. Leadville continues active, and the shipments from the camp are large.

Copper mining is active everywhere. In the Butte district in Montana the formation of new companies and transfers of holdings are still the order of the day. The Amalgamated and other mines are making a large production. In Arizona much work is being done, but there is little that is new. The Lake Superior district also reports a large and increasing output and much development work.

Some new strikes are reported from

Nevada, but there is less sensation in the news than for some time past. In the Tonopah, Goldfield, Bullfrog, Manhattan and other districts there is more steady development work going on, and the making of mines is beginning to occupy attention more than prospecting.

In Alaska the season is just opening, and there is every reason to expect much new work, and a large output for the year. Particular attention will be paid to the copper deposits, in all probability. Some results from the tin deposits of the York Peninsula are hoped for this year.

Iron mining in the Lake Superior district is active everywhere. The search for new deposits on the western Mesabi in Minnesota, and on the new Cuyura range, continues.

Shipments of iron ore, which began at a high rate, were stopped for ten days by a strike of the longshoremen. This is now at an end, and vessels are moving.

The anthracite coal troubles have been settled, the miners returning to work under the old conditions. The bituminous regions of the West are still involved in labor troubles, but are gradually working around toward a settlement.

In the markets, prices of all metals continue high. The demand for materials of construction of all kinds shows no abatement.

San Francisco. May 9.

As was to have been expected, the mining machinery supply houses of this city have met with very severe losses in their stocks of goods, and also a resultant diminution in volume of business. They will all resume the usual course as soon as buildings can be erected. Few of the manufacturers lost their machine shops or plants, they all lying outside the fire zone, on the outskirts of the city. The business offices of nearly all of them were, however, destroyed. As all patterns were naturally kept at the shops, they were saved. The Joshua Hendy Machine Company, Dow Pump Works, and Pelton Water Wheel Company had their plants in the old foundry district, and these were burned up. Many persons in immediate need of mining machinery and mining supplies ordered at once from the East and Los Angeles, bringing great activity among these dealers in the latter city. They very wisely decided not to make an advance in prices and wired East for mine supplies at once.

Miners in the various mining centers of the State have been quite liberal in the matter of contributing their individual mites to local relief funds. These hard-working men have gone down into their own pockets and contributed, one, two and three days' wages to relieve the distress prevailing in this stricken city.

The State Mining Bureau in the Ferry Building lost but a few hundred dollars, and is virtually intact. The book cases were turned over and things more or less

upset, and covered with plaster. The State owns the building which is slowly being repaired.

There was not so much opening or swelling of ground in the city by reason of the earthquake, as supposed. Most of the cases are confined to localities where the ground has been filled in either on the bed of the bay or over swampy sections. More or less of this made ground showed signs of disturbance, but on the solid part of the city few such signs are shown.

Shasta county's newest smelter town will be called Coram, in honor of the President of the Balaklala Copper Mining Company, which has already begun construction work on a 1000-ton smelter four miles south of Kennett, close to the main line of the Southern Pacific. The smelter will be larger than that of the Mammoth Copper Company at Kennett, and it is reasonable to predict that the town of Coram will in time be larger than Kennett is now. Other smelter towns in Shasta county are Keswick, Ingot, De La Mar and Kennett. Thus Coram will be the fifth.

James H. Tibbetts, superintendent of the Headwater Mining Company at Siskiyou county, states that he recently saw Mrs. Hetty Green in New York, owner of the Eureka mine at Amador county, and states that she expects to start it up again. This is one of the former rich mines of the Mother Lode section, but it has been abandoned and filled with water for many years. Mrs. Green has previously refused to sell or to reopen the mine. Possibly the success of the Kennedy, Central Eureka and other mines near by, during recent years when extensive developments have taken place, has induced Mrs. Green to consider again opening the mine.

Marigold, is the name of the new town built by the Marysville Gold Dredging Company on the Yuba river, nine miles east of Marysville, and three miles west from the dredger town of Hammon.

The El Dorado Club of that county has become disorganized. The club was started about two years ago, some time after the organization of the Board of Trade. Its specialties were to be the supplying of information in regard to mines and the maintenance of headquarters where mining literature and specimens of minerals would be collected, and where mining men could meet one another. It secured quite a large membership and collected several hundred dollars with which handsome rooms were fitted up. C. H. Weatherwax was installed as secretary. Dissensions arose in the club, however, and its membership decreased so that it was unable to carry out the plans for a permanent reading room. The furniture is now to be sold, and the club disbanded. It seems difficult to maintain mining clubs or associations in the mining towns. It is hard even to keep one going properly in San Francisco, where there are thousands interested in the mining industry.

Toronto, Ont. May 12.

The Government bill amending the mining laws of the Province passed its third reading in the Legislature May 10. The companion measure imposing a tax upon mining lands and providing for a bonus to smelters was dropped, owing to want of time for its consideration before the prorogation of the House. It excited strong opposition among mining men. Some measure of the kind will probably be introduced next session, and it is intimated that the Government will not give any bonuses for smelting, unless the money comes in some form from the mining industry. In the meantime the government offers a free site to anyone who will erect a smelter in northern Ontario on conditions as to location and charges, provided a situation can be found free of timber and at a distance from agricultural settlements.

Real estate speculation in Cobalt, Haileybury, and New Liskeard continues to divide attention with mining enterprises. The inflation of prices is indicated by a recent deal made by the Cobalt Standard Mining Exchange, which purchased a 70-ft. lot in a central position in Cobalt for a building to cost \$20,000, the price paid for the land being \$15,000 cash, or about \$215 per foot frontage. Another little town of growing importance as a starting point for prospectors going up the Montreal river is Latchford, about eight miles south of Cobalt, with a present population of about 150, which is rapidly increasing, with many new business buildings going up. Large numbers are leaving this point daily for the north in search of gold. A party, recently returned from a prospecting trip up the river into unsurveyed territory past Portage Bay, reports having struck a 12-in. quartz vein carrying gold and copper. They also found cobalt-bloom and calcite veins.

A very rich vein has been struck on the University property on Giroux lake, which borders on the Foster property. A recently discovered vein on the latter was found to extend into the University location, the cobalt-bloom and nickel ore giving place to pure native silver, of an average width of five inches. It has already been traced about 300 ft., and gives promise of extending the whole length of the location. On May 3, a rich vein of silver ore was found in La Rose mine, location, about 500 ft., outcropping on the surface. It displays masses of granular silver, the cobalt being dissolved. An 18-in. vein filled with cobalt-bloom was also found on the same property.

The township of Bucke, lying immediately north of Coleman township, is now nearly all staked out and offers very few opportunities for prospectors, but it is anticipated that many claims made during the winter will be disallowed by the prospector. The property of the Gilpin-Cobalt Silver Mining Company in Bucke has

been considerably developed and seven veins have been disclosed by trenching-buildings are being erected, and six men are at work under Superintendent George Foster, formerly of Sault Ste. Marie. A property adjoining is being worked by Detroit capitalists, who have found smaltite, and it is stated that gold to the value of \$7.50 a ton has been discovered.

The Silverland Development Company has secured the right to use the German Schneeberg process for the treatment of cobalt-silver ores.

Mexico. May 12.

On May 15 there will be convened in Mexico City, the first Mining Junta, or Congress, in the offices of Lic. Pablo Martinez del Rio. That it will be an important and successful gathering is certain from the assurances obtained from the most prominent mining men of the Republic, both Mexican and foreign, of their attendance.

In Chihuahua, the well known Concheño district has been brought more into the world by the completion of the wagon road to Temosachi, whence there is a railroad to the city of Chihuahua. This excellent section of country, where is located the mines and cyanide plant of the Concheño Mining and Milling Company, was formerly reached only over difficult trails, and this kept many out, because of the difficulties and expense of freighting. Now this new road will greatly facilitate matters, and should lead almost to a boom in that section of the State. The work to be instituted by W. C. Greene on the new holdings of the Greene Gold-Silver Company in the Santa Maria district will give an additional impetus. Mr. Greene is said to have also paid \$325,000 gold for the Santa Eduwigis mines and mill, in the Rayon district, for the Greene Gold-Silver Company. Near Parral, W. B. Thompson and associates, of New York, have purchased the Descubridora and El Rayo from J. F. Johnson, and obtained control of W. V. Pettit's mill near his Adela mine, which they will change from amalgamation to cyanide, retaining Bert Peterson, former associate of Mr. Johnson, as consulting engineer. J. C. Brooks has taken an option, and will soon start work on the Enriqueta and Loreta copper claims of Procopio Olea and associates, located on the Chorreros ranch, about 10 miles from the Santa Domingo placers, and eight miles from Pueblito, where the Kansas City, Mexico & Orient will cross the Conchos river.

In the State of Michoacan, a representative of eastern capital claims to have \$750,000 for the purpose of exploring thoroughly the coalfields of the Agostitlan, Tuxpan, for oil.

Guanajuato, Mexico. May 11.

The attention of the public has lately been directed to the mine of Providencia

de La Luz, near San Felipe; the stock which a few months ago was selling at \$200 per share, having recently reached \$1000. That this is based on solid values may be understood from the fact that the mine has been paying monthly dividends regularly for years, and during the last year these dividends have been increasing until in March of the present year \$60,000 was declared. The mine has over \$800,000 in the treasury and is producing faster than the freighters can take the ore away. There is now piled up awaiting a shipment about \$240,000 worth of ore, the bulk of which runs from 2 to 5 kg. silver per ton. About one-half of the ore is derived from an almost solid streak of sulphide and ruby silver. Besides the silver contents, a variable amount of gold is always present, from 20 to 500 grams per ton. The greater part of this ore is coming from the 310-meter level on which a shoot 300 meters in length has been opened up. The company is also working a parallel vein, called San Juan de la Chica, from which it is obtaining very good results. The latter mine was formerly owned by Americans, who built a mill upon the property, working it in a desultory way for several years, but through the inefficiency of the management, very poor results were obtained from the mill and all work was finally abandoned. The Providencia Company bought it six years ago from the American owners, and during the last four years has been slowly prosecuting developments on La Chica vein. The old incline on the vein being insufficient for hoisting, a vertical shaft was started in the hanging wall, which is at present 135 meters deep, and from which a crosscut has been run in to the lode, already cutting four quartz veins belonging to the hanging wall.

Both La Chica and La Providencia are modern mines, their discovery dating only 25 years back. The Providencia was discovered by a Mexican who had very little knowledge of mining; after picking up all the loose float scattered over the surface, he sold it to some shopkeepers in the City of Mexico, who contributed \$80,000 for the purchase and exploitation of the mine. One-half of this sum was paid for the mine and the greater part of the remainder in useless work and expert opinions, which latter was to the effect that the vein was a "manta,"—a superficial deposit—and consequently no good. Fortunately the owners concluded to abide by the advice of their manager, Don Jorge Zapata, who was allowed to follow his own lines, and soon made the mine self supporting.

London. May 5.

An echo of the Whitaker Wright crash has been heard this week, owing to the publication of the final report of the liquidator of the British America Corporation. Time passes quickly, and it is hard to realize that it is five years ago since

this corporation passed into the hands of the official receiver. It is of no advantage to take up the history of this company, or quote the official receiver's report in detail. It is, however, interesting to observe that the assets of the company, estimated by the directors just before the collapse at £1,125,000, have realized only £184,399. The bulk of the assets was in the form of shares in subsidiary or other allied companies. Of these, 200,000 shares in the Standard Exploration Company brought nothing at all; shares in the East Le Roi, West Le Roi and Columbia-Kootenay, estimated to be worth £460,000, realized £10,000; while 430,000 shares in the Moorlort and Loddon Valley companies brought £35,000. The only assets of any real value were 49,000 shares of the nominal value of £5 each in Le Roi No. 2. These were estimated to be worth £246,000, and they realized £108,000. The realized assets were not by a large amount sufficient to meet the liabilities, and creditors received less than 4s. in the pound.

Considerable interest has been aroused during the last few weeks by the placing of shares in a new company called the Ceylon Company of Pearl Fishers, Ltd., which has been formed with a capital of £165,000 to acquire from the Government a 20-year lease of the celebrated pearl fisheries of Ceylon. The flotation of the company has been in the hands of the Exploration Company, and J. H. M. Shaw, one of the managing directors of the latter company, is managing director of the pearl company. The Exploration Company has always been known, popularly, as the "Rothschild" company, for that house was its chief founder, and still owns a larger share interest than anyone else. As a rule the Rothschilds do not introduce new business to the Exploration Company, but this case was one of the exceptions. It will be remembered that a similar concession, that of the Burma Ruby Mines, was obtained by the Rothschilds and floated by them in 1889, before the days of the Exploration Company. The rush for shares in the Burma Ruby Mines, Ltd., was unprecedented, and the shares were at a great premium. Unfortunately the prospects were unfulfilled, and the life of the company has been a chequered one. There has not been quite the same boom in the Pearl Company's shares. They have been placed privately among underwriters, and not by the publication of a prospectus. There is always a doubt whether the search for precious stones in a suitable subject for joint stock enterprise. The Kimberley diamond mines are practically the only instance where success has attended such efforts, and in that case the geological occurrence of the deposit is such as to make an exact estimate of its value possible. As regards the pearl company the difficulties would seem to be exceptional. The one point in its favor is that the management is in excellent hands.

