

## THE ENGINEERING AND MINING JOURNAL

### Fissure-Veins.

BY R. W. RAYMOND.

The question, What is a fissure-vein?, constitutes the subject of an interesting "symposium" in the forthcoming number of *Economic Geology*, a periodical published at Lehigh University, South Bethlehem, Pa., under the editorship of Prof. J. D. Irving. The present article, though primarily intended for THE ENGINEERING AND MINING JOURNAL, will, in substance, constitute my contribution to that discussion.

According to the universally accepted definition of a fissure-vein, it is a mineral mass occupying a fissure in the earth's crust, whatever be the nature of the vein-material, its difference from the adjacent rock, or the manner in which it was deposited in the fissure. Thus, fissure-veins may be metalliferous or non-metalliferous; may consist of the same materials as the country rock or of other materials; and may have been produced by one or more of many different processes. The only essential proposition involved in this definition is that of a pre-existing fissure.

But if we proceed to inquire into the relations and theoretical or practical importance of fissure-veins, we must confess that they are now recognized, in many instances, as merely subordinate features of large mineral masses, the interstices of which have been genetically equivalent to the space of the fissures themselves, so that the whole of such a mass must be regarded as an aggregate of cavities filled with mineral. This larger view of a mineral deposit is due chiefly to modern progress in the economy of mining, transportation and metallurgical treatment, which has caused many rock masses, formerly ignored as practically barren, to be regarded as economically valuable, and thus to be included in the class with which the student of ore deposits has always felt himself specially concerned.

Moreover, many deposits, apparently fissure-veins, have been found to be the result of the slow replacement, impregnation or alteration of zones which cannot be considered as having presented, at any time, open fissures. And, finally, the largest producing mines of the world are now based upon deposits which never would have been classed as fissure-veins; and hence the leading position assigned to such veins by the "Saxon school," from Agricola to Cotta, because they constituted the principal source of certain metals, no longer belongs to them.

The principal characteristic of fissure-veins is one of form, as the classic textbooks, with their discussions of strike, dip, walls, faults, etc., abundantly show. By many authors they are placed under

the head of sheet or tabular deposits, and such a conception underlies the provisions of the United States mineral land law. But this was never exclusively significant, even in the art of mining. A bed, tilted and bounded like a true vein, would be mined in the same way. From a scientific standpoint, on the other hand, the origin and nature of any mineral deposit are not to be deduced from its form alone; and fissure-veins, in a genetic classification, necessarily occupy subordinate divisions under the general head of secondary or subsequent deposits, and under separate sub-headings denoting the manner of mineralization. In other words, they do not constitute a leading class by themselves.

Nevertheless, there is, in my judgment, a group of fissure-veins which deserves a higher rank as a separate class. I refer to veins of deep-seated origin, entirely different from the country rock enclosing them, and not extending, as impregnations, etc., into the rock, or attributable to such action proceeding from it. The importance and extent of this class may be at present more or less doubtful; but I think it will permanently remain and demand recognition in any general theory of ore deposits, because it presents (besides the characteristic of form) peculiar features of structure and probable origin. Such deposits have always been known as fissure-veins, and, as they have been distinguished from sundry other deposits resembling them (gash-veins, contact zones, shear zones, etc.), this original name has been made more definite by adding the word "true." With some such modification, perhaps, I think the name should survive. It is always a pity to break the continuity of technical literature by unnecessarily killing a familiar term. This process is sometimes necessary; and it is, in my judgment, always better than the retention of an old term with a distinctly new meaning. For instance, it would be better to drop the term "fissure-vein" altogether than to apply it to something which would never have been so called by the classic authors who invented that term. But a mere restriction of the class, taking out deposits (shear zones, etc.) which were once included in it, but leaving those which now, as always, properly belong to it, does not warrant the abandonment of the name. New births, of course, require new christenings, and the genealogies of science should not be confused by giving to the little strangers the names of their ancestors. There are some terms in modern geological literature which really ought to be followed by "Jr." But, on the other hand, when the ancestor still survives, albeit somewhat shrunken with age, he ought not to be mistaken for a baby and re-baptized!

This leads me to say a final word concerning the classification of mineral deposits. After more than forty years of

study, I am inclined to say, as Thackeray's Jeames Yellowplush said of orthography, "As for classification, every gentleman has his own!"

A logical classification requires a primary division, based upon the deepest and sharpest distinction that can be found, and a series of sub-divisions, based upon less profound and, perhaps, less sharply defined differences—which should be, however, successively less important and duly subordinate to those which precede them. Moreover, the members of each rank should be equivalent in importance, as measured by the principle of the classification; and vagueness of distinction should be, if possible, confined to the last series (corresponding to "varieties" in biology).

Now, in the classification of mineral deposits, we encounter at the outset the difficulty that the basis of the profound primary division depends upon the purpose of the classification. From the standpoint of the art of mining, perhaps the most radical distinction is between superficial and underground deposits; and classifications based on this distinction are doubtless most convenient for instructors in the processes and methods of that art, who naturally follow this primary division with others based upon form, position, contents and structure, rather than genesis—which does not greatly concern the mining engineer, except so far as it may be a guide to the discovery, valuation and exploitation of mineral deposits.

On the other hand, a logical classification is conceivable from the standpoint of descriptive geology, arranging the deposits according to what they now are or contain, without primary distinctions as to how they acquired their present characteristics. Such a system might begin with a division into metalliferous and non-metalliferous deposits; or deposits in igneous, in metamorphic, and in sedimentary rocks; or deposits contained in the rocks of different formations.

No doubt the most scientific classification should be a genetic one; and for this purpose, probably the best practicable primary distinction is the ore long ago proposed by Werner, of Freiberg, between "contemporaneous" and "subsequent" mineral deposits. Yet it is conceivable that a still deeper and older distinction may be established hereafter, to which mineral deposits, like all other parts of the earth's crust, will be properly subject. Meanwhile, it seems to me that our classifications for a considerable period will continue to express the several purposes for which they are made, and the notions of the makers as to the relative general importance of the differences they represent; while the most important service that any investigator can render will be the accurate observation and adequate record of the facts required for larger induction and ultimate theory.

### Large Orebodies in Australia— Mining Methods.

BY A. SELWYN-BROWN.

The successful methods adopted in exploiting large orebodies are among the most noteworthy characteristics of Australian mining practice. Many such deposits are being extracted at a much lower cost, and with less loss of valuable matter, than is the case with smaller lodes of other countries, which present but few difficulties. These results have been attained by a slow process of evolution, which has been directed by unusual mining aptitude combined with careful study of the best foreign experience. A brief sketch of some of the more important operations may prove of interest.

The Mount Bischoff tin mine in Tasmania, in addition to holding the record for the largest tin production, has long been cited as an example of cheap mining. This mine was first opened at the end of 1872. It is situated on the crown of Mount Bischoff, a flat-topped isolated elevation rising (between the Arthur and Waratah rivers on the northwest coast) to a height of 2,598 ft. The country rock consists of a porcellanite-like quartzite (or a silicified fine-grained sandstone) which has been intruded by dikes of a stanniferous porphyritic topaz-rock.

Mining operations have been confined to a crescent-shaped basin divided into three distinct depressions, locally known as the "Brown face," "White face" and "Slaughter-yard face," respectively. The first of these three is the largest and richest.