General Mining News.

Sault Ste. Marie Canal—The traffic reported through the Sault Canals in April was: East-bound, 1,765,332; west-bound, 747,935; total, 2,513,267 tons. The number of vessels was 1079, showing an average cargo of 2329 tons. The mineral freights included were, in short tons except salt:

| | |
|--------------------------------|----------------|
| Anthracite..... | 74,834 |
| Bituminous..... | 587,780 |
| Total coal..... | 662,614 |
| Iron ore..... | 1,260,067 |
| Pig and manufactured iron..... | 24,435 |
| Copper..... | 7,491 |
| Salt, barrels..... | 44,545 |

The Dominion Government has let contracts to extend the entrance piers to the Canadian canal 800 ft.; also to deepen the upper entrance to the canal from 18 ft. to 21 ft. 5 in., the same as the lower entrance.

Lake Ore Shipments—Shipments of iron ore from the Lake Superior ports up to April 30 were as follows: Escanaba, 243,254 tons; Marquette, 85,216; Ashland, 134,302; Two Harbors, 390,708; Superior, 210,263; Duluth, 383,643; total, 1,447,386 tons. The strike of the longshoremen at the Lake Erie ports has come to an end, and there is now no obstacle to free traffic on the Lakes.

Tennessee Coal, Iron and Railroad Company—The plans for improvements have been partly arranged. They will be carried on in such a way as will cause the least interruption to the operation of existing plant and will result in additions to both blast-furnace and steel-works outputs at intervals through the year. In the raw-material departments expenditures to be made at once will provide for a large increase in coal-washing equipment and for the getting out of a larger output from the company's brown-ore mines. In addition to the new washing plants, coal crushers will be installed and the coal will be so prepared for the by-product coke ovens that more and better coke will be produced. At the Ensley group of furnaces the No. 5 furnace, which has been under reconstruction, will be ready to blow in about 60 days and will take its place in the class of the new No. 6 furnace that has made good record, both in output and economy of production. The plans for the rebuilding of the other four furnaces in the group will then be carried out. No. 4 will be taken in hand first, then No. 3, No. 2 and No. 1, in turn, only one furnace being out at a time. New boilers will be installed, some addition will be made to the blowing capacity and the bin system will be extended, so that sufficient ore can be carried at the furnaces to insure a steady supply independent of the occasional interruptions to iron mining due to heavy rains, or to the peculiar labor conditions obtaining in the South. At the steel plant at Ensley, the plan to be carried out at

once includes the building of several additional open-hearth furnaces, the moving of the gas-producer plant a sufficient distance from the open-hearth house to give some relief to the workmen from the heat, that under Alabama temperatures has been very trying in the summer months, and other changes that will yield a considerably increased output. The intention is to have the steel-rail mill in condition to turn out 30,000 tons of rails a month, by the beginning of 1907, and 40,000 tons later in the year.

ARIZONA.

GRAHAM COUNTY.

Arizona Copper Company, Ltd.—This company reports that the production of its mines at Clifton for the month of April was equal to 1295 short tons of copper.

CALIFORNIA.

AMADOR COUNTY.

Fremont Consolidated Mining Company.—This company is operating 40 stamps and it was intended to increase the milling capacity to 60 stamps, but the heavy losses of the principal owners at San Francisco will cause a postponement of the plans.

Kennedy Milling and Mining Company.—In this mine at Jackson a heavy flow of water is encountered at a point in one of the lower levels, where the east and west ledges form a junction. The footwall vein in the 27-ft. level has been opened, and 4 ft. of it is found to be or fair milling quartz.

KERN COUNTY.

Tungsten.—Castro & Schneidel, of Randsburg, have commenced developing new tungsten claims near Summit, seven miles north of Randsburg.

LASSEN COUNTY.

Lassen Mining and Milling Company.—Heavy shipments of freight for this company are at Madeline, waiting for the roads to dry up so that it may be hauled in. This freight is consigned to the Lassen Mining and Milling Company and is to be used for the development of what are known as the Hoyt mines. It is the intention of the company to work quite a force of men on these claims this year.

MODOC COUNTY.

Fort Bidwell Mines.—A number of Reno, Nevada, people are preparing to begin extensive mining operations at Fort Bidwell, where gold discoveries have been made. Recently a company was organized for the purpose of erecting an electric-generating station at the camp, and it is now given out that \$75,000 will be spent at once for this purpose. Many Nevada prospectors are going into the new district, which was once an important army post.

NEVADA COUNTY.

Homestead.—This mine in Willow Valley, near Nevada City, will be reopened, despite the fact that the company controlling it is composed of San Francisco men

who were hit hard by the recent catastrophe. They expect to start up shortly. The company took hold last fall and put in a fine pumping plant, but suspended operations when the heavy rains came, stating that work would be resumed this spring.

Iron Mountain.—The company operating at Iron Mountain, west of Grass Valley, is now driving a tunnel to strike the 165-ft. shaft recently sunk at its bottom. This will drain off the surface water, and when sinking is again resumed it will only be necessary to pump this level. A large concern is behind this move, prospecting the hill for copper.

Massachusetts Hill.—Once more rumor is about to reopen the famous old Massachusetts Hill mine, adjoining Grass Valley on the southwest. The valuable property forms part of the North Star holdings, but has been closed for a number of years, owing to a suit now pending relative to the ownership of the ledge in two adjoining claims. It is reported that the North Star Mines Company is figuring on reopening the Massachusetts Hill, on which stands a fine hoisting and pumping plant, all ready to start up on shorter notice, having been kept in perfect order.

Maryland.—At this mine 20 stamps are working in ore from the 700 level, where tributaries have a contract to take out 250 tons. At that point a 20-ft. ledge was in sight when the mine was given up. The crew expects to strike it any day. Another force will be put to work on the 700 level. The shaft has now been retimbered to 860 ft. from the surface.

Prospectors' Mining Company.—This company is operating the old Alta ground, west of Grass Valley, and the prospects so far seem quite favorable.

SHASTA COUNTY.

Mammoth Copper Company.—This company has bonded the Mammoth quartz mine of Old Diggings, one of the biggest bodies of developed quartz ore in Shasta county, which will be used to draw upon for flux ores.

SIERRA COUNTY.

Antelope.—At this mine, three miles southwest of Loyalton, Ralph Bender has a gang of men engaged in development work. Ore so far found runs to about \$20 per ton in gold and silver.

SISKIYOU COUNTY.

Ely Group.—This group of five mining claims on Kennebec Gulch, eight miles from Yreka, will be operated this summer by the Mountain Craggy Company of New York. The Headwaters Company bought the claims several months ago. A five-stamp mill will be erected, and the work of producing ore for milling will commence at once under the superintendency of James H. Tibbitts.

Mono Mining Company.—At this mine, Punch creek, seven miles from Yreka,

the three-stamp mill and cyanide plant are in operation and 18 men are employed. The body of ore encountered ranges in width from 14 in. to 12 ft., and the values are high. The present force is able to break more rock than the mill can handle, and it is the intention of the owners to soon add five more stamps to their mill plant.

COLORADO.

CLEAR CREEK COUNTY.

Silver Age-Franklin—This group of mines in Gilson gulch has been leased and bonded by Sam Brethour, Idaho Springs, in the interests of Eastern men and operations have been started, with leasers and company men.

Grass Roots Gold Development Mining Company—Thomas M. Egan, of Idaho Springs, has transferred to this company for a consideration of \$10,000 the Russian, Prussian and Turk lodes in Jackson district.

Continental Mines, Power and Reduction Company—Henry I. Seemann, manager, with offices in Equitable Building, Denver, has given a contract for 5000 ft. in the Seemann tunnel up Fall river, which will represent an expenditure of \$100,000, to Leadville miners. A large boiler and American compressor are being installed.

Newhouse Tunnel—A new building to hold nine transformers is being built at Idaho Springs, and a large Norwalk air compressor is to be installed in the same building. George Collins, Idaho Springs, Colo., is manager.

Gold King—Col. W. H. Moore, of Nebraska, with office at Idaho Springs, has arranged for overhauling the machinery for mine and mill, and for active operations at an early date.

Clift—This property, located at Georgetown, is reported sold to Dr. J. H. Bell, of St. Paul, Minn., the consideration being \$10,000. Charles Estell, Georgetown, has been appointed superintendent and machinery is to be installed.

Doric Tunnel Holdings—This property has been leased and bonded to the X-Ray Mining Company, in which Idaho Springs people are chiefly interested, the bond being \$250,000. English people are the owners and John Larson, Georgetown, has been appointed manager.

Oro Verde Mining and Milling Company—Eastern people are interested and they will install new machinery at the mine and make arrangements for the erection of a 50-ton concentrating mill during the coming summer. G. P. Goodier, Yankee, Colo., is manager.

GILPIN COUNTY.

Pewabic Consolidated Gold Mines Company—A new Excelsior five-drill compressor has been received for the Iron mine. Sinking operations have been commenced at the Pewabic shaft, and the

daily shipments average between 100 to 125 tons, all going to the New York mill under lease. J. G. Fleschutz, Central City, Colo., is manager.

White Peak Mining and Milling Company—Boulder, Colo., people have become interested in the purchase of a group of mines in the Wisconsin district with John L. White, Boulder, as manager.

New Concentrating Plant—Steps are being taken to erect a 25-ton concentrating plant on North Clear creek at Black Hawk by local and Denver people, and it is understood that the financing of a 200-ton concentrator to be erected west of Black Hawk by Eastern people is also under way.

Clay County—Operations have been resumed at this property by the owners, Gower & Aarons, of London, England.

San Juan—Hawn & Co., of Nevadaville, recently opened a body of free milling ores in the San Juan through the La Crosse tunnel workings.

Fifty Gold Mines Corporation—A new 1-in. cable, 2600 ft. long, has been installed on the Cook hoist. Jenkins & Co., have opened into the old Bobtail vein in the twelfth level, values going high for smelting ores; while Bishop & Co., have opened up 6 ft. of free-milling ore in the thirteenth Fisk level. O. B. Thompson, Black Hawk, Colo., is manager.

Helos—H. C. Bolsinger of Bald Mountain, Colo., and associates have taken a lease on this mine in Nevada district.

Jupiter-Belmont—A Rand air compressor has been installed at this mine in Russell gulch. J. C. Williams, Russell Gulch, is superintendent.

Pozo—A 50-h.p. boiler has been received from Hendrie & Bolthoff of Denver, for this mine in Nevada district.

East Boston Mining Company—New England capital is interested, and it is reported that they will soon settle financial affairs, and resume operations on the property. E. W. Davis, Central City, is local agent.

IDAHO.

IDAHO COUNTY.

Hogan—Work is being pushed on this mine near Elk City. The 25-stamp mill is kept busy.

NEZ PERCE COUNTY.

Development work is being pushed on the Ohadi property near Lewiston. Two tunnels are being run on the vein, both of them making good showings.

KENTUCKY.

HOPKINS COUNTY.

Oak Hill Coal Company—This company's property has been sold to John B. Brasher, of Madisonville, Ky. It is at Oak Hill, on the Louisville & Nashville road, and was owned by J. H. Frathen.

The mine has been employing 150 men, but this number is to be increased, with a view to a larger output.

MONTANA.

MISSOULA COUNTY.

Amador Consolidated Mining and Development Company—This company is arranging to put up a smelter at its property at the new town of Amador. Some of the material has already been ordered. The property has been shipping about two carloads of ore daily. D. E. McKinnon, is manager.

NEW JERSEY.

MORRIS COUNTY.

Leonard Peckett—In this mine, at Mount Hope, a vein of iron ore 9 ft. wide has been struck in the new shaft. The Empire Steel and Iron Company, of Catasauqua, Penn., is operating the mine.

Teabo—At this mine, owned by Joseph Wharton, the new shaft is down 650 ft., but has not yet shown any considerable quantity of ore.

NORTH CAROLINA.

MOORE COUNTY.

Croatian Company—This company is arranging to develop the Fair Promise talc mine, near Glendon. A plant to prepare 50 tons a day for market is to be erected. A dam and reservoir to furnish water for the plant are under construction. F. M. Peck, of Hartford, Conn., is president; D. P. Bible, of Glendon, vice-president; R. M. Farmer, secretary; N. D. Mervin, treasurer, both of Hartford, Conn., and J. C. Stockton, of Boston, Mass., superintendent.

OREGON.

BAKER COUNTY.

Union Companion—It is reported that this old mine in the Cornucopia camp, 60 miles east of Baker City, has been sold to representatives of the Guggenheim interests. N. E. Lindsay, of Spokane, is now examining the mine.

Indiana—This mine, situated 25 miles east of Baker City and owned chiefly by Indiana people, is developing well. A tunnel is being run to cut the lode at a depth of 400 ft. This is now in a little over 40 ft. Drifting is being carried on from the bottom of the main shaft on the main lode. No crosscutting has been done, so it is impossible to estimate the width of the orebody. It appears to be of large size, and carries ore of good grade. A good deal of development work will be carried on this summer and should the results warrant it, a copper smelting plant will be built next summer. J. W. Messner is general manager.

Cox claims—The Cox claims at Goose Creek, are developing well. A body of copper ore is showing, and it is proposed to interest capital in order to have a smelter placed on the ground. C. C. Cox, Baker City, is manager.

PENNSYLVANIA.

ANTHRACITE COAL.

A despatch from Shenandoah, Penn., May 15, says: "An explosion occurred at 7.30 o'clock this morning in the Shenandoah City colliery of the Philadelphia & Reading Coal and Iron Company, the concussion of which closed the gangway and imprisoned about 40 men. The brattice used for directing the air was blown to pieces and the gangway filled with afterdamp, preventing the rescuing parties from reaching the scene of the disaster. Two men were picked up on the gangway several hundred feet from where the explosion occurred so maimed that they were unrecognizable. At the bottom of the shaft, two miles away, the force of the explosion injured a dozen men by blowing them against the timbers. It is feared that the imprisoned men are all dead and that those who escaped from being caught under the falling roof were smothered by the afterdamp. The rescuing party is headed by the officers of the company, and the work is extremely dangerous.

BITUMINOUS COAL.

Thompson Connellsville Coke Company—A tract of about 1600 acres of coking coal in Fayette county, Penn., has been sold by J. V. Thompson to this company, which will proceed at once to develop the property. The coal lies in the Dunlaps creek basin. It is understood that it sold for \$1400 an acre. The Thompson Connellsville Coke Company was recently organized by Chas. Donnelly, F. H. Richard and W. G. Rock of Pittsburg, and A. A. Thompson and Lloyd G. McCrum of Uniontown. Mr. Donnelly, formerly president of the McClure Coke Company, is president of the new concern, which has issued bonds to the amount of \$3,000,000. Sites have been chosen for the location of two 400-oven coke plants, which will be connected with the Monongahela railroad.

Pittsburg-Buffalo Coal Company—This company, in the Pittsburg district, has awarded contracts for the sinking of two large shafts, and will spend \$1,250,000 in improvements. The shafts will be 22x33 ft., with a depth of 400 ft. each. The company owns 18,000 acres of valuable coking coal land in Washington county, estimated to contain 200,000,000 tons, which is to be developed. The Pennsylvania Railroad Company will expend \$1,500,000 in extending its lines from Brownsville to Rice's Landing, 12 miles, and for building seven miles of track from the Ellsworth branch to Zollersville. Both these roads will pass through the coal property owned by the Pittsburg-Buffalo Company and the Jones interests which control the company. When the two shafts are completed the company expects to mine 14,000 tons daily out of each shaft, which will make it the largest independent coal producer in the world. The mines are to be equipped with all modern appliances and mechanical haulage

will be used exclusively. Several hundred coke ovens are to be built. A town will be built and the cottages will be sold to the miners at actual cost, and they will be permitted to pay for them on the installment plan.

SOUTH DAKOTA.

CUSTER COUNTY.

Clara Bell—The amalgamating portion of the new stamp mill on this property will be completed within three weeks. It will take some time longer to complete the cyanide annex. A classifier is put in for the purpose of separating the sand and slime. The new shaft, which will be the working shaft, is 50 ft. deep. It was necessary to sink this as the old shaft followed the vein on the dip in an irregular manner for about 300 ft. and was therefore very inconvenient for hoisting purposes.

Extreme—The officers of this company are now working on a plan to get the shareholders to turn in 100,000 shares to be sold again at 15c. a share. If this can be done the \$15,000 so obtained will cover the debts of the company, and put it on its feet again.

LAWRENCE COUNTY.

Homestake—A trial has been made of the new high-pressure air compressor, which promises to be very satisfactory. For several months the machinists have been putting it together. It is the largest compressor of this kind ever manufactured by the Ingersoll people. Air will be furnished by it to run the underground motors which will supplant the mules and horses hitherto used. Two motors are now in use on the lower level and five others will soon be in operation.

Homestake Extension—It has been decided to sink two shafts on this property, both to the 350-ft. level. One shaft, to be sunk in the center of the property, will connect by a tunnel with the New England shaft across the gulch and will be the main working shaft. The other will be used temporarily for ventilation.

Lexington Hill—Suits recently instituted against this company by the Black Hills & Denver Gold Mining Company have been withdrawn, and the Lexington Hill will resume operations within 30 days. The mill on this Spruce gulch property has been leased by Dr. Ogden, and associates, and will treat partly ore from the Lexington Hill, and partly adjacent properties. The mill, which is an 80-stamp mill, is a wet crushing cyanide plant with a capacity of 200 tons a day. The company owns 350 acres of ground, and the main tunnel, which is in 360 ft., has opened up the property well.

TENNESSEE.

Cumberland Plateau Coal and Timber Land Company—This company, with principal office in Nashville, Tenn., and a

branch office in Louisville, Ky., has been incorporated with a capital stock of \$350,000 to develop 50,000 acres of coal and timber lands in Morgan, Fentress and Cumberland counties, Tennessee. Officers of the company are: William Cooper, of Cumberland county, president; Joseph Huffaker, of Louisville, vice-president; and B. G. Huffaker, of Louisville, secretary-treasurer.

UTAH.

SALT LAKE COUNTY.

Columbus Consolidated—This Alta company has encountered ore at the 300-ft. point below the tunnel level. The product is about the same grade as that taken out on the 200 level.

New England Gold and Copper—The new boarding house at this Bingham property is completed. The management is preparing to install a compressor plant.

TOOELE COUNTY.

New Stockton—A second north-and-south vein has been encountered on the 850-ft. level of this Stockton mine. The width of the vein is 26 ft., it is reported.

Ophir Hill—The roads are again in good condition, and this company is pushing shipments.

South Daisy—The owners of this property, on the west dip of Mercur, have been given an opportunity to sell out at a good figure, which was refused.

WASHINGTON.

FERRY COUNTY.

Pearl—Fifteen carloads of ore were shipped to the B. C. Copper Company, at Greenwood, B. C., during April.

OKANOGAN COUNTY.

Copper World Extension—Preparation is being made to sink the shaft from the 200- to the 500-ft. level.

Copper World—John Wentworth, superintendent, has made a camp at the mine, and will erect log buildings immediately for quarters. An incline shaft will be sunk on the vein, with the intention of following the ore on its dip. The place selected to sink is about 800 ft. west of the Copper World Extension main shaft.

Ruby—At this mine, on Mount Chapaca, the upraise has followed ore to a height of 200 ft. This will be held for railroad transportation. Work is conducted with three shifts.

Mountain Sheep—The lower tunnel will have to run 700 ft. further to tap the ledge, according to the survey. Preparation will be made to install a 40-h.p. boiler, air compressor and power drills. Water power will be used if sufficient water can be made available from Chapaca creek, otherwise gasolene.

Prize—Another Wilfley concentrating table is to be added to the mill equipment.

STEVENS COUNTY.

The Enterprize, U. S. Copper-Gold and

June-Echo properties are situated at Chewelah. After a dull period of several years this camp is showing renewed activity.

Shoshone—Situating on Nine Mile creek, near the Spokane Falls & Northern Railway. After cutting through several stringers of quartz, with bunches of galena, the tunnel is now in quartzite, about 200 ft. from the main vein, which dips toward the face of the tunnel.

U. S. Copper-Gold Company—Two carloads of ore are ready for shipment.

June-Echo Group—This has been bonded for \$30,000.

Foreign Mining News.

AFRICA.

TRANSVAAL.

Cable despatches give the gold output for April at 439,243 oz. fine, a decrease of 4480 oz. from March, but an increase of 40,077 oz. over April, 1905. This makes, for the four months ending April 30, a total of 1,719,292 oz. fine gold, or \$35,537,352; which compares with 1,532,058 oz. last year, showing an increase of 187,214 oz., or 12.2 per cent.

ASIA.

INDIA-MYSORE.

Kolar Goldfield—The gold production for April was 46,033 oz. bullion, or 3007 oz. less than in March. For the four months ending April 30, the total was 196,658 oz. bullion, against 208,879 oz. last year; a decrease of 12,221 oz. The bullion reported this year was equal to 176,992 oz. fine gold, or \$3,658,525 in value.

AUSTRALIA.

WESTERN AUSTRALIA.

The gold output in April was 152,216 oz. fine, being 3359 oz. less than in March. For the four months ending April 30, the total was 604,583 oz. fine, against 652,539 oz. in 1905; a decrease of 47,950 oz., or 7.3 per cent., this year.

SOUTH AMERICA.

BOLIVIA.

The Huanchaca Mining Company is shipping 3000 tons of auriferous copper ore from its mines by rail to Antofagasta, Chile, and thence to the Tacoma smelter, Washington, by water. A British bark left the Chilean port on March 21, and is expected to arrive at Tacoma in a week or two, with 2000 tons of the ore. The balance will follow in a steamer.

NEW ZEALAND.

The Mines Department reports 32,708 oz. gold and 168,765 oz. silver exported in February. For the two months ending Feb. 28 the totals were, in ounces:

| | 1905. | 1906. | Changes |
|-------------|---------|---------|------------|
| Gold..... | 89,948 | 94,412 | I. 4,464 |
| Silver..... | 123,096 | 254,317 | I. 131,221 |

The gold bullion reported this year was equal to 89,592 oz. fine gold, or \$1,851,869 in value.

Coal Trade Review.

NEW YORK, May 16.

The anthracite question is now settled, as noted last week. Some collieries are already at work, and the rest will resume on May 21.

In the West the mines are generally at work in the western Pennsylvania district, and in a part of Ohio.

The central district of Pennsylvania, however, is still tied up, no settlement between miners and operators having been reached. In Indiana many operators are reported to be weakening, and the effect may be manifest at the meeting of their association, which will be held this week. In Illinois, also, the operators meet this week. The disposition among them to hold out is reported to be stronger than in Indiana.

Competitive conditions are all in favor of a settlement, and delay is not of advantage. The supply of coal for the present, from those mines which are at work, seems to be large enough.

The situation in the West is entirely an exceptional one, and it does not seem probable that it will last much longer without change.

COAL TRAFFIC NOTES.

The total coal and coke traffic originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to May 5 was as follows, in short tons:

| | 1905. | 1906. | Changes. |
|-------------------|-------------------|-------------------|---------------------|
| Anthracite..... | 1,543,027 | 1,402,770 | D. 140,257 |
| Bituminous..... | 9,465,178 | 11,335,574 | I. 1,870,396 |
| Coke..... | 3,796,562 | 4,380,705 | I. 584,143 |
| Total..... | 14,804,767 | 17,119,049 | I. 2,314,282 |

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the week ending May 12, were 5374 tons; for the year to May 12, they were 299,415 tons.

Shipments of anthracite coal in April were only 488,203 tons, which compares with 5,278,041 tons in April, 1905, showing the results of the suspension. Of this year's small tonnage the Reading produced 53,757 tons, Lehigh Valley 19,995, Jersey Central, 2534, Delaware, Lackawanna & Western 144,645, Delaware & Hudson 70,013, Pennsylvania 53,867, Erie 115,344, New York, Ontario & Western 25,173, and Delaware, Susquehanna & Schuylkill 2875 tons. For the four months ending April 30, the shipments were, in long tons:

| | 1905.— | | 1906.— | |
|----------------------|-------------------|--------------|-------------------|--------------|
| | Tons. | Per Ct. | Tons. | Per Ct. |
| Reading..... | 3,763,867 | 19.9 | 3,355,430 | 20.4 |
| Lehigh Vy..... | 3,106,295 | 16.5 | 2,373,331 | 14.5 |
| N. J. Central..... | 2,465,176 | 13.1 | 2,064,234 | 12.6 |
| Lackawanna..... | 2,965,873 | 15.7 | 2,768,366 | 16.8 |
| Del. & Hudson..... | 1,861,074 | 9.9 | 1,671,860 | 10.2 |
| Pennsylvania..... | 1,648,649 | 8.2 | 1,439,497 | 8.8 |
| Erie..... | 1,764,736 | 9.3 | 1,610,264 | 9.8 |
| N. Y., Ont. & W..... | 898,090 | 4.8 | 705,003 | 4.3 |
| Del., Sus. & Schu'l | 493,421 | 2.5 | 426,229 | 2.6 |
| Total..... | 18,867,787 | 100.0 | 16,404,264 | 100.0 |

The total decrease this year was 2,463,533 tons, or 13.1 per cent., due entirely to the small April tonnage.