The Brown face is funnel-shaped, and is enclosed by an elliptical porphyry dike 10 ft. in width. The upper portion of the funnel measured 700 by 400 ft. The White face is 900 by 600 ft.; while the third face is of much smaller dimensions. The material in the faces is ordinary alluvium, mixed with boulders and occasional fragments of trees. Since the property was first operated the material has been mined by open quarrying. Small sloping benches are laid out, and these are then undercut. When the ground shows signs of caving, the men are withdrawn, and heavy shots are fired to bring down large quantities of material. The dislodged ore is then hand-loaded into small cars, and is hauled up an incline from the excavation, by a rope drawn by a stationary engine on the outer edge of the orebody. The cars are then detached from the rope, and are run on a self-dumping device, whence the ore falls into large bins to be re-loaded into railroad cars and carried to the mill a mile distant. The other faces are similarly handled. The cost of mining and hauling to the mill is about 50c. per ton. As the class of ore hitherto mined is nearing exhaustion, no change has lately been made in this procedure. The orebodies, however, would have been suitable for mining by electrically-driven mechanical shovels working on the bench system in

conjunction with electric trams running straight from the benches to the mill. There would have been ample hydraulic power for generating the electricity, and mining costs would have been reduced to an extraordinarily low figure.

Timber of good quality for mining purposes is plentiful in Tasmania. It is an extraordinary fact that over 3,000,000 tons of material yielding more than 63,000 tons of cassiterite have been taken from the Mount Bischoff workings without any props being used. The alluvial ground has been scraped clean to the solid bed-rock by simple quarrying. When the sulphide-bearing topaz dikes are opened new mining problems will arise; but they will doubtless be overcome by the miner sooner than the unique metallurgical problems which are presented by the complex low-grade sulphide ore are solved.

The Mount Lyell mine (also in Tasmania, like the Mount Bischoff) has been distinguished alike for the cheapness and efficiency of the mining and metallurgical methods pursued by the management. Mining costs since 1897 have averaged about 50c. per ton. The mine is situated on a mountain peak about 1,500 ft. above sea level. The ore is a lens-shaped pyritic body, 600 ft. long by 30 ft. wide in its extreme parts; it rests on a schist, and is overlaid by a massive conglomerate. The deposit was first attacked by sinking a shaft in the center of the orebody and connecting this by a tunnel through the mountain-side at a depth of about 450 ft. Then the ground was excavated around the top of the shaft, and was worked back toward a bench. As soon as this bench was far enough back, a second bench was opened; other benches then followed as facility offered, until there are now ten benches in operation. The topmost is about 800 by 600 ft., while the lowest is 100 ft. across at a depth of 266 feet.

The ore quarried from the benches is trucked to a shaft and tipped to cars which are in a tunnel below or in the lower benches; the ore is run straight out through a tunnel to one side of the mountain to be tipped into storage bins. The barren material is similarly treated, but is taken through a separate tunnel and is run on to a dump on a different part of the mountain. The cost of treating this waste material is the same as that of winning the ore. Any large blocks of ground brought down by the blasts (which are fired in series), are separately broken up by pop-shots to sizes convenient for loading into mine cars by steam traveling cranes or by hand. All drilling is done by machines. The output of mined material is a little over 1,000 tons per day. This system as at present carried out, leaves little room for improvement.

In the early days the Broken Hill lode was a difficult body to mine; and even

today great caution has to be exercised in opening it up. Broken Hill is about two miles in length, and rises to a height of about 200 feet above the surrounding country. It is formed of schistose slate and garnetiferous sandstone. The lode traverses the center of the Hill. Its outcrop was a massive manganese ironstone from 20 to 100 ft. in width. Beneath the outcrop, and to a depth of 300 to 500 ft., there was found oxidized lead and zinc ore; then the sulphide zone was entered.

The lode was first opened by shafts. The ore was taken down by the pillar-and-room system, as employed in collieries. This was extravagant, as much valuable ore was required to be left in the pillars. Then square-set timbering was introduced to take the place of the ore pillars. The timber was obtained from Washington, Oregon and British Columbia, and consisted of Oregon pine, sawed 10 in. square. The sets were built up from wall to wall and to the overhead stopes. Passes and shoots were constructed on ordinary principles.

As depth was attained, "creeps" crushed the timber, and in some instances set it on fire, causing the closing of the mine for many months. Filling was then resorted to, and all the sets were solidly packed with waste rock. The sulphide ore is much firmer than the oxidized, and permits of modified methods of extraction.

In the Proprietary mine the sloping-stope system is practiced. Drives are run in the ore and connected by winzes. The ore is then stoped in such a manner that a section of the chamber appears to have an arched roof. The object of this, obviously, is to obtain the strongest possible roof, with the employment of a minimum amount of timber. The drives are timbered by square sets, and covered with waste rock. The mine waste is augmented by material sent down from the surface; it is kept up to form the floor in the stopes. This method dispenses with timber, except in the winzes, passes and drives; it is strong and comparatively economical.

An important modification of this system, which is sometimes used, is locally known as the "block method." It consists in running a drive in the center of the orebody; from three sides of this, at intervals, crosscuts are run to the walls. The crosscuts are then enlarged to form 9-by-9-ft. rooms. When all the ore is taken out waste is filled in, and the adjoining ore on either side of the packed waste is extracted in blocks 9 ft. square. The ore above the packed blocks is extracted in the same way. This system permits the extraction of all the ore even in the most dangerous ground, and requires very little timber. It can be varied to meet almost any condition, however extraordinary.

In the Central mine the orebody is from 300 to 400 ft. in width. It is being worked

by the block system. But the method employed differs from that above described. The main gangways are driven in the hanging wall, and crosscuts are run from them right across the lode to the footwall every 100 ft. Blocks 50 ft. in length are then worked off from the footwall, leaving pillars of equal size standing. That is to say, only alternate blocks are extracted on first working. The worked ground is then filled with waste, which is kept in position by square set timber.

The outcrop on the Proprietary mine is excavated by means of an open cut about  $\frac{3}{4}$  of a mile long, 360 ft. wide, and 300 ft. deep. Had this method been pursued earlier a larger saving in cost would have been made.

The Mount Morgan Company has abandoned the square-set system, in favor of the open-cut benching system as

to be superior to pine in every way; indeed a large proportion of the timber from the old stopes near the surface is recovered in the open cut, and is found suitable for use again in the lower workings.

On the Charters Towers goldfield, Queensland, where the country rock is granite, and the quartz veins often run to 20 and 30 ft. in width, the old "pig-sty" method of timbering is employed. The "sties" are built up, like square sets, in the form of pillars until the hanging wall is reached. Waste is filled into the sties and tamped hard. This method enables a cheap timber of poor quality to be used, and costs much less than properly constructed square sets.

The country rock on the Gympie goldfield, Queensland, is a highly faulted slate. The ore gangue is quartz or calcite. The ore occupies the crevices and joint-planes

### The Anthracite Conciliation Board.

BY OUR SPECIAL CORRESPONDENT.

Although not empowered to speak for the operators of the anthracite region, Chairman W. L. Connell, of the Board of Conciliation, has made a very important statement, in which he favors the continuation of the award of the Strike Commission and of the Conciliation Board. It may be safely taken for granted that Mr. Connell would not express these views, if a majority of the operators were against them. In an interview Mr. Connell states that he is in favor of extending the award and was asked to suggest a method whereby the extension could be brought around. He said: "It could be done in the miners' convention in Shamokin in December. A resolution could be adopted, indicating the desire of the miners to extend the award for a term of three, five or more years as may be desired or deemed advisable. The resolution could then be submitted to the representative of the operators on the Board of Conciliation by the miners' representatives. A convention of the operators could then be called and the proposition discussed. It could thus be settled very easily." It was pointed out to Mr. Connell that this would place the miners in the position of taking the initiative. He replied: "The reason that I suggested that a resolution be considered at the Shamokin convention is that one of the principal matters to be discussed is the expiration of the award of the Strike Commission."

Mr. Connell, in discussing the situation, claimed that the Conciliation Board had been a most valuable factor in maintaining peace in the region and had done a wonderful amount of good. Regarding the suggestion that it should dispose of the grievance with more dispatch, he stated that it was his opinion that the Board could not be improved upon, and that the delays were frequently for the mutual benefit of operator and the miner. There were grievances presented at a time when considerable friction and feeling prevailed. It would be unwise to attempt to "conciliate" under such conditions, and it is more advisable that the matter should rest until better feeling prevailed.

This is the first declaration which has emanated directly from any of the operators upon the question. There is absolutely no doubt that the miners are in favor of the continuation of the Conciliation Board as well as of the award of the Anthracite Commission, subject to the changes which they claim time has demonstrated to be advisable. There are reports that the situation has been discussed in a confidential manner between representatives of the two parties. Mr. Connell, as the representative of the operators upon the Conciliation Board, spoke in an optimistic vein, indicating that he was convinced that there will be no strike in April.



SCOTTISH GYMPIE, 1,532 FT. LEVEL.

worked at Rio Tinto and in the Mesabi iron mines, Minnesota.

This cut is now ready for the extraction of ore, and steam shovels are working at a depth of 315 ft. Preparations are being made for carrying the cut down to a depth of 500 or 600 ft. This will necessitate the excavation of the waste for a considerable distance from the orebody to prevent "creeps." The benches are between 50 and 60 ft. deep. In the preliminary operations, as much waste as ore has to be removed; but, when the cut is opened out further, the amount of waste will be largely reduced. The orebody is lenticular in shape; and, roughly speaking, it is 800 ft. long and 500 ft. wide. The surface ore is of the consistency of chalk; much of the country is composed of quartzite. In the lower levels the sulphide ore is hard and compact. It is entirely removed in blocks on the Broken Hill plan; but Queensland hardwood is used in place of American pine. The timber is found

of the slate, as in a stock-werke. In some of the mines the whole country for a large width is mined.

In the Scottish Gympie mine the ground is being stoped at a depth of 1,540 ft. for a width of 15 ft., although it is auriferous for more than 200 ft. on each side of the shaft. A simple method of pillar-and-room working is employed; but, as will be seen from the illustration, the extensive untimbered stopes in this mine present many elements of danger. The management is consequently considering a new method of procedure that will enable the whole of the auriferous mass to be directly extracted with the least danger to the miners. It is probable that a modification of one of the Broken Hill block-filling methods will be adopted.

South Africa uses large quantities of German cement; this is received at Delagoa Bay, to which point it is shipped *via* the Suez canal.

### Uses of the Rare Earths—Part I.

BY CHAS. BASKERVILLE.\*

The so-called "rare-earths" constitute almost a quarter of the number of chemical elements known.<sup>1</sup> Many of the names found under this head refer to chemical preparations, whose individuality has not been sufficiently determined to warrant a place among the elements proper.<sup>2</sup>

**Illumination.**—As early as 1826 Drummond evolved the lime-light, which depends upon directing an oxy-hydrogen flame on a pencil of calcium oxide. Tessie du Motay, in 1867, substituted bituminous-coal gas for the hydrogen. Lime was found not to answer the full requirements, on account of slaking when not in use; so Linnemann substituted a plate of zirconium oxide. Koch also prepared, for medical purposes, porous glow-pieces of zirconium. Klotinsky used various oxides; among them zirconia, and gaseous or pulverized hydrocarbons, whose combustion was facilitated by oxygen. Clamond suspended his glowing material in the form of a basket over a central spiral tube from which issued a mixture of the gas and heated air. Fahnehjelm formed the incandescent portion out of fine, flat or round, needles, set close together and suspended in a rack above the burning mixture; water-gas was used; while this was reported as successful in Germany, in the three places it was tried in America (Chicago, Jackson, Mich., and St. Joseph, Mo.) it was found impracticable.

Haitinger prepared a mantle for incandescent gas-lighting, composed of aluminum and chromium oxides. It gave a rose-red light, but did not possess the necessary resistance to atmospheric influences and mechanical shock. In 1885 Carl Auer<sup>3</sup> obtained his first patent for a mantle to be used in incandescent gas-lighting. The best mantle obtained by Auer is composed of 99% thoria and 1% of ceria.<sup>4</sup>

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<sup>1</sup>These earths are conveniently classified under three groups, viz.: (1) The "cerite-earth," including cerium, lanthanum, praseodymium, neodymium (together making the old "didymium"), samarium, gadolinium, and europium. (2) The "yttrite-earth," including yttrium, erbium, terbium, ytterbium, scandium, holmium, and thulium. (3) The zirconium group, including zirconium, thorium and germanium. Titanum, which belongs to the third group, is purposely omitted, as it is really no longer regarded as a rare element. It is beyond the limits of this paper to discuss the complicated procedures necessary to separate the several constituents; such methods fill volumes, like "Die seltenen Erden" (Herzfeld and Korn); "Les Terres Rares" (Truchot); "Chemie des Thoriums" (Koppel); "Darstellung der seltenen Erden" (Bohm, three volumes); "Introduction to the Rarer Elements" (Brownling), etc.

<sup>2</sup>"The Elements: Verified and Unverified," Vice-Presidential address; Sect. C: Am. Assoc. Adv. Sci., St. Louis meeting.

<sup>3</sup>Subsequently he was created Baronet von Welsbach. The mantle used in the "Auer light," as it is called in Europe, is spoken of in America as the "Welsbach mantle."

<sup>4</sup>Regarding the various theories proposed to account for the incandescence in the Welsbach mantle, suffice it to say that the extraordinary power of the Welsbach light appears not to be due to any one of the oxides alone, but to certain mixtures of them.

At first, thorite and orangite were the sources of the thoria. The location of the somewhat extensive deposits of monazite sands in the Carolinas and Brazil gave larger sources of raw material.<sup>5</sup>

It will be of interest to note the lowering in price of thorium nitrate due to its increased use, to new sources of the raw material, to improvements in extraction, etc. Prior to 1893 the price per kilogram varied between \$125 and \$500. Now it may be had for from \$7 to \$10 per kilogram.

Concerning the uses of the rare-earths in the manufactured form, it may be of interest to cite the position of the Appraisers of the U. S. Customs-House, April 3, 1903, who placed 20% *ad valorem* duty on Welsbach mantles, consisting of cotton "sleeve," saturated with mineral solution, chiefly thorium nitrate, which constitutes 28.3% of the mantles.

Many attempts at devising other incandescing mixtures have been made. As a consequence there have been many patents taken out; the number touching the mechanical side of the problem being great. Drossbach experimented with mixtures of the heavy metals and alkaline earths.

Nernst learned that certain substances which are non-conductors (practically) of electricity when cold, become conductive when heated to a high temperature. He made a cylinder of magnesia provided with electrical connections. This was heated by a Bunsen burner to make it a conductor. The passage of the current then rendered it incandescent. The addition of boric acid, calcium chloride, and tungstic acid, and other oxides (as of erbium and "didymium") improves the conductivity of magnesia. The maximum luminosity is equal to 10-16 Hefner candles per sq. cm. The life of the filament, consuming 1.35 watts per candle, may be taken at 180 hours.