Coal tonnage over the Southern Railway for the two months ending Feb. 28 was: Tennessee district, 330,051; Alabama district, 299,507; total, 629,558 tons, an increase of 19,129 tons.

NEW YORK, May 16.

ANTHRACITE.

Resumption of mining is quite general in the anthracite fields, although no fresh coal has yet arrived at tidewater. The mining companies will not, however, be obliged to exert special effort to keep up to demand; supplies are sufficient for all needs. The steam sizes in particular are abundant, both because the output of this kind of coal from the washeries was less restricted by the strike, and because consumers generally had large stocks on hand before trouble began.

The customary May discount is now in force and prices for the remainder of this month will continue as follows: \$4.35 for broken and \$4.60 for domestic sizes. For steam sizes: \$3 for pea; \$2.25@2.50 for buckwheat; \$1.45@1.50 for rice and \$1.30@1.35 for barley f.o.b. New York harbor shipping points.

BITUMINOUS.

The Atlantic seaboard soft-coal trade is dull and prices are falling. More coal seems to be mined outside of central Pennsylvania than the market can absorb, and from every side we hear of curtailed outputs among mines that have suffered nothing by the suspension of mining. The opening of anthracite mines will divert some cars from the soft-coal region, and this may have some, but slight, effect.

Trade in the far East is quiet and consumers appear anxious to use up stocks on hand; the low water freights now prevailing are no inducement to take on shipments.

Trade along the Sound is slightly better than in the East, but pressure has to be exerted to induce consumers to accept shipments and business will be restricted to regular contracts for a few weeks yet. Trade in New York harbor is quiet and not much coal is going there. Prices are around \$2.60 f.o.b. New York harbor shipping points, for fair grades of steam coal. All-rail trade is quiet. Transportation is slow, but nobody complains. Car supply is fairly good, but is likely to be curtailed, as noted above.

Vessels in the coastwise market are in fair supply and rates are weakening. Current quotations from Philadelphia are: To the Sound, 60c.; to Boston, Salem, and Portland, 65c.; to Lynn and Newburyport, 75c.; to Portsmouth and Bath, 70c.; to Gardner 75@80c. and towages.

BIRMINGHAM, May 14.

The railroads are still a little slow in furnishing cars. Good prices obtain in the coal market. There is a better profit for the coal producers this summer than was ever before enjoyed by the coal men of Alabama. Coalfields in Cullman

county, 50 miles north of Birmingham, are to be developed on an extensive scale. The coal in that section of the State is hard and can stand the handling necessary in the exportation of the product to Mexico. A railroad line several miles in length will have to be constructed to reach the property.

The returns from the hire of State convicts, the greater number of able-bodied convicts working in coal mines in the Birmingham district, were \$59,391 for the month of April. For the six months, ending with April the returns amounted to \$402,824. It is now expected that the net earnings for the twelve months ending with August 1 will be in the neighborhood of \$325,000. The gross receipts for the year 1905 were \$561,241. It was the idea of Governor W. D. Jelks to lease convicts for mine work at a fixed rate per ton coal mined instead of by the month.

Chicago. May 14.

The coal market is quiet; there is little satisfaction to the speculative element that wished and has worked to profit out of the labor troubles. Stocks of manufacturers and railroads hold out to an unexpected degree, and such supplies as are bought and sold in the open market, bring lower prices than obtained a month ago. Too much coal is being released from the stocks at Illinois and Indiana mines, to say nothing of the supply from Western non-union mines.

Prices are largely speculative, on bituminous coals. Run-of-mine from Illinois and Indiana mines—the chief supply of the local market—brings \$2.00@2.75; lump from the same mines is quoted at \$2@2.75, and screenings hold up to \$2.25@2.75. The tendency of the market is downward, in view of the light demand and unexpectedly heavy supply.

Eastern bituminous is in good supply, and not in heavy demand. Smokeless is in plentiful supply at about \$3.30; Hocking is in fair demand at \$3.05@3.50. Youghiogheny brings \$3 for ¾ in., and is in light demand on spot sales.

Anthracite is not active, despite the restoration of the usual spring discount of 40c. on May orders, 30c. on June, etc. Consumers are slow to buy, though retailers are advertising largely. It seems probable that there will be no heavy buying of anthracite until the coal is actually needed. Meanwhile dealers' stocks will accumulate on docks and in yards.

Cleveland. May 15.

The coal market during the past week has been somewhat stronger; stocks on hand have been rapidly consumed, and a new demand is springing up from several different quarters. The Lake strike, which was an influence a week ago, has been eliminated, and coal is being moved up the lake in large quantities. Small boats at present have the call, since it is difficult to get together enough coal for many of

the boats carrying upward of 7,000 tons; but shipments by these small boats have been sufficiently heavy to take up the surplus amount produced by the mines in the Pittsburg district. In addition to the lake demand the railroads have consumed their stocks, and are now taking coal regularly on contract. The increased activity among the manufacturing concerns also draws heavily on the supply. The middle district mine operators have not yet resumed, and it is hardly possible that they will do so before another week or ten days. Some statements are made to the effect that these mines will not be open before June. Under the circumstances, the market is much stronger than it has been, and run-of-mine steam is selling at \$1@1.10 at the mines. Slack is also in good demand with the prices ranging about 75c. at the mines. The coke market is strong, the best grades of 72-hour coke selling at \$2.25@2.50 at the ovens.

Indianapolis. May 14.

There is little or no change in the coal-strike situation in this State. The miners say 2500 men are at work in the Indiana mines either mining coal or caring for mines and making repairs for the "stand-pat" operators who pay the 1902 scale for this particular work. The Wyoming and one other large mine signed the 1903 scale during the week.

The Indiana operators and the Indiana miners regard the action of the meeting of operators at Chicago last week as a step toward the dissolution of the Interstate alliance; hereafter each State will proceed to settle its wage disputes in its own way. That is what the Illinois joint conference called for May 17 means.

The fact that the conference was promoted by President Perry, of the Illinois miners, is significant.

The operators of Indiana are rushing repair work at the mines. The miners construe this to mean that the operators expect breaks in the ranks of the stand-patters, and that it is advisable to be ready to get out coal quickly when the time comes for each operator or company to take care of their customers.

The leading editorial this week in the *United Mine Workers' Journal* says "that in Indiana about fifty operators have signed and negotiations are pending with several large independent operators. A curious and shameful situation confronts the independent operators in Indiana, Ohio and Illinois. Many would gladly sign, but are afraid to do so because they fear the railroads would drive them out of business when a general resumption takes place."

It is rumored here that an attempt will be made to operate coal mines in Ohio, Indiana and Illinois with non-union labor. It is believed that such notices will be posted within the next ten days. It is understood that the Indiana operators are not united on this proposition and some

will oppose the attempt when it comes up in the conference to be held this week. From the feelings privately expressed by Indiana operators, it is evident that little hope is entertained of successful resistance to the demands of the mine workers. It seems to be the impression that the alliance will be broken, and that the operators will sign the 1903 scale to bring the suspension to an end. There are several causes for this changed attitude, chief of which is the desire to retain customers who may be captured by operators who have already agreed to the 1903 scale.

Considerable interest is manifested in the Elkins amendment of the railroad rate bill, prohibiting common carriers from engaging in mining coal. In this State the railroads have immense coal-mine investments.

Pittsburg. May 15.

Coal—The settlement of the longshoremen's strike has resulted in the renewal of coal shipments to lake ports. The Pittsburg Coal Company is operating all of its mines and the bulk of the production is going to its Cleveland docks. During the suspension of shipments railroad cars accumulated here, and there is an unusual supply. This condition of affairs is not expected to continue and a car shortage is likely within the next two weeks. A large number of striking miners from other fields have come to the Pittsburg district and all are at work, and the production and shipment in this district is greater than at any time in its history. Prices continue strong on the basis of \$1.15 a ton for mine-run coal at mine, but higher prices are paid in some instances. All the river mines are in full operation and there is plenty of empty coal boats and barges. A large tonnage will go to the lower markets on the next rise in the rivers.

Connellsville Coke—Production and shipments last week broke the record for the year, but prices are a trifle lower. Furnace coke is quoted at \$2.50@2.60 a ton, and foundry coke at \$2.80@2.90 a ton. The production for the week in the Connellsville field is given at 272,224 tons. The shipments aggregated 12,761 cars distributed as follows: To Pittsburg and river points, 4516 cars; to points west of Pittsburg, 6664 cars; to points east of Everson, 1402 cars. The combined shipments from the Connellsville and Mason-town fields amounted to 366,681 tons.

Foreign Coal Trade.

May 16.

Exports of fuel from Belgium for the three months ending March 31 were, in metric tons:

| | 1905. | 1906. | Changes. |
|---------------|-----------|-----------|-----------|
| Coal..... | 1,164,794 | 1,108,070 | D. 56,724 |
| Coke..... | 240,002 | 211,691 | D. 28,311 |
| Briquets..... | 100,562 | 89,056 | D. 11,506 |
| Total..... | 1,505,358 | 1,408,817 | D. 96,541 |

The chief exports are to Holland and Germany. Imports for the three months were:

| | 1905. | 1906. | Changes. |
|---------------|-----------|-----------|------------|
| Coal..... | 999,211 | 1,360,225 | I. 361,014 |
| Coke..... | 85,998 | 99,666 | I. 13,668 |
| Briquets..... | 12,918 | 27,456 | I. 14,538 |
| Total..... | 1,098,127 | 1,427,347 | I. 329,220 |

In 1905 the exports were 407,231 tons more than the imports; this year the imports exceeded the exports by 18,530 tons.

Iron Trade Review.

NEW YORK, May 16.

There is little change to be reported in the iron and steel markets this week. With some slight fluctuations, buying of pig iron continues good, and there are no signs of weakness. The Lake ore strike has been settled, and iron ore can now come forward freely, so that there will be no scarcity of supplies.

In finished material business is also large, especially in structural steel. The railroads are placing orders freely, and there is already a large tonnage of rails on the mill books for 1907 delivery. New bridges and new rolling stock have also been ordered on a large scale.

The labor troubles in the coal trade are not entirely settled, but are practically over, so far as any interruption to the iron trade is concerned. Coal and coke supplies are sufficient to meet all current needs.

Pig Iron Production—The capacity of the coke and anthracite furnaces in blast on May 1 is estimated at 484,000 tons per week; a decrease of 300 tons from March 1. Taking the *Iron Age* estimate for coke and anthracite furnaces, and making allowance for the charcoal furnaces, the production of pig iron in April was 2,105,000 tons. For the four months ending April 30 it was 8,343,000 tons.

Birmingham. May 15.

Important changes have been made in Southern iron companies this week. John A. Tipping, president of the Republic Iron and Steel Company, and chairman of the board of directors of the Tennessee Coal, Iron and Railroad Company, announces the following appointments: Frank L. Crockard, now general manager of the Riverside Works of the United States Steel Corporation, will be vice-president and general manager of the Tennessee Coal, Iron and Railroad Company and vice-president of the Republic Iron and Steel Company, with general management of its Southern plants. George L. Colard, late of the Clairton works of the Steel Corporation, will be general superintendent of the blast furnaces in Alabama, owned by the Tennessee and the Republic companies. L. Lebricher is secretary of the executive committees of both companies.

N. H. Hassinger, heretofore general Southern manager of the Republic Iron

and Steel Company, will retire from that position June 1.

It is announced that the Southern Steel Company will build steel car works, a steel wire-rod, iron and nail mill, and rolling mills for making shapes and structural steel. Work on the new plants will be begun immediately. They will be erected at Gadsden, Ala., adjoining the present steel works. Contracts have been made for the machinery for the new works.

The iron market continues steady, and pig iron is still held on the basis of \$14 per ton for No. 2 foundry.

Chicago. May 14.

Labor troubles no longer menace the iron and steel industries of this locality, and there is a feeling of relief and security everywhere. Firmness continues to characterize the market, and everywhere there are signs indicating strength in the future. It is not to be denied, however, that the actual volume of sales is increasing but slowly. The absence of any relapse, however, at this season, is considered favorable to firm business.

Orders for the third and fourth quarters of the year are slowly increasing, and inquiries continue numerous, some of them being for large amounts. Sales of pig iron for quick delivery continue numerous, but for small quantities on each order.

Prices remain practically the same; Northern No. 2 being quoted at \$18.50@18.75, and Southern No. 2 at \$14 Birmingham, or 17.90 Chicago, minimum. It is probable that the Northern sales are more largely on spot demands, and the Southern on contract requirements. Finished products continue in good demand with structural material especially active.

Coke continues plentiful at \$5.40 for Connellsville, and the demand only moderate.

Cleveland. May 15.