Beebe (who formerly was chemist to the Nernst Lamp Co., Pittsburg) has published a full account of the methods of treatment of the ores for the extraction of the rare oxides used. There is also an excellent discussion of some of the principles involved in the making of the glowers. The lamps are excellent in many ways, but up to the present there are certain physico-chemical difficulties which shorten their life.

Wedding, in Germany, has prepared a zirconium lamp, by submitting the zirconium oxide with magnesium to the action of hydrogen at high temperatures. The alloy obtained is pulverized, and, on the addition of a cellulose solution, it is transformed into a plastic homogeneous mass from which the filaments are drawn. The filaments, after being carbonized in an atmosphere free from oxygen, present a metallic appearance. One pound will furnish fifty thousand filaments. The zirconium filament is reported to consume a

<sup>5</sup>See reports by the late H. B. C. Nitze and J. H. Pratt, U. S. Geological Survey.

current of two watts per candle-power, and to run with a current of 37 volts. Three of the lamps can be conveniently placed in series across the usual 110-volt circuit. The lamp has a life of from 700 to 1,000 hours. Wedekind states that these filaments in reality consist of a mixture of compounds of zirconium with nitrogen, hydrogen, and carbon, to which rhodium is also added to obtain the necessary conductivity.

Adel made filaments for incandescent lamps from vanadium, thorium, columbium, and their alloys, by subjecting them in the form of amorphous bodies, without a binding material, to a pressure sufficient to make them of the desired shape.

While not properly belonging to the class of elements whose uses we are considering, it is appropriate to mention in this connection two other rare elements, namely, tantalum and osmium. Many efforts have been made to obtain improved types of filaments for incandescent lamps. Auer von Welsbach also invented the osmium lamp. This consists of a mixture of osmium and some other rare refractory oxide, as thorium. It can be raised to a high temperature without the osmium becoming oxidized; even the melting point of the oxide may be reached without oxidation of the osmium. Such a mixture has remarkable capacity for resistance to high temperatures, especially when the refractory oxide used is non-volatile at that high temperature. Finely divided osmium is mixed, in variable proportions, with the refractory oxide (as thorium, which may be partially or wholly replaced by yttrium oxide). The proportion of thorium must be kept in such limits that the filament will act as a conductor for the current while in the cold condition. It is preferable to use the pure osmium; but an osmium mixture with other metals, such as platinum, may be used. The filament may be used in lamps filled with gas, or it may be enclosed in bulbs. The difficulty in its use seems to be in the insufficiency of the osmium supply, which has been sought for in many countries.

Voelker secured a patent for filaments made of the carbides of uranium, thorium, ytterbium, erbium, cerium, calcium, and magnesium. "The oxides of the metals used should have a low specific heat, as this will determine the efficiency of the finished lamp."

Von Bolton (chemist to Siemens and Halske, of Berlin) invented the tantalum lamp, patents for which have been secured by his firm. This latest lamp has a filament of tantalum, which is obtained from the double fluoride of tantalum and potassium, in the form of a powder. It is then fused *in vacuo*, by means of electricity. The pure metal thus obtained (which resists the action of all alkalis and acids, with the exception of hydrofluoric acid) is malleable and can be drawn out into fine wire. The resistance of a wire of 1 sq. mm. sectional area and 1

meter in length, between 0 and 100° C. is 0.165 ohm. The filament of a 110-volt lamp must be very long, viz., 650 mm., and it gives the light of 25 Hefner candles, with a current energy of 1.5 volts per candle, or one-half less than lamps with a carbon filament. This long filament is coiled in a zigzag manner round the metallic radial arms of two stars on glass supports. This filament is said to last as long as those of carbon, and offer a better resistance to accidental increases of voltage and shocks and vibrations.

### The Dexter Portland Cement Company's Plant.

The plant of the Dexter Portland Cement Company is located in Northampton county, Pennsylvania, near the old Moravian town of Nazareth. The quarry from which the largest proportion of raw material is taken is located near the works; it furnishes an argillaceous limestone which is mixed, in the process of manufacture, with a shale or slaty rock from another quarry something more than a mile away. Material from the first (which is the larger of the two) is broken out and loaded upon dump cars, which are then hauled up the slope to the mill and dumped onto the crusher floor. The material from the other quarry furnishes less than one-fourth the total amount used; it is hauled to the works in broad-tired dump carts. The railroad is, however, to be extended to tap this quarry and so provide direct rail transportation.

The raw materials from both quarries are kept separate, but are brought to the same building for crushing. This is 51 by 60 ft., of stone, with a steel-and-slate roof; it has sufficient storage capacity to take care of a week's run. The crusher floor is 8 ft. above the milling floor. The crushers used are of the Gates "K" size, two of which are installed; one for handling the limestone, and the other for "slate," as the shale is called locally. The two grades are crushed separately and then blended.

The blended or mixed and crushed mass is fed, by elevating conveyors and gravity, either into a storage house or into the mill. The material first passes through a rotary dryer and into bins, from which it all eventually passes into the mill. This is 60 ft. square, and is fitted with two ball mills for coarse grinding, and with four tube-mills for fine grinding; the latter weigh 30 tons each, without the charge, and are operated at 27 r. p. m. The flint pebbles used in grinding are said to be brought from Norway and Greenland. The material is ground so that 85% will pass a 200-mesh sieve, and 95% a 100-mesh sieve.

The kiln room is 60 by 100 ft. The material discharged from the mills is elevated to a large bin, and thence distributed by screw conveyors, to the kilns, through water-jacketed tubes. The kilns are 6 ft.

in diameter and 60 ft. long, set on a slight incline, and slowly revolved by individual motor drives. The coal is fired, from the opposite end, in the form of finely powdered dust. This is done by the blast, which supplies the air required to support combustion. The highest temperature is in the neighborhood of 3,000° F. The kilns are lined with fire-brick, and a fire-brick shield is also placed at the front end in order to protect the operator. The

At one end of the stock-house, electrically driven fillers are provided for weighing and packing the finished product. This is shipped directly, railroad tracks being provided at each side of the stock-house.

The power for operating the plant is furnished from a power-house which is divided into a boiler-room 56 by 43 ft., and an engine-room 56 by 125 ft. Steam is furnished at 150 lb. pressure by a battery of four water-tube boilers. The fire-

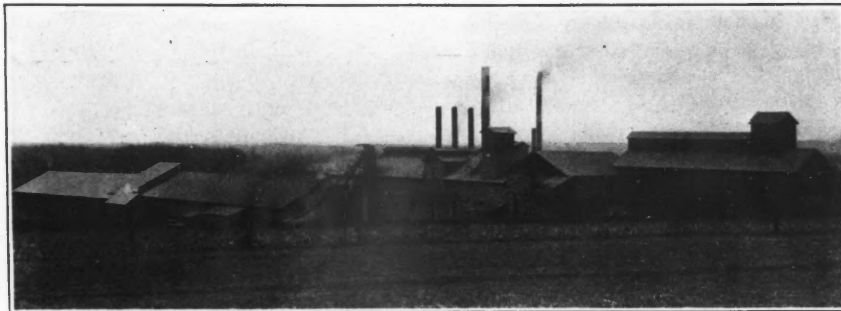


FIG. 1. THE DEXTER PORTLAND CEMENT COMPANY'S MILL, NAZARETH, PA.

clinker falls from this end of the kiln through openings into coolers on the lower floor, from which it is elevated to overhead bins.

The stock supply of clinker is weighed during its passage from the kilns into the storage bins; these bins are drawn upon to feed the final operation, which consists of the reduction of the clinker into commercial cement. The grinding is done in a building 60 ft. square; and the operation is practically the same as that carried on in the mill where the raw ma-

pump is also located in the boiler-room; the fire-main encircles the entire plant and carries a constant pressure of 100 lb. per sq. in. The water used is supplied by an artesian well; a belt-driven geared pump being used for raising it. The engines, two in number, are of the horizontal cross-compound type, with Corliss valve gear; they drive a line shaft from which are belted two generators for supplying the electrical current used. Individual-motor drive is used for the blast-fans that supply air to the kilns, and a rope trans-



FIG. 2. QUARRY AT THE PLANT OF THE DEXTER PORTLAND CEMENT COMPANY.

terial is ground. A screw conveyor carries it into the stock-house, where it is stored in bins; here another longitudinal conveyor (in connection with cross conveyors under each bin) removes it when ready for packing. The stock-house is 80 by 280 ft., of frame, with a slate roof; 40 bins are provided, each 36 by 12 ft.; these are 8 ft. deep and face on a central aisle, in the floor of which the longitudinal conveyor is placed.

mission is used for driving some of the subsidiary apparatus.

The coal-mill (as its name indicates) is provided with machinery for pulverizing the fuel used in producing the intense heat required in the preparation of the clinker. The building is 48 ft. square, and is located in close proximity to the building containing the kilns. The accompanying illustrations show the mill (Fig. 1) and the main quarry (Fig. 2); the track

shown in the latter is that leading to the crusher where the preliminary roughing down is done.

### Sulphur in Coke and the Blast-Furnace.\*

BY F. WUEST AND P. WOLFF.†

In the art of extracting metals from their ores, the fuel which of necessity plays the most important part is coal. The practice of coking coal owed its origin not so much to the desire of obtaining a non-flaming fuel as to the idea that the all-important object to be obtained was the desulphurization of the coal.

Notwithstanding the many chemical and thermal influences to which the sulphur in coke is exposed during the process of coking in ovens, the finished coke still retains an extremely high percentage of this deleterious element. The metallurgist, in consequence, has been in the habit of assuming that the sulphur of the coke remains practically unaffected by the heat of the blast-furnace until it reaches the tuyere zone, and that only then does combustion take place, resulting in the formation of sulphur dioxide.

Existing literature contains only meager information regarding the behavior of the sulphur of the coke in the blast-furnace, and it is necessary in the first place to determine whether the sulphur content of the coke is to any extent influenced by the action at different temperatures of the blast-furnace gases on the coke. In order to do this there have to be taken into account, besides the oxygen, the hydrogen vapor, nitrogen, carbon monoxide and carbon dioxide. For purposes of investigation, a blast-furnace coke from the Westphalian Ruhr district was selected, in which the proportion of total sulphur contained was 1.406%. An analysis of the coke gives the following: Carbon, 86.07%; ash, 10.05%. The composition of the ash was: Fe<sub>2</sub>O<sub>3</sub>, 21.50%; Al<sub>2</sub>O<sub>3</sub>, 27.36%; SiO<sub>2</sub>, 38.26%; CaO, 6.13%; MgO, 3.32%; Mn<sub>2</sub>O<sub>4</sub>, 0.61% P<sub>2</sub>O<sub>5</sub>, 0.50%; SO<sub>3</sub>, 2.292%; (Fe, 15.05%; Mn, 0.439%; P, 0.220%). The mineral constituents of the coke with which the sulphur is chiefly associated are iron, calcium, magnesium and manganese, and they are present in the coke in the following proportions: Iron, 1.511%; calcium, 0.441%; magnesium, 0.201%; manganese, 0.044%.

The total quantity of sulphur which is capable of combining with these metals would be 1.41%. The mean of several tests gave 0.116% as the amount of sulphide sulphur which it was possible to eliminate in the form of sulphureted hydrogen. The quantity of sulphate sulphur

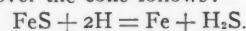
in the coke being 0.0922%, this leaves altogether only 0.208%, as the amount of sulphur combined with the iron, calcium, magnesium and manganese. The remaining 1.198% sulphur therefore must exist in the form of organic sulphur, and the proportion of organic sulphur is 85.20% of the whole sulphur, which is nothing out of the common. Many analyses have been published, from which it is possible to calculate that the proportion of organic sulphur, expressed in percentages of the total sulphur content, varies from 66 to 92%. With this is a small portion of sulphide and sulphate. No method entirely free from objection has yet been found by which the organic sulphur can be determined.

*The Combustible Sulphur.*—The determination of the combustible sulphur in the coke is made by burning finely-powdered coke in a current of oxygen. The mean of ten careful tests yielded 1.09% of combustible sulphur. By adding the sulphur thus determined to the sulphur in the residues, it was never possible to make up even approximately the total sulphur content, because sulphur trioxide is formed simultaneously with the sulphur dioxide.

The further experiments had for their object the investigation of the behavior of the sulphur of the coke with reference to the hydrogen vapor, nitrogen, carbon monoxide and carbon dioxide at higher temperatures. The experiments were carried out in an electric-resistance furnace, the heat being maintained five hours in each case. The coke was first pulverized and dried, the quantity used for each investigation being 1.2 to 1.7 grams, according to the anticipated loss on ignition.

*Experiments with Hydrogen.*—The gas was charged into a gasometer, washed, dried and passed through condensers with acetate of cadmium, the quantity passed through hourly being 2 to 2½ liters. At about 470 to 490° C. the acetate of cadmium condenser began to cloud, and a precipitate of sulphide of cadmium took place. At 600° the quantity of sulphur volatilized is three times as much as that at 500°. Beyond 600° the rate of volatilization increases slowly, until at 1,000° the quantity is rather more than half the total sulphur content. The higher the temperature the more marked the tendency of the hydrogen to combine with the sulphur, and by prolonging the period of the passage of the hydrogen, and maintaining a constant temperature, an increased quantity of sulphur is taken up.

An indication of the reaction which takes place during the passage of the hydrogen over the coke follows:



The coke was not altered in appearance by any of these tests, except that it darkened slightly at the higher temperatures.

It may be pointed out in this connection that by such methods it would be possible

to effect the desulphurization of the coke in the coke-oven (eliminating the sulphur by means of steam or compressed air) without risk of any reduction in the yield of coke by oxidation of the carbon.

*Tests with Steam.*—The steam was produced from distilled water, and the additional precaution taken to boil the water again to free it perfectly from air. The steam was maintained at about 3½ lb. pressure, and the draining and washing were most thorough. The acetate of cadmium began to cloud at 350 to 380° C., which proves that hydrogen in the nascent state begins to exercise its binding influence on the sulphur in coke at a much earlier stage than the pure dry hydrogen. At 900° the steam volatilizes more sulphur in the form of sulphureted hydrogen than pure hydrogen does at 1,000°. The losses on ignition are very high, and exceed those in the tests with hydrogen by two, seven, fourteen and nine times, respectively.

At 500 and 600° the coke had not altered in appearance. At 1,000° the mass of coke was gray-white throughout, and completely incinerated, as shown by a loss on ignition of 89.18 per cent.

In these tests the excessive loss on ignition as compared with the degree of desulphurization shows that the suggestion of Barthelemy and others that the sulphur in the coke might be partly eliminated by blowing in steam cannot be carried out in practice. The volatilization of the sulphur proceeds rapidly, as shown in one test, where at the end of three hours 0.76% sulphur was already driven off in the form of sulphureted hydrogen.