Iron Ore—The movement of iron ore has been resumed, the strike on the lakes being called off. The longshoremen abandoned the cause of the mates, bringing immediate peace. The only difficulty at present is to get the boats started again, the strike causing a serious congestion at the lower lake ports. It will take the remainder of the week to clear up the congestion, and in the meantime the lake trade will continue to limp. The strike will offset the effects of the heavy shipments during April and will shorten the season to seven months. Since the movement this year is to be 3,000,000 tons heavier than it was a year ago, this means the necessity of carrying 750,000 tons per month more than was carried a year ago. The increased carrying capacity will tend to decrease the burden of this movement but at the same time the freight market ought to be strong throughout the year. It is a question whether the Lake Erie docks will be able to handle the additional

supply of ore quickly enough to avoid a constant congestion.

Pig Iron—Buying of No. 2 foundry is still heavy, contracts being placed for third-quarter delivery, ranging from 500 to 1000 tons. One big block of basic was also placed during the week, selling at \$17.25 at furnace. The foundry market is strong at \$16.50 in the Valleys for No. 2. Southern furnaces are still selling some iron here for mixtures at \$14 Birmingham, to which is added the freight rate of \$4.10 to make up the Cleveland price.

Finished Material—The market is exceptionally strong at present, due to a shortage of sheet-bars and billets. This has caused some sheet mills to quit work and other concerns have sold their sheet-bars rather than convert them. The curtailment of production has strengthened the market. Axle makers are not able to produce axles out of forging steel but have been using scrap. The consequence is that the market there is dull. Billets, however, have not eased, still selling on the basis of \$35 at mill. New contracts are coming in for plates and shapes. The whole market is stronger. Traction roads are buying rails in good sized quantities.

New York. May 16.

Pig Iron—Selling has been chiefly in small lots, but there are a good many of these. Prices are a little irregular, but with no signs of any considerable break.

For Northern iron in large lots we quote: No. 1 X foundry, \$18.50@19; No. 2X, \$18@18.50; No. 2 plain, \$17.50@18; forge, \$16.25@16.75. Southern iron is held firmly by the larger companies on the basis of \$14 Birmingham for No. 2. For large lots on dock, New York, prices are: No. 1 foundry, \$18@18.50; No. 2, \$17.50@18; No. 3, \$17@17.50; No. 4, \$16.25@17; No. 1 soft, \$18.25@18.50; No. 2 soft, \$17.50@18; gray forge, \$16.25@16.50. Basic is held at \$19 for Virginia, \$18.50 for Alabama and \$18@18.25 for Northern.

Cast-Iron Pipe—Prices are steady, the present basis being \$30.50 per net ton for 6-in. pipe in carload lots, at tidewater points. More big contracts are pending, including one of 40,000 tons for Philadelphia.

Bars—Business is better and prices are steady. Sales are at 1.645c. for common iron bars, and 1.695c. for refined iron. Steel bars are 1.645c. tidewater. Store trade is steady at 2c. delivered.

Plates—Steel plates are in smaller demand. Tank plates are nominally 1.745@1.825c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745@1.845c. according to width. Sales here are chiefly in small lots.

Structural Material—Prices are nominally unchanged. Beams under 15 in. are 1.845c. for large lots; over 15 in., 1.895c.; angle and channels, 1.845c., tidewater de-

livery. Jobbers ask a considerable advance on small orders.

Steel Rails—No change in standard sections. Light rails are in steady demand, prices ranging from \$27 for 25-lb. up to \$33 for 12-lb. rails. The demand for trolley rails is good. The price of \$28 for standard sections is being accepted for orders running into 1907 deliveries. Open-hearth rails are quoted at \$29 for standard sections.

Old Material—Business is better and dealers are stiff in their views. No. 1 railroad wrought is \$18.75@19.50; No. 1 yard wrought can be had for \$17@18; machinery cast, \$14@14.50; heavy steel melting scrap, \$16@16.50. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. May 16.

Pig Iron—Somewhat quieter conditions prevail, except for two kinds, basic and pipe irons. Basic has been extremely active for several days, and large orders have been placed at strong prices; inquiries for additional large quantities are now in hand for the quickest possible delivery. In other lines there is fair activity for forge and foundry irons, but most of the inquiries and all of the orders heard of in this market are for special grades of iron for engineering and special foundry requirements. The information received today from the pipe foundry people is that they will probably close contracts for large quantities of pipe before the close of this month, which will make it necessary for them to again appear in the market for iron. The quotations may be given approximately at \$19@19.50 for No. 1X foundry; \$18.50 for No. 2X; \$18.25 for No. 2 plain; \$16.50 for standard forge; \$17.50 for basic and \$20 for bessemer.

Steel Billets—The mills have not accepted more than half of the business offered; the difficulty lies in the impossibility just at present in adjusting deliveries to suit the convenience of purchasers. A few small lots of forging billets have been contracted for at \$32.50. Ordinary open-hearth steel has been contracted for at \$29, though this is regarded as a low price.

Bars—Some little variation in prices seems to point to anxiety upon the part of certain large bar mill interests in middle and eastern Pennsylvania to capture orders.

Sheets—The sheet people have not been booking quite as much business as possible, but they claim there is nothing in the situation to warrant any anxiety.

Pipes and Tubes—The extraordinary activity in this branch continues and there is a heavy demand for merchant pipe, for boiler tubes and for all other tube products. At the same time it is estimated that the prospects are for slightly lower quotations in the near future.

Plates—A good deal of business that

was temporarily held up on account of the possibility of a long suspension of coal mining has been recently creeping in, and a fair week's business has been done, although the orders are of a small shop size.

Structural Material—An enormous amount of business has been done in structural material and prices remain at about 1.83½@2c. delivered. It is understood that there is a large amount of bridge-work temporarily pigeon-holed, which may or may not be undertaken this year, though it is not known what the conditions are which lead to this uncertain policy.

Steel Rails—Quite a large business has been done in steel rails, resulting in large orders by the Pennsylvania, New York Central and a number of Western roads, most of which material is to be delivered next year.

Scrap—No new developments have occurred in the scrap market, and prices are about where they were, although the tendency is believed to be downward.

Pittsburg. May 15.

An increase in production of bessemer pig iron is expected as one of the results of the settlement of the strike of long-shoremen, and the resumption of ore shipments. Some furnaces that are on foundry iron will be put on bessemer this week as the demand for foundry has been falling off lately. Strikes of iron molders in different sections of the country are partially responsible for the decreased demand, as foundries affected are not in the market. A general strike of molders in this district is threatened, and probably will result in a further curtailment of buying. Bessemer and basic iron were very firm until this week, and buyers evidently are expecting lower prices for second-half delivery as there have been but few inquiries. Some small sales of bessemer iron have been made for delivery up to July 1, at \$17.50, Valley furnaces; the only large transaction was the purchase of 20,000 tons by the Republic Iron and Steel Company for May and June shipment at the same price quoted the United States Steel Corporation by the association, \$17.25 a ton at the furnaces. With an increase in production of bessemer iron it does not seem likely that a higher rate will prevail for this quarter, or third-quarter delivery. Foundry iron prices are easier, and it is reported that the minimum price of last week, \$16.50, Valley, could be shaded. Heavy purchases of basic iron by two western consumers have strengthened the market, and the price for the present is firm at \$17, Valley, but it is probable this rate may be shaded before the end of the month. Ore shipments are getting better, and while it is reported that lower prices may soon be quoted for ferromanganese, it is difficult to obtain any definite information on the market, and outlook. The

Carnegie Steel Company is a large producer, and it is doubtful if it will have to buy any outside ferro this year.

The finished steel market shows an improvement, there being a great deal of new buying and orders against old contracts in nearly all lines. Large contracts for structural material continue to be placed; despite the fact that production has increased, the mills are as far behind in deliveries as they were six months ago. The strike of the bridge and structural iron workers in this district, which covers a radius of 135 miles from Pittsburg, is still on, but so far has not been attended with any serious results. It does not interfere with the fabricating of material, and there is but little erecting work of any consequence ready. Some of the small concerns have conceded the terms of the union, and the Pittsburg Erectors' Association, composed of the large interests, is bringing non-union men into the district. The members seem confident that they will be able to establish open-shop conditions. Rail business for 1907 delivery is increasing, and before the end of the month, it is likely that fully 1,000,000 tons will be booked. Orders for this year's delivery continue to be placed, and the mills will have difficulty in filling all contracts. Some large contracts for line pipe are being received. The National Tube Company has just booked an order for 25 miles of pipe for shipment to Canada, and the A. M. Byers Company last week began delivery on 30 miles of pipe for an oil company in Kansas. There is a heavy demand for sheets, particularly galvanized corrugated, for San Francisco, and the American Sheet and Tin-Plate Company is giving this business the preference. There is a marked improvement in the demand for plates and the mills have enough business to keep them going for several months without any general buying movement.

Contrary to expectations, there will be no change in wages of puddlers and finishers in the Union iron mills for May and June. The bi-monthly examination of the sales sheets of bar iron of the Republic Iron and Steel Company, under the scale of the Amalgamated Association of Iron, Steel and Tin Workers, was made on Friday. It showed that the average price of common iron bars for March and April was 1.60c., the same as at the previous examination, and the pay of the puddlers will remain at \$6 a ton.

Information was received here today of the action of the convention of the Amalgamated Association in session in Cincinnati on the annual wage scale. It was decided to make no change in any of the branches, and the present scale, with some few changes in foot-notes, will be presented to the manufacturers for renewal. A decision, however, has not been reached on the puddling scale, which was referred to a committee. No material change is expected. Unless the manufacturers in-

sist on a reduction, there will be no wage troubles this year.

Pig Iron—Quotations are as follows: Bessemer, \$17.25@17.50; basic, \$17; foundry No. 2, \$16.50, all at Valley furnaces; gray forge, \$16.50@16.60, Pittsburg.

Steel—The bessemer billet market has eased off, and sales have been made at \$26.50. Open-hearth billets and sheet-bars continue scarce, and are still quoted at \$28. Plates remain at 1.60c. and merchant steel bars at 1.50c.

Sheets—There is a decided improvement in the demand for sheets and prices are firm. Black sheets remain at 2.40c. and galvanized at 3.45c. for No. 28 gage.

Ferro-Manganese—There has been a big drop in prices and, while definite information is not available, it is believed \$75 can be done for spot and second-half delivery.

Ottawa, Canada. May 12.

Steel production in Canada in 1905, as reported to the American Iron and Steel Association, made a great advance. The total was 403,449 tons, an increase of 254,665 tons, or 171 per cent., over 1904; and of 221,412 tons, or 122 per cent., over that of 1902, the previous year of greatest production. The total for 1905 included 9394 tons of direct steel castings. The following table gives the production of steel in Canada for 12 years, in long tons:

| | | | |
|-----------|---------|-----------|--------|
| 1905..... | 403,449 | 1899..... | 22,000 |
| 1904..... | 148,784 | 1898..... | 21,540 |
| 1903..... | 181,514 | 1897..... | 18,400 |
| 1902..... | 182,037 | 1896..... | 16,000 |
| 1901..... | 26,084 | 1895..... | 17,000 |
| 1900..... | 23,877 | 1894..... | 25,685 |

Of the total in 1905, about 41 per cent. was made by the bessemer process and 59 per cent. was open-hearth steel. All the converter steel was acid, and nearly all the open-hearth steel basic.

The make of finished iron and steel also showed a great gain, being 385,326 tons in 1905; an increase of 205,788 tons, or 114 per cent., over 1904. The totals for 11 years have been, in long tons:

| | | | |
|-----------|---------|-----------|---------|
| 1905..... | 385,326 | 1899..... | 110,642 |
| 1904..... | 180,038 | 1898..... | 90,303 |
| 1903..... | 129,516 | 1897..... | 77,021 |
| 1902..... | 161,485 | 1896..... | 75,043 |
| 1901..... | 112,007 | 1895..... | 66,402 |
| 1900..... | 100,690 | | |

The production of bessemer and open-hearth steel rails in 1905 amounted to 175,885 gross tons, against 36,216 tons in 1904; structural shapes, 885 tons, against 447 tons; nail and spike plate, 4110 tons, against 5030 tons; plates and sheets, 4944 tons, against 3102 tons; all other finished rolled products, excluding muck and scrap blooms or forging billets, and other unfinished forms, but including forging blooms or forging billets, 197,002 tons; against 135,243 tons. Of the 385,826 tons of finished iron and steel reported for 1905 about 317,405 tons were rolled from steel and 67,421 tons from iron, as compared with 126,850 tons rolled from steel and 53,188 tons from iron in 1904. In

1905 the rolling mills and steel works in Canada which operated cut nail or wire-nail factories produced approximately 366,800 kegs of cut nails and wire nails, as compared with 324,000 kegs of cut nails and wire nails in 1904.

At the close of the year there were 21 completed steel works and rolling mills in Canada; one plant under construction and two projected. Of these works, four are in Nova Scotia, five in Quebec, 10 in Ontario, one in New Brunswick and one in Manitoba. The plant under construction and the two projected are in Ontario.

Cartagena, Spain. April 28.