*Tests with Nitrogen.*—The washing and combustion were carried out in the most careful manner. The chemical action of nitrogen being very slight, the amount passed through the furnace per hour did not exceed 1.2 to 1.4 liters. Up to and including 900° the coke had not in any way changed in appearance. At 1,000° it appeared to have turned somewhat darker, and the first condenser with alcoholic soda solution was visibly colored yellow. The nitrogen was regarded as having no affinity whatever for the sulphur in the coke. At 1,000° a fairly large percentage of the total sulphur was given off as gas. There can be no doubt that, together with the escaping hydrocarbons, a portion of the organically combined sulphur was carried off by the nitrogen.

*Tests with Carbon Monoxide.*—The carbon monoxide was prepared by passing carbonic acid through an asbestos-lined iron pipe filled with zinc filings and charcoal broken small, and heated to a bright red heat. The gas thus produced was charged into a gasometer, and the experiment proceeded in the usual manner. Though the losses on ignition were not great, the proportion of sulphur in the coke decreased considerably from 500° upward. The organic sulphur probably partly combined with the carbon monoxide

\*Abstract of a paper presented at the annual meeting of the Iron and Steel Institute, London, May, 1905.

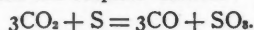
†Dr. F. Wuest is professor of the metallurgy of iron at the Technical High School at Aachen, and edits the foundry section of *Stahl und Eisen*. Dr. Paul Wolff is engineer to the foundry of the Krupp Works at Krefeld.

to form oxy-sulphide of carbon, which is immediately split up in the condensers into carbon dioxide and sulphureted hydrogen. The bromine then causes the latter to become oxidized to sulphuric acid. It was also observed in these experiments that a decomposition of the carbon monoxide took place.

**Tests with Carbon Dioxide.**—This gas was prepared in a Kipp apparatus. The marble used was broken into flakes, and was freed from air as thoroughly as possible. The hydrochloric acid was boiled out. The carbon dioxide was purified with sticks of yellow phosphorus, nitrate of silver and permanganate of potash, and drying followed. The difference between the sulphur obtained as sulphur dioxide plus the remainder of sulphur in the coke on the one hand, and the total quantity of sulphur as previously determined in the coke on the other hand, was striking.

Up to a temperature of 900° the quantity of sulphur volatilized as sulphur dioxide increases very slowly. Even at 1,000° the sulphur determinable as sulphur dioxide amounts only to 18.29% of the total sulphur. But on subtracting the sulphur remaining from the total sulphur in the coke, it appears that altogether 0.833% sulphur has been driven off, an amount equal to 59.24% of the total sulphur, so that 40.99% is unaccounted for. This difference, though in a smaller degree, is noticeable at 900°, and the point where the change sets in seems to be about 800°.

The volatilization of a large quantity of sulphur at 900 and at 1,000°, which cannot be traced in the condensers, is accounted for by the formation of sulphur trioxide along with the sulphur dioxide:



A startling proof of the formation of sulphur trioxide in conjunction with sulphur dioxide was afforded by an extensive series of experiments, carried out at the commencement of this investigation, which yielded the following results:

Temperature in degrees C.	500	600	800	900	1,000
Sulphur determined as					
SO <sub>2</sub> , %	0.389	0.394	0.205	0.161	0.339

From 800° upward, a sudden diminution is observable in the quantity of sulphur volatilized as sulphur dioxide, while, on the other hand, the sulphur content of the coke continues to decrease regularly. Even at 1,000° the quantity of sulphur passing off as sulphur dioxide has not risen again sufficiently to equal that evolved at a temperature of 500 and 600°. The discrepancies are to be attributed solely to the formation of sulphur trioxide, which it was impossible to arrest in the condensers.

The result of these tests enforces the conclusion that similar reactions must occur in the blast-furnace, and it must be assumed that the sulphur of the coke in the blast-furnace is volatilized in the same manner, seeing that it is exposed to the same chemical and thermochemical influences. It is impossible that the coke can reach the level of the tuyere zone undi-

minished and unaffected by the heat, in accordance with the generally accepted theory; but it must, during the sinking of the charge, be reacted upon actively by the gases, and undergo partial gasification, due to the prolonged contact with the blast-furnace gases and the continuously rising temperature, though the coarse size of the lumps of coke probably exercises a retarding influence. At high temperatures the gases will penetrate to a considerable depth into the coke, and the high pressure must assist this. There is no doubt that the old theory must now be abandoned. The sulphur set free from the coke must, unless it combines again with other substances, pass off from the furnace with the gases, and its recovery from these probably will be possible as a quantitative proportion. The sulphur carried off in the blast-furnace gases, a portion of the combustible or so-called injurious sulphur, can therefore exercise no further ill effect.

**Balance of Sulphur in the Blast-furnace.**—In order to obtain a definite estimate of the sulphur content of the gases from a new blast-furnace, the gases from a furnace in Rhenish-Westphalia were exhaustively tested while the furnace was running on forge iron and basic bessemer iron. The temperature at the furnace throat was very low. Acetate of cadmium was used for the collection of sulphureted hydrogen, and "bromic hydrochloric" acid with an excess of bromine for the separation of the sulphur dioxide. Lastly, the determination of the whole of the sulphur compounds present was partly made with potash solution and partly with the same bromine. The gases were freed from dust by passing through "cotton silicate" and cotton-wool. The tests showed that the sulphur amounted to from 103 to 153 grams per ton of pig iron smelted.

A balance-sheet for the blast-furnace has been published by Wedding, according to which the 0.79 gram of sulphur per 100 kg. of pig iron, which is missing from the products (pig iron, dust and slag) was to be found in the waste gases. These would therefore contain the extraordinary proportion of 7.9 kg. of sulphur per ton of pig iron.

A remarkable point in connection with the analysis is that no sulphur was present in the dust of the gases. This is the more striking when it is considered that the light dust contains all the constituents of which the charge is composed, though in totally different proportions, the more volatile substances being present in the highest proportion.

**Sulphur Balance.**—In order to ascertain more exactly what becomes of the sulphur in a modern blast-furnace, an exact balance-sheet of the sulphur was drawn up. The average values of 15 gas analyses were as follows:

	CO <sub>2</sub>	O.	CO.	H.	CH <sub>4</sub> .	N.
Volume %..	10.49	0.06	28.16	2.58	0.48	58.23
Weight %..	15.93	0.07	27.23	0.18	0.27	56.32

The coke contained: Sulphur, 0.6899%; ash, 10.204%; carbon, 88.160%. In addition to which there was about 1% nitrogen and small quantities of hydrocarbons. Of the 0.6899% sulphur in the coke, 80.76% was organically combined.

Taking the total input and the total output of the furnace per ton of pig-iron produced, the balance account of the sulphur appears as follows:

SULPHUR BALANCE.