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were two cargoes, 8400 tons colorado ore, and one cargo, 5400 tons Calasparra magnetic, to Rotterdam; one cargo, 3857 tons Calasparra magnetic, and one cargo, 1600 tons colorado ore, to Great Britain. Business in futures is being done at an advance. Freight continue very low.

Quotations are 8s. 7d.@8s. 10d. for ordinary 50 per cent. ore; 9s.@9s. 4d. for special low phosphorus; 12s. for specular ore, 58 per cent. iron; 10s. 2d. for S. P. Campanil. Manganiferous ores range from 11s. 9d. for 35 per cent. iron and 12 manganese up to 18s. 2d. for 20 per cent. iron and 20 manganese. All prices are f.o.b. shipping port.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are quoted at 10s. 6d. per ton, f.o.b. shipping port.

Metal Market.

New York, May 16.

Gold and Silver Exports and Imports.

At all United States Ports in April and year.

| Metal. | Exports. | Imports. | Excess. |
|----------------|-------------|--------------|-------------------|
| Gold: | | | |
| Apr. 1906... | \$2,485,552 | \$14,972,576 | Imp. \$12,487,024 |
| " 1905 .. | 1,303,874 | 2,581,057 | " 1,277,183 |
| Year 1906.. | 22,632,174 | 25,288,663 | " 2,656,489 |
| " 1905.. | 35,319,138 | 11,803,259 | Exp. 23,515,879 |
| Silver: | | | |
| Apr. 1906... | 4,213,687 | 2,796,626 | Exp. 1,417,061 |
| " 1905 .. | 2,317,599 | 2,559,876 | Imp. 242,277 |
| Year 1906 .. | 23,379,295 | 15,473,624 | Exp. 7,905,671 |
| " 1905 .. | 14,930,041 | 8,075,232 | " 6,854,809 |

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

Gold and Silver Movement, New York.

For week ending May 12, and years from Jan. 1.

| Period. | Gold. | | Silver. | |
|-----------|------------|-------------|------------|-----------|
| | Exports. | Imports. | Exports. | Imports. |
| Week..... | \$ 10,000 | \$5,133,793 | \$ 987,500 | \$ 44,556 |
| 1906..... | 4,310,036 | 26,184,896 | 24,175,124 | 746,364 |
| 1905..... | 32,903,625 | 4,979,478 | 11,502,218 | 1,225,625 |
| 1904..... | 44,459,258 | 1,805,970 | 15,529,295 | 283,806 |

Exports of gold for the week went to the West Indies; of silver chiefly to London. Imports of gold were from France, Germany and Great Britain; of silver from Central America, Mexico and the West Indies.

The foreign merchandise trade of the

United States for the four months ending April 30, is reported as follows by the Bureau of Statistics of the Department of Commerce and Labor:

| | 1905. | 1906. |
|-----------------------------------|---------------|---------------|
| Exports..... | \$496,021,968 | \$602,372,227 |
| Imports..... | 406,968,765 | 431,678,719 |
| Excess, exports... | \$ 89,053,203 | \$170,693,508 |
| Add excess of exports, silver.... | | 7,905,671 |
| Total..... | | \$178,599,179 |
| Deduct excess of imports, gold.. | | 2,656,489 |
| Apparent export balance..... | | \$175,942,690 |

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

The statement of the New York banks—including all the banks represented in the clearing house—for the week ending May 12, gives the following totals, comparisons being made with the corresponding week of 1905:

| | 1905. | 1906. |
|------------------------|-----------------|-----------------|
| Loans and discounts.. | \$1,099,716,900 | \$1,025,650,580 |
| Deposits..... | 1,150,219,700 | 1,014,556,400 |
| Circulation..... | 44,698,700 | 60,378,700 |
| Specie..... | 219,888,300 | 186,443,400 |
| Legal tenders..... | 84,379,200 | 80,090,300 |
| Total Reserve..... | \$304,267,500 | \$266,533,700 |
| Legal requirements.... | 287,554,925 | 253,639,100 |
| Surplus reserve..... | \$16,712,575 | \$12,894,600 |

Changes for the week this year were increases of \$3,296,800 in specie, \$519,000 in legal tenders, and \$6,995,975 in surplus reserve; decreases of \$16,450,400 in loans, \$12,717,100 in deposits and \$465,500 in circulation.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

| | Gold. | Silver. | Total. |
|---------------|---------------|---------------|---------------|
| New York..... | | | \$186,443,400 |
| England..... | \$154,210,825 | | 156,210,825 |
| France..... | 689,790,280 | \$212,082,275 | 801,872,555 |
| Germany..... | 182,615,000 | 60,870,000 | 243,485,000 |
| Spain..... | 75,585,000 | 120,075,000 | 195,660,000 |
| Netherlands.. | 28,581,500 | 29,224,000 | 57,805,500 |
| Belgium..... | 16,900,000 | 8,450,000 | 25,350,000 |
| Italy..... | 142,585,000 | 19,640,500 | 162,225,500 |
| Russia..... | 450,315,000 | 24,570,000 | 474,885,000 |
| Austria..... | 231,605,000 | 63,945,000 | 295,450,000 |

The returns of the associated banks of New York are of date May 12, and the others May 11. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows for the year to May 1.

| | 1905. | 1906. | Changes. |
|--------------|-------------|-------------|----------------|
| India..... | £ 2,800,490 | £ 6,394,103 | I. £ 3,593,613 |
| China..... | 63,070 | | D. 63,070 |
| Straits..... | 2,800 | 1,750 | D. 1,050 |

Total..... £ 2,866,360 £ 6,395,853 I £ 3,529,493

Receipts for the week were £11,000 from the West Indies and £146,000 from New York; a total of £157,000. Exports were £241,425 to India, and £1750 to the Straits; £243,175 in all.

Indian exchange has been firmer, and the Council bills offered in London were taken at an average of 16.03d. per rupee. Business is active in India, and demand for silver there is good.

Prices of Foreign Coins.

| | Bid. | Asked. |
|---------------------------------|--------|---------|
| Mexican dollars..... | \$0.51 | \$0.52½ |
| Peruvian soles and Chilean..... | 0.46½ | 0.48 |
| Victoria sovereigns..... | 4.85½ | 4.87½ |
| Twenty francs..... | 3.86 | 3.89 |
| Spanish 25 pesetas..... | 4.78 | 4.80 |

SILVER AND STERLING EXCHANGE.

| May. | Sterling Exchange. | Silver. | | May. | Sterling Exchange. | Silver. | |
|------|--------------------|------------------|----------------|------|--------------------|------------------|----------------|
| | | New York, Cents. | London, Pence. | | | New York, Cents. | London, Pence. |
| 10 | 4.85½ | 67 | 31 | 14 | 4.85½ | 66½ | 30½ |
| 11 | 4.85½ | 66½ | 30½ | 15 | 4.85½ | 66½ | 30½ |
| 12 | 4.85½ | 67 | 30½ | 16 | 4.85½ | 66½ | 30½ |

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Other Metals.

Daily Prices of Metals in New York.

| May | Copper. | | | Tin. | Lead. | Spelter. | |
|-----|--------------------|----------------------------|--------------------|------|-------|------------------------|-------------------------|
| | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | London, £ per ton. | | | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 10 | 18½ @ 18½ | 18½ @ 18½ | 83½ | 44½ | 5.60 | 6.00 | 5.85 |
| 11 | 18½ @ 18½ | 18½ @ 18½ | 84½ | 47 | 5.60 | 6.00 | 5.85 |
| 12 | 18½ @ 18½ | 18½ @ 18½ | ..... | 48 | 5.75 | 6.00 | 5.85 |
| 14 | 18½ @ 18½ | 18½ @ 18½ | 86½ | 49½ | 5.75 | 6.00 | 5.85 |
| 15 | 18½ @ 18½ | 18½ @ 18½ | 87½ | 49 | 5.75 | 6.00 | 5.85 |
| 16 | 18½ @ 18½ | 18½ @ 18½ | 86½ | 47½ | 5.75 | 6.00 | 5.85 |

London quotations are per long ton (2,240 lb.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usually 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

Copper—Consumers have placed heavier orders during the last week than for some time past, in order to cover their future requirements. Their purchases have indeed been large. This action is no doubt due to the strength which the metal developed in Europe. As a result, prices advanced and close firmly at 18½@18¾ for Lake; 18 7/16@18½ for electrolytic in cakes, wirebars or ingots; and 18½@18¾ for casting copper.

The London standard market which remained quiet up to the end of last week, to the surprise of everyone shot up about £3 at the beginning of the week, owing to heavy speculation and enforced covering on the part of bears. The market closes easier with a reaction of about £1 from the highest, spot being quoted £86 10s. and three months £85 12s. 6d.

Refined and manufactured sorts are quoted: English tough, £88; best selected, £88 10s.; strong sheets, £94.

Statistics for the first half of May show an increase in the visible supplies of 400 tons.

Exports of copper from New York for the week were 1891 long tons. Our special correspondent reports the exports from Baltimore for the week at 2821 long tons of fine copper. There was also exported from Baltimore 968,350 lb. copper sulphate.

Tin—The bulls in London had it all their own way during the greater part of the week, the quotation at one time reaching £215 for spot and £205 for three months. On heavy realizations, the market closes weak at £207 10s. for spot and £200 for three months.

Supplies in the domestic market being reduced to a minimum, tin for spot delivery has right along brought heavy premiums, selling between 48 and 50c., while futures are offered at one to two cents less, depending upon delivery. The market closes unsettled.

Lead—The American Smelting and Refining Company has again advanced its schedule \$3 per ton, which brings the price to 5.75 New York and 5.67½, St. Louis. Some business has been done in the local market for immediate delivery, at a premium, but it was largely confined to foreign lead, which is being imported.

The market abroad is also higher and closes firm at £17 7s. 6d. for Spanish and £17 10s. for English lead.

The movement of foreign lead in the United States for the three months ending March 31 are reported by the Bureau of Statistics as below, the figures being in short tons:

| | |
|-------------------------------|---------------|
| In bond, Jan. 1..... | 8,148 |
| Imports, three months..... | 29,905 |
| Total supplies..... | 31,453 |
| Re-exports, three months..... | 11,965 |
| In bond, March 31..... | 11,224 |
| Total deductions..... | 23,179 |
| Balance..... | 8,274 |

This balance has, presumably, entered into consumption.

St. Louis Lead Market—The John Wahl Commission Company telegraphs us on May 16, as follows: Lead is strong, scarce and advancing. Missouri brands are selling at 5.85@5.90c., according to brand and delivery.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 28 that silver has been 13.75 reales per ounce. Exchange has been 28.93 pesetas to £1. Pig lead is 76.25 reales per quintal; equal, on current exchange, to £14 15s. 2d. per long ton, f.o.b. Cartagena. Shipments for the week were 199 tons desilverized and 587 tons argentiferous lead, all to Marseilles.

Spelter—This metal continues pressed for sale, and as the demand has been

rather light, prices have receded to 5.85 St. Louis and 6c. New York.

The London market is firmer and closes at £27 2s. 6d. for good ordinaries and £27 5s. for specials.

St. Louis Spelter Market—The John Wahl Commission Company telegraphs us on May 16, as follows: Spelter is reasonably active, at slightly lower prices. Latest sales here are on a basis of 5.85c., East St. Louis.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 28, that the market continues firm, but with few transactions.

Zinc Sheets—The price of zinc sheets is \$7.75 per 100 lb. (less discount of 8 per cent.) f.o.b. cars for Lasalle and Peru, in 600-lb. cases for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive, and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since Jan. 1, 1906, have been as follows: Jan. 6, 1906, \$8; Feb. 5, \$7.75.

Antimony—There has been no change in this metal. Cookson's and Hallett's are quoted 25@26c.; other makes are offered at somewhat less.

Nickel—Quotations for large lots, New York, or other parallel delivery, are 40@47c. per lb., according to size and condition of order. For small quantities, prices range from 48c. up to 60c., also according to size of order and deliveries.

Platinum—The current quotation in New York is \$25 per ounce. The price, however, is subject to fluctuations, on account of variable supply. Demand is strong and steady.

Quicksilver—The metal is firm and New York prices are still \$41 per flask of 75 lb. for lots of 100 flasks or over, and \$42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to \$43.50@44 per flask. San Francisco prices are firm at \$39.50 for domestic orders and \$38 for export. The London price is £7 7s. 6d. per flask, but jobbers ask £7 10s. for moderate lots.

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

| | Per lb. |
|--------------------------------------|-------------|
| Bismuth..... | \$1.25@1.65 |
| Cadmium, 99.5% f. o. b. Hamburg..... | 92c. |
| Chromium, pure (N. Y.)..... | 80c. |
| Copper, red oxide..... | 50c. |
| Ferro-Molybdenum (50%)..... | 95c. |
| Ferro-Titanium (20@25% N. Y.)..... | 75c. |
| Ferro-Chrom. (75%)..... | 12½c. |
| Ferro-Tungsten (37%)..... | 29c. |
| Magnesium, pure (N. Y.)..... | \$1.60 |
| Manganese (98@99% N. Y.)..... | 75c. |
| Manganese Cu. (80@70% N. Y.)..... | 40c. |
| Molybdenum (98@99% N. Y.)..... | \$1.75 |
| Tantalum acid (N. Y.) (oz.)..... | 49c. |
| Phosphorus, foreign red..... | 75c. |
| Phosphorus, American yellow..... | 50c. |
| Tungsten (best), pound lots..... | 90c. |

Variations in price are chiefly due to size and conditions of order and deliveries.