Input—		Sulphur.
		Kilograms.
2,142.0 kilograms iron ore, with 0.123% sulphur.....		2.6350
207.3 kilograms of (a) cinder, with 0.121% sulphur.....		0.2508
345.6 kilograms of (b) cinder, with 0.113% sulphur.....		0.3905
69.1 kilograms of (c) cinder, with 0.078% sulphur.....		0.0538
143.0 kilograms limestone, with 0.042% sulphur.....		0.0600
1,000.0 kilograms coke, with 0.6899% sulphur.....		6.8990
Total sulphur put in.....		10.2891
Output—		
1,000.0 kilograms pig iron, with 0.033% sulphur.....		0.3300
1,017.0 kilograms slag, with 0.908% sulphur.....		9.2350
315.5 kilograms light dust in 4,382 cubic meters of gas, and with 0.166% sulphur.....		0.5238
4,382.0 cubic meters gas, with 0.0034% sulphur.....		0.1489
Total sulphur brought out.....		10.2377

It now appeared desirable to investigate more closely the conditions under which the sulphur of the coke, which was volatilized by the blast-furnace gases, had been absorbed by the charge; that is to say, by the ores and limestone. It was assumed, in carrying out the experiments, that the sulphur driven off from the coke in the furnace at a temperature of about 1,000° at once comes in contact with the materials of the charge, also at a temperature of 1,000°. It then ascends, meets in succession the charges from above, and grows constantly cooler as it passes up.

The blast-furnace gas was represented by mixing together the separate component gases, and the composition of the mixture, which was constantly controlled by gas analyses, was:

	N.	CO.	CO <sub>2</sub> .	H.
Volume %.....	56.0	28.0	13.5	2.5

The experiment, which was conducted with the same care as all the others, showed that the ferric oxide at 250° was exactly the same in color and appearance as before ignition, and no change in the degree of oxidation of the iron was noticeable, notwithstanding that half the sulphur content of the gases was already absorbed. At 500° the ferric oxide had turned to a deep blue. Ferroso-ferric oxide had therefore formed, and probably ferrous oxide, but no metallic iron had been reduced. In the course of one experiment at 500°, it was observed that the ignited mass was highly pyrophorous. The color of the ferric oxide, after ignition at the higher temperatures, shaded into gray.

While the iron is passing through its various degrees of oxidation the combination of the sulphur with it may proceed by a series of reactions. From a temperature of 700° upward, the absorp-

tion of sulphur by reduced metallic iron also occurs. Even at low temperatures a considerable absorption of the sulphur content of the gases takes place.

*Experiments with Ferric Oxide and Carbonate of Lime.*—A series of experiments was undertaken in order to determine the behavior of the ferric oxide and carbonate of lime together in the presence of the blast-furnace gases containing sulphur. For this purpose the same substances were used as in the foregoing experiments, and the mode of carrying out the experiments was the same in principle.

The separation of the masses was effected by taking advantage of the magnetic properties of the iron and its oxides. The results of the series are shown in the table given herewith.

FERRIC OXIDE AND CARBONATE OF LIME TEST.

Temperature of the Ignited Coke.	Loss on the Ignition of the Coke.		Sulphur Driven off from Coke.		Volatilized Sulphur in Percentages of the Total Sulphur Content.		Sulphur Taken up by Ferric Oxide.		Sulphur Taken up by Ferric Oxide in Percentages of Total Volatilized Sulphur.		Sulphur Taken up by the CaCO <sub>3</sub> .		Sulphur Taken up by the CaCO <sub>3</sub> in Percentages of the Total Volatilized Sulphur.		Sulphur Taken up by Fe <sub>2</sub> O <sub>3</sub> + CaCO <sub>3</sub> .		Sulphur Taken up by Fe <sub>2</sub> O <sub>3</sub> + CaCO <sub>3</sub> in Percentages of the Total Volatilized Sulphur.		Temperature at which the Fe <sub>2</sub> O <sub>3</sub> + CaCO <sub>3</sub> was Ignited.
	°Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	°Cent.		
1,000	23.09	0.6837	41.51	0.3312	56.81	0.2783	59.44	—	—	—	0.3313	56.81	0.2783	59.44	—	—	250		
	20.97	0.4683	33.31	0.2783	59.44	0.2599	59.32	0.011	2.34	0.2709	61.66	0.2995	64.06	0.3694	84.03	500			
1,050	21.67	0.4382	31.17	0.1041	18.28	0.2954	45.78	0.1890	43.00	0.4878	100.64	—	—	—	—	600			
	24.98	0.5694	40.49	0.1804	41.03	—	—	—	—	—	—	—	—	—	—	800			
	22.30	0.4396	31.27	—	—	—	—	—	—	—	—	—	—	—	—	900			
	22.87	0.4847	34.47	—	—	—	—	—	—	—	—	—	—	—	—	1,000			

It will be seen that up to 500° the sulphur of the gases is taken up by the ferric oxide alone. Even at 600° the limestone scarcely exercises a perceptible influence on the absorption of the sulphur. At 800° the conditions suddenly change, and the limestone far outstrips the ferric oxide in its capacity for the absorption of sulphur from the blast-furnace gases. As was shown by the previous experiments, 800° is the temperature at which the decomposition of the limestone begins to proceed more rapidly. The combining of the sulphur is therefore to be attributed to the formation of lime. It is evident that the lime continues to be the leading factor in regard to capacity to absorb the sulphur, and this capacity increases as the temperature rises.

The results of these investigations as to the behavior of the sulphur in coke in the blast-furnace justify the following conclusions:

Contrary to the generally held opinion, the sulphur in the coke does not reach the level of the tuyeres of the blast-furnace without undergoing alteration, but a great portion of it is previously volatilized by the ascending gases, and is then largely absorbed from the gases by the descending charge, and in this condition arrives in front of the tuyeres.

Up to 800° the sulphur is principally absorbed from the sulphur-laden gases, by the oxides of iron, while from 800° upward the position is reversed, and the lime becomes the chief absorbent of the sulphur.

### The Induction Furnace.\*

BY LEONARD WALDO.†

In most electric furnaces it has been customary to deliver current through an electrode, in which case the management of the circuit becomes difficult. At some point or other in the circuit the current either passes through a varying resistance of the charge, or encounters an imperfect contact. When that happens, the current arcs; and when it arcs it presents the practically uncontrollable temperature of 3,850° C., together with corresponding chemical reduction of impurities and a correspondingly intense disintegrating action at the point of arcing.

After designing furnaces for work to which the Siemens type of furnace had

as the amperage is increased. This presents the ideal condition in metallurgy; the containing crucible has no electrodes, no contact with fuel in any shape; the efficiency is high with a properly constructed transformer, and the current is furnished from outside of the melting cycle. In my judgment, for most metallurgists—at least on a moderate scale—this is the coming type of furnace, for the reason given. If this crucible is built of the proper material its life is indefinite, for the heat is generated wholly within the crucible as a secondary. The temperature of the ring seems almost instantaneously to follow a change of the voltage in the primary. There ought to be a time function in the temperature elevation; and there probably is one, but it is very small.

If the charge is made up of a series of steel rings, to be melted, those which are above the axis of the furnace will rise and be suspended in mid-air; and it is perplexing for the men in charge of the

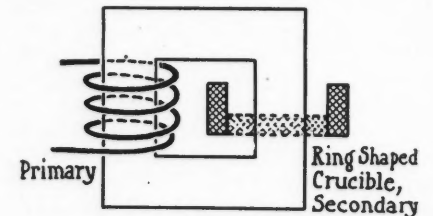


FIG. 1.

been applied, I concluded that the best method was to have no arcs, nor any heating current except in the metal which was being treated; in accordance with the same view, Colby, Ferranti and Sprague, Duncan and Hutchinson about the same time built or patented types of induction furnaces. Unfortunately, at that time the alternating current generator had not yet been developed to its present stage, and the alternating current transformer was in still less satisfactory shape.