Aluminum—List prices of the chief maker are as follows, for ingots: No. 1, over 99 per cent. pure, 38c. per lb. in less than 100-lb. lots, 36c. in lots of 100 lb. up to one ton, and 35c. in ton lots; No. 2, over 90 per cent., 35c., 43c. and 33c., as above. Granulated metal is 1c. per lb. over price of ingots. Rolled sheets from 44c. up, according to size.

Wisconsin Ore Market.

PLATTEVILLE, May 12.

Prices of high-grade zinc ore rallied late in the week, owing to the fact that one of the regular buyers who has been out of the market, suddenly started buying, much to the surprise of all; 60 per cent. zinc ore brought from \$43 to \$45, location and quantity having considerable to do with the price. Low-grade pyritic ore was in good demand and brought \$2 per ton more than last week in several cases.

Drybone and sulphur remained the same as last week. A higher price was offered for lead than last week. Very few sales reported.

The camps of the district loaded ore as follows during the week:

| Camps. | Zinc, Lb. | Lead, Lb. | Sulphur, Lb. |
|---------------------------|------------|-----------|--------------|
| Platteville..... | 231,370 | ..... | ..... |
| Cuba City..... | 177,000 | ..... | ..... |
| Mineral Point..... | 124,740 | ..... | ..... |
| Buncombe-Hazel green..... | 124,500 | ..... | ..... |
| Benton..... | 104,000 | ..... | ..... |
| Linden..... | 88,540 | ..... | 59,920 |
| Livingston..... | 80,000 | ..... | ..... |
| Highland..... | 60,000 | ..... | ..... |
| Montfort..... | ..... | ..... | 59,440 |
| Total..... | 990,150 | ..... | 119,360 |
| Year to May 12..... | 23,554,080 | 1,291,960 | 2,370,760 |

Empire ore has been withdrawn from the market; it had dropped in grade so that it brought only \$23 or \$24. The ore will be held out till a roaster is installed.

Missouri Ore Market.

JOPLIN, May 12.

The highest price reported paid for zinc was \$44, on an assay basis of \$40 to \$41 per ton of 60 per cent. zinc. As high as \$83 per ton is said to have been paid for lead, a price \$4 higher than a week ago. Eighty per cent. grades sold at \$80@81 and the average price was \$79.60.

The shipments of zinc and of lead are the largest of any one week in the history of the district, being 2,756,450 lb. zinc and 63,180 lb. lead larger than the previous record-breaking week of November 11, 1905, six months ago. Zinc was then \$11 per ton higher and lead \$11 per ton less, and the total value is \$42,834 greater. The increased shipments came from the reserve stock of the Underwriters' Land Company, the American Zinc, Lead and Smelting Company, and other companies with less amounts in the Webb City-Carterville subdivision, the former company reporting 2,533,200 lb. of zinc and 555,770 lb. of lead, the American 899,550 lb. of zinc ore. The Underwriters' sale is the largest ever made from one mine, and there

are approximately 1,000 tons more ore in the bins at this property.

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

| | Zinc, lb. | Lead, lb. | Value. |
|-------------------------|------------|-----------|-----------|
| Carterville-Webb City.. | 5,593,120 | 1,033,620 | \$166,130 |
| Joplin..... | 3,060,870 | 387,060 | 74,660 |
| Galena-Empire..... | 1,482,410 | 230,880 | 37,406 |
| Duenweg..... | 915,630 | 226,900 | 27,845 |
| Granby..... | 594,000 | 157,000 | 15,000 |
| Aurora..... | 583,680 | ..... | 10,926 |
| Alba..... | 389,730 | 44,280 | 10,148 |
| Badger..... | 365,900 | ..... | 7,680 |
| Oronogo..... | 359,450 | 18,760 | 7,858 |
| Neck City..... | 351,340 | ..... | 7,898 |
| Prosperity..... | 114,340 | 102,620 | 6,448 |
| Spurgeon..... | 224,080 | 8,340 | 3,647 |
| Zincite..... | 135,140 | 3,160 | 2,896 |
| Stott City..... | 100,790 | ..... | 2,115 |
| Carthage..... | 63,650 | ..... | 1,378 |
| Totals..... | 14,837,140 | 2,099,140 | \$381,874 |

19 weeks..... 195,295,110 27,436,410 \$5,292,685
Zinc value, the week, \$298,722; 19 weeks, \$4,265,448.
Lead value, the week, 83,162; 19 weeks, 1,027,237.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

| ZINC ORE AT JOPLIN. | | | LEAD ORE AT JOPLIN. | | |
|---------------------|-------|-------|---------------------|-------|-------|
| Month. | 1905. | 1906. | Month. | 1905. | 1906. |
| January... | 52.00 | 47.38 | January.... | 61.50 | 75.20 |
| February... | 52.77 | 47.37 | February... | 57.62 | 72.83 |
| March..... | 47.40 | 42.68 | March..... | 57.20 | 73.73 |
| April..... | 43.58 | 44.63 | April..... | 58.00 | 75.13 |
| May..... | 43.31 | ..... | May..... | 58.27 | ..... |
| June..... | 40.75 | ..... | June..... | 57.88 | ..... |
| July..... | 43.00 | ..... | July..... | 58.00 | ..... |
| August..... | 48.83 | ..... | August..... | 58.00 | ..... |
| September.. | 46.75 | ..... | September.. | 63.50 | ..... |
| October..... | 47.60 | ..... | October..... | 63.86 | ..... |
| November.. | 49.55 | ..... | November.. | 68.67 | ..... |
| December.. | 49.00 | ..... | December.. | 76.25 | ..... |

Mining Stocks.

NEW YORK, May 16.

The stock market generally has been irregular and uncertain, generally with a downward tendency; but relieved by occasional rallies. Every incident makes talk, and much was made of a cut from 50 to 25c. in the quarterly dividend on Parrot stock; but Parrot is a small company, and the drop does not make an important difference in Amalgamated earnings. It only shows the unsteady condition of the market.

Curb stocks were quiet for the most part, and the coppers were rather neglected and inclined to be heavy, Utah Copper closed at \$26½; Boston Consolidated at \$26; while \$19¼ was named for Nevada Consolidated.

On the Consolidated Exchange mining stocks were quiet. Portland sold at \$1.85, and Work at 9c. Of Comstock shares, \$1 was paid for Hale & Norcross; 90c. for Savage; 24c. for Gould & Curry. There are, of course, no San Francisco quotations for these stocks at present.

Boston. May 15.

Parrot and Atlantic mining shares furnished the sensation in this market this week. The cutting of the Parrot dividend in half to 25c. per quarter came from a clear sky, as there has been no hint of

such action. The stock broke from \$36.25 to \$28.50 in very heavy trading Monday, the day of the declaration, and went off to \$26.12½ today, with subsequent recovery to \$27.50. There had been some quiet buying of this stock recently, as the output has continued to increase month by month, which led many to believe there would be an increase in the dividend rate, rather than a reduction. A great many people think the stock has been accumulated on the slump, notwithstanding the talk of an iron zone which has got to be penetrated. Atlantic broke \$4.75 to \$14 the same day. It is reported that the property is practically closed down, due to continued air blasts in the mine which have put the shaft out of commission.

Tecumseh took the other tack, and rose \$2.50 to \$12 with a \$1 reaction. Rich amygdaloid rock is being taken from the Kearsarge lode which was penetrated some months ago. North Butte touched its highest price last Friday, namely \$95.25. It closed tonight about the same as a week back at \$92.37½. The next dividend will be either \$1.75 or \$2, according to unofficial reports. Amalgamated which spurted from \$103.50 to \$110.50, closed \$3.37½ better than a week ago at \$109.12½. The buying is persistent and is said to be good. Old Dominion rose \$2.75 to \$43, but has lost most of the advance. Another 50-cent dividend is talked to follow declaration of \$6.50 on United Globe stock owned by the Maine corporation, Osceola rose \$3 to \$108, but reacted \$1.50, and Mohawk rose \$2.75 to \$62.75 losing the fraction. United Copper spurted over \$6 to \$67.37½ and Utah \$1.75 to \$62.50, but both have reacted. United States Smelting fell \$2.25 to \$57.50, but has recovered \$1 of the loss.

United States Coal and Oil, on extra heavy dealings for a short period rose \$2, to \$13.50, but has reacted to \$12.50, with nothing said. Shannon reached \$10, but is back to \$8.75 tonight. Copper Range rose \$2.75 to \$78.50 but is back to \$77 tonight. Champion Mining directors are not expected to declare a dividend this month although three \$1 dividends have been paid thus far this year. Bingham advanced \$1.25 to \$36.25 but lost more than it gained, and Boston Consolidated rose \$2.50 to \$26.50, reacting to \$25 subsequently. Greene Consolidated is off \$1.25 to \$28.25.

On the curb Arizona Commercial has advanced \$5 to \$32, while Raven is off to \$4.25 today.

Colorado Springs. May 11.

The market has been fairly active during the past week, with prices not much changed. A fractional decline has been the tendency with a majority of the mines list. Elkton was quite active during the week, selling as low as 43, but recovering to 44c. El Paso's low mark was 50¾, but none sold today. Mary M'Kinney advanced from 52 to 53¾c. Portland sold

down to \$1.85 today. Findley made a decline of 1c., closing at 75 1/2c. United Gold Mines was traded in as low as 9 1/2, but sold today for 10c. Vindicator changed hands at 94@95c. Isabella has made a slight gain, selling for 25 1/2c. today.

Six companies have subscribed close to \$500,000 toward the new tunnel, and there are 40 more which have not yet been solicited. The railroads, mills and smelters are expected to subscribe another \$200,000. This amount, together with that has already been raised, will drive the tunnel into the main water course.

STOCK QUOTATIONS.

| NEW YORK. | | Week May 15 | | |
|--------------------------|---------|-------------|---------|---------|
| Name of Company. | High | Low | Clg. | Sales |
| Amalgamated..... | 109 1/2 | 104 1/2 | 107 1/2 | 811,250 |
| Anaconda..... | 275 1/2 | 248 1/2 | 261 | 503,400 |
| Boston Copper..... | 26 1/2 | 23 1/2 | 25 1/2 | 29,675 |
| British Col. Copper..... | 8 1/2 | 6 1/2 | 7 1/2 | 16,800 |
| Federal..... | 169 1/2 | 165 | 165 | 500 |
| Federal, Pf..... | 100 1/2 | 97 1/2 | 98 | 9,300 |
| Greene Copper..... | 29 1/2 | 28 1/2 | 28 1/2 | 8,800 |
| Greene Gold..... | 4 | 3 1/2 | 3 1/2 | 10,600 |
| Mitchell..... | 8 | 7 1/2 | 7 1/2 | 6,360 |
| Tennessee Copper..... | 44 1/2 | 42 1/2 | 43 1/2 | 1,400 |
| Union Copper..... | 2 1/2 | 1 1/2 | 1 1/2 | 21,300 |
| United Copper..... | 67 1/2 | 60 1/2 | 65 1/2 | 28,150 |
| Utah Apex..... | 5 1/2 | 5 1/2 | 5 1/2 | 600 |
| Utah Copper..... | 28 | 26 | 26 1/2 | 2,894 |

NEW YORK INDUSTRIALS.

| | | | | |
|------------------------------|---------|---------|---------|---------|
| Am. Smelting & Ref..... | 157 1/2 | 152 1/2 | 154 | 409,350 |
| Am. Smelting & Ref., Pf..... | 120 1/2 | 117 1/2 | 118 | 7,200 |
| Ool. Fuel & Iron..... | 52 1/2 | 48 1/2 | 49 1/2 | 97,150 |
| Pittsburg Coal..... | 14 1/2 | 14 | 14 1/2 | 300 |
| " " pfd..... | 53 1/2 | 53 1/2 | 53 1/2 | 16 |
| National Lead..... | 82 1/2 | 78 1/2 | 79 1/2 | 67,650 |
| Republic I. & S..... | 29 1/2 | 27 1/2 | 28 | 14,300 |
| Republic I. & S., Pf..... | 108 | 99 1/2 | 100 1/2 | 8,100 |
| Tenn. C. & I..... | 148 | 145 | 145 | 3,800 |
| U. S. Red. & Ref..... | 34 | 33 | 33 | 2,220 |
| U. S. Red. & Ref., Pf..... | 75 | 71 1/2 | 74 1/2 | 9,700 |
| U. S. Steel..... | 42 | 39 1/2 | 40 1/2 | 359,375 |
| U. S. Steel, Pf..... | 108 1/2 | 104 1/2 | 105 | 73,820 |
| Standard Oil..... | 620 | 604 | 604 | |
| Bethlehem Steel..... | 28 | 26 1/2 | 27 1/2 | |

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Bamb. Delamar, 5 1/2-7; Butte Coalition, 3 1/2-3 3/4; Cumb. Ely Min., 5 1/2-7; Greene Gold-Silver, 2 1/2-3 1/4; Mont. Shoshone, new, 16 1/2-16 3/4; Nevada Con. Copper, 19-19 1/2; (Boston) Adventure, 7-7 1/2; Montana C. & C., 3 1/2-3 3/4; Nevada, 18 1/2-19 1/2; Trinity, 9 1/2-10 1/2; U. S. Oil, 12-13 1/2; Wolverine, 135-137; Wyandotte, 1 1/2-1 3/4.

BOSTON.

| | | | | |
|--------------------------|---------|---------|---------|--------|
| Allouez..... | 39 | 37 | 38 | 1,705 |
| *Amalgamated..... | 110 1/2 | 105 1/2 | 107 1/2 | 60,863 |
| Atlantic..... | 18 1/2 | 14 | 14 1/2 | 8,815 |
| Bingham..... | 36 1/2 | 34 1/2 | 34 1/2 | 5,376 |
| Boston Consolidated..... | 26 1/2 | 23 1/2 | 25 | 18,747 |
| *Calumet & Hecla..... | 700 | 692 | 700 | 93 |
| Centennial..... | 24 1/2 | 23 1/2 | 23 1/2 | 560 |
| Con. Mercur..... | 65 | 62 | 65 | 900 |
| Copper Range..... | 78 1/2 | 75 1/2 | 76 1/2 | 8,034 |
| Daly-West..... | 17 1/2 | 16 1/2 | 17 | 1,508 |
| Franklin..... | 18 1/2 | 16 | 17 1/2 | 2,873 |
| *Granby..... | 13 1/2 | 12 1/2 | 12 1/2 | 970 |
| Green Con. Copper..... | 30 | 28 1/2 | 28 1/2 | 5,211 |
| Ile Royale..... | 21 1/2 | 20 | 20 | 1,045 |
| Mass..... | 8 1/2 | 7 | 8 1/2 | 692 |
| Michigan..... | 13 | 12 1/2 | 12 1/2 | 1,170 |
| Mohawk..... | 63 | 60 | 62 | 2,033 |
| *North Butte..... | 95 1/2 | 90 1/2 | 91 1/2 | 45,741 |
| Old Dominion..... | 43 | 40 1/2 | 40 1/2 | 3,374 |
| Osceola..... | 108 | 105 1/2 | 106 1/2 | 1,772 |
| Parrot..... | 36 1/2 | 26 1/2 | 26 1/2 | 23,194 |
| *Quincy..... | 102 1/2 | 98 | 101 | 523 |
| Rhode Island..... | 5 1/2 | 5 | 5 | 1,690 |
| Shannon..... | 10 | 8 1/2 | 8 1/2 | 32,789 |
| Tamarack..... | 107 | 100 | 105 | 263 |
| Tecumseh..... | 12 1/2 | 9 1/2 | 11 | 4,630 |
| United Copper, com..... | 67 1/2 | 61 | 65 1/2 | 10,220 |
| U. S. Smg. & Ref..... | 59 1/2 | 57 1/2 | 57 1/2 | 1,764 |
| " " pfd..... | 46 1/2 | 46 | 46 | 2,708 |
| Utah Con..... | 62 1/2 | 60 1/2 | 60 1/2 | 14,746 |
| Victoria..... | 8 | 7 1/2 | 7 1/2 | 1,165 |
| Winona..... | 8 | 6 1/2 | 7 1/2 | 1,100 |

COLORADO SPRINGS.

| Name of Company. | First | High | Low | Clg |
|------------------|--------|--------|--------|--------|
| Elkton..... | 44 1/2 | 48 1/2 | 43 | 48 |
| El Paso..... | 51 | 51 | 49 1/2 | 49 1/2 |
| Isabella..... | 25 | 26 | 24 1/2 | 24 1/2 |
| Portland..... | 195 | 195 | 180 | 180 |
| Vindicator..... | 95 | 95 | 93 | 93 |

SAN FRANCISCO.

(Business suspended for the present; last figures left for reference.)

| | | | | |
|----------------------|----------|------|------|------|
| Best & Belcher..... | 1.25 | 1.25 | 1.15 | 1.15 |
| Bullion..... | .31 | .31 | .25 | .29 |
| Caledonia..... | .37 | .44 | .35 | .44 |
| Confidence..... | .90 | .94 | .90 | .90 |
| Con. Cal. & Va..... | 1.35 | 1.35 | 1.30 | 1.30 |
| Gould & Curry..... | .28 | .28 | .27 | .27 |
| Hale & Norcross..... | 1.20 | 1.20 | 1.05 | 1.10 |
| Mexican..... | 1.15 | 1.15 | 1.15 | 1.15 |
| Occidental Con..... | .96 | .96 | .85 | .95 |
| Ophir..... | 5.37 1/2 | 5.50 | 5.25 | 5.25 |
| Savage..... | 1.00 | 1.00 | 1.00 | 1.00 |

* Ex-dividend. † 1st Installment Paid. ‡ Assessment Paid.

Monthly Average Prices of Metals.

| Month. | SILVER. | | | |
|----------------|-----------|--------|---------|--------|
| | New York. | | London. | |
| | 1905. | 1906. | 1905. | 1906. |
| January..... | 60.690 | 65.288 | 27.980 | 30.113 |
| February..... | 61.023 | 66.108 | 28.047 | 30.464 |
| March..... | 58.046 | 64.597 | 26.794 | 29.854 |
| April..... | 56.600 | 64.765 | 26.108 | 29.984 |
| May..... | 57.832 | 66.664 | 26.664 | 29.664 |
| June..... | 58.428 | 66.100 | 26.100 | 29.664 |
| July..... | 58.915 | 66.100 | 27.163 | 29.664 |
| August..... | 60.259 | 66.100 | 27.822 | 29.664 |
| September..... | 61.695 | 66.100 | 28.528 | 29.664 |
| October..... | 62.084 | 66.100 | 28.637 | 29.664 |
| November..... | 63.849 | 66.100 | 29.498 | 29.664 |
| December..... | 64.850 | 66.100 | 29.977 | 29.664 |
| Year..... | 60.382 | 66.100 | 27.839 | 29.664 |

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

| Month. | NEW YORK. | | | | LONDON. | |
|------------|---------------|--------|--------|--------|---------|--------|
| | Electrolytic. | | Lake. | | 1905. | 1906. |
| | 1905. | 1906. | 1905. | 1906. | | |
| Jan..... | 15.008 | 18.310 | 15.128 | 18.416 | 68.262 | 78.896 |
| Feb..... | 15.011 | 17.869 | 15.136 | 18.116 | 67.963 | 78.147 |
| March..... | 15.125 | 18.361 | 15.260 | 18.641 | 68.174 | 81.111 |
| April..... | 14.920 | 18.375 | 15.045 | 18.688 | 67.017 | 84.793 |
| May..... | 14.627 | 18.375 | 14.820 | 18.688 | 64.875 | 84.793 |
| June..... | 14.673 | 18.375 | 14.813 | 18.688 | 65.881 | 84.793 |
| July..... | 14.888 | 18.375 | 15.005 | 18.688 | 66.887 | 84.793 |
| Aug..... | 15.664 | 18.375 | 15.725 | 18.688 | 69.530 | 84.793 |
| Sept..... | 15.965 | 18.375 | 15.978 | 18.688 | 69.667 | 84.793 |
| Oct..... | 16.279 | 18.375 | 16.352 | 18.688 | 71.406 | 84.793 |
| Nov..... | 16.599 | 18.375 | 16.768 | 18.688 | 74.727 | 84.793 |
| Dec..... | 18.328 | 18.375 | 18.398 | 18.688 | 78.993 | 84.793 |
| Year..... | 15.590 | 18.375 | 15.690 | 18.688 | 69.465 | 84.793 |

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

| Month. | 1905. | | 1906. | |
|------------|--------|--------|-------------|--------|
| | 1905. | 1906. | 1905. | 1906. |
| Jan..... | 29.325 | 34.390 | July..... | 31.760 |
| Feb..... | 29.252 | 36.403 | August..... | 32.866 |
| March..... | 29.523 | 36.662 | Sept..... | 32.095 |
| April..... | 30.525 | 38.900 | Oct..... | 32.451 |
| May..... | 30.049 | 38.900 | Nov..... | 33.443 |
| June..... | 30.329 | 38.900 | Dec..... | 35.885 |
| | | | Av. year. | 31.358 |

Prices are in cents per pound.

LEAD IN NEW YORK.

| Month. | 1905. | | 1906. | |
|------------|-------|-------|------------|-------|
| | 1905. | 1906. | 1905. | 1906. |
| Jan..... | 4.552 | 5.600 | July..... | 4.524 |
| Feb..... | 4.450 | 5.464 | Aug..... | 4.665 |
| March..... | 4.470 | 5.350 | Sept..... | 4.850 |
| April..... | 4.500 | 5.404 | Oct..... | 4.850 |
| May..... | 4.500 | 5.404 | Nov..... | 5.200 |
| June..... | 4.500 | 5.404 | Dec..... | 5.422 |
| | | | Av., year. | 4.707 |

Prices are in cents per pound. The London average for January, 1906, was £ 16.850 per long ton; February, £ 15.922; March, £ 15.922; April, £ 15.859.

SPELTER.

| Month. | New York. | | St. Louis. | | London. | |
|------------|-----------|-------|------------|-------|---------|--------|
| | 1905. | | 1906. | | 1905. | 1906. |
| | 1905. | 1906. | 1905. | 1906. | | |
| Jan..... | 6.190 | 6.487 | 6.032 | 6.337 | 25.622 | 28.225 |
| Feb..... | 6.139 | 6.075 | 5.989 | 6.224 | 24.594 | 25.844 |
| Mar..... | 6.067 | 6.209 | 5.917 | 6.056 | 23.825 | 24.563 |
| April..... | 5.817 | 6.078 | 5.667 | 5.931 | 23.813 | 25.781 |
| May..... | 5.434 | 5.244 | 5.244 | 5.244 | 23.594 | 23.594 |
| June..... | 5.190 | 5.244 | 5.244 | 5.244 | 23.878 | 23.878 |
| July..... | 5.386 | 5.556 | 5.556 | 5.556 | 23.938 | 23.938 |
| Aug..... | 5.706 | 5.737 | 5.737 | 5.737 | 24.675 | 24.675 |
| Sept..... | 5.887 | 5.887 | 5.887 | 5.887 | 26.375 | 26.375 |
| Oct..... | 6.087 | 6.087 | 6.087 | 6.087 | 28.225 | 28.225 |
| Nov..... | 6.145 | 6.145 | 6.145 | 6.145 | 28.500 | 28.500 |
| Dec..... | 6.522 | 6.522 | 6.522 | 6.522 | 28.719 | 28.719 |
| Year..... | 5.882 | 5.730 | 5.730 | 5.730 | 25.433 | 25.433 |

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.

Dividends.

| Company. | Payable. | Rate. | Amt. |
|------------------------------------|----------|----------|-------------|
| Amalgamated Copper..... | May 28 | \$ 1.75 | \$2,712,500 |
| Am. Smelters' Sec'ties, B pfd..... | June 1 | 1.25 | 375,000 |
| Doctor-Jack Pot..... | May 15 | 0.00 1/2 | 15,000 |
| Homestake..... | May 15 | 0.50 | 109,200 |
| International salt..... | June 1 | 1.00 | 187,500 |
| Lshigh Coal & Nav..... | May 28 | 2.00 | 695,140 |
| N. Y. & Hond. Rosario..... | May 19 | 0.20 | 30,800 |
| Parrot, Mont..... | June 12 | 0.25 | 57,463 |
| U. S. Steel, pfd..... | May 31 | 1.75 | 6,305,480 |

Assessments.

| Company. | Delinq. | Sale. | Amt. |
|----------------------------|---------|---------|---------|
| Arrow, Utah..... | May 7 | June 1 | \$0.005 |
| Brewer-Harrison, Utah..... | May 10 | June 1 | 0.01 |
| Bullion..... | Apr. 30 | May 21 | 0.05 |
| Butler-Liberal, Utah..... | May 26 | June 16 | 0.02 |
| Congar, Utah..... | May 29 | June 10 | 0.0 1/2 |
| Justice..... | May 17 | June 12 | 0.05 |
| Loon Creek, Utah..... | May 12 | May 31 | 0.01 |
| Overman..... | May 18 | June 8 | 0.10 |
| Sierra Nevada..... | May 7 | May 28 | 0.10 |

Tonopah Stocks.

May 14.