A few years ago a gentleman in Sweden owned a paper-mill; this did not pay, and finally burned down. In order to utilize his water-power and the natural facilities at hand, he devised a method of making Swedish steel. From that sprung the Kjellin process, which at this stage was successful because dynamos and transformers of suitable type could be built; the theory was understood.

Without reverting in any detailed way to the development of the same problem in the United States, let us consider what that problem becomes. Suppose that we have a square transformer sheet (Fig. 1); on one leg of the transformer a ring-shaped crucible, which may be considered a secondary, can be put; on the other, the ordinary primary coil. If a sufficiently powerful current is sent through the primary, the secondary becomes heated,

furnace to operate it until they become familiar with its peculiar behavior. The furnace sings; it is a beautiful note, with a pitch which is a function of the alternating current period; there are no perceptible over-tones. When the furnace starts to sing the metal begins to rise, and the new workman begins to look for chances of escape. The situation is something he does not anticipate. The metal rises promptly to a red heat and then to a white heat, and lies there in a perfectly still melt.

H. L. Sulman and H. F. Kirkpatrick-Picard, of London, in Eng. Pat. 13,481, June 14, 1904, describe a method for the rapid collection and filtration of finely divided precipitates. From 1 to 2% of an alkaline soap is added to the liquid to be filtered. A small equivalent proportion of a salt of calcium or magnesium, or other metal capable of forming an insoluble soap, is then added. The insoluble soap envelopes and attracts the particles of the precipitate into a coagulated mass, which sinks rapidly to the bottom of the vessel.

The Hamburg astronomer, O. Steffens, has collected information which shows that of every million buildings in North Germany, 350 are struck per year by lightning. In South Germany the number is only half as large, possibly because there are fewer high factory chimneys, and more mountain peaks.

\*From discussion at the eighth general meeting of the American Electrochemical Society, Bethlehem, Pa., Sept. 19, 1905.

†Electrical engineer and metallurgist, 49 Wall St., New York.



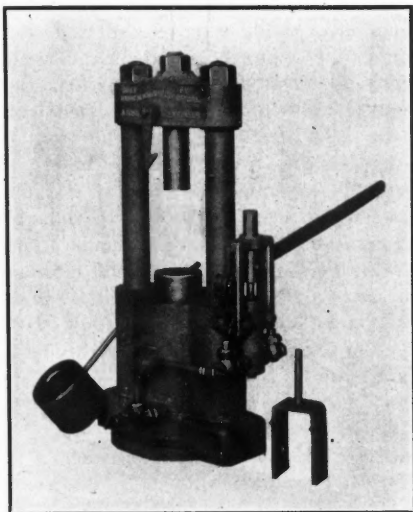
**Ferro-Manganese.**

O. Simmersbach says (*Berg. u. Hüttenman. Rundsch.*, 1905, I, p. 305) that for the scientific basis for the production of ferro-manganese we are indebted to Pruger. For making this alloy, manganese spar (rhodochrosite) and roasted manganite are particularly suitable. More common occurrences are pyrolusite and wad.

The determination of phosphoric acid is very important, as is also the silica. Spiegeleisen, with 20% of manganese, should not carry more than 0.1 of P; and spiegeleisen (ferro-manganese), with 80% Mn, not more than 0.22% of P. Spanish and Brazilian ores carry only 0.01 to 0.02% of P; while Russian ores, on the other hand, carry from 0.15 to 0.17% of P.

The silicon content in spiegeleisen should not amount to more than 1%; in ferro-manganese, to not more than 1.6 per cent.

In the upper part of the blast-furnace.



EXPERIMENTAL HYDRAULIC PRESS "1904."

the higher oxides of manganese are reduced to the lower oxides; in the lower parts of the furnace they are reduced to manganous oxide by carbon monoxide; the latter, in turn, by solid carbon, must be reduced to metallic manganese. As a result of this reduction of manganese by carbon, the consumption of fuel is much higher. For the reduction of ferro-manganese with 80% Mn, one should calculate on extra coke. The author discusses the Möller method of calculation, the various views on slag calculation, profiles of blast-furnace, the bosh, etc. In making 40% ferro-manganese, good slags therefrom will carry about 7% Mn; while the slag of 80% ferro-manganese will carry 10% Mn. In melting manganese spar or pyrolusite, the manganese content in the slag increases considerably. A large part of the manganese is volatilized at the high temperature of reduction. Owing to the ten-

dency to "weathering" shown by high-grade ferro-manganese, it is unsuited to most metallurgical purposes.

**Test Press For Briquetting.**

BY ROBERT SCHORR.\*

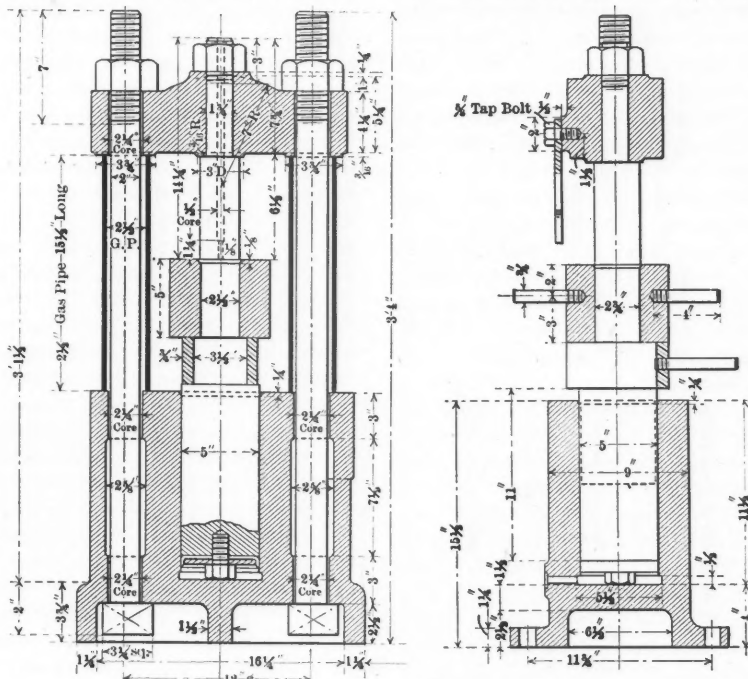
The accompanying illustrations show a small hydraulic press which has proved of value in making briquetting tests with both mineral and carbonaceous materials. It can be built at slight expense, and briquetting plants will find it a good investment from the standpoint of the laboratory as well as of the works. A simple arrangement permits of comparatively quick work; two men can turn out 60-80 briquettes per hour with a single mold, and 100-140 per hour by using a double mold. The hand pump may be operated from a line-shaft, or by some other me-

of inserting the discharge-stirrup. A slight pressure is applied to eject the briquettes, which drop between the side-checks of the stirrup upon the plunger-top, and are removed by hand.

The press illustrated has a 5-in. plunger and was tested up to 4,000 lb. per sq. in., a total pressure of about 80,000 pounds.

The square briquettes, as well as the cylindrical ones, have an area of 7 sq. in., consequently a maximum pressure of about 11,400 lb. per sq. in. of briquettes is permissible. With a double mold for the same size of briquettes it would be 5,700 lb., which is ample for most work of this character.

In the *Zeitschrift für angewandte Chemie* (1905, No. 38, pp. 1531-1540), Boeshard and Häuptli give an account of a



Scale 1" = 1"

EXPERIMENTAL BRIQUETTING PRESS.

chanical means; in this event, the product may be turned out quite rapidly. The press can be connected to a water main; or, if that is not available, the pump suction can be placed in any receptacle filled with water.

The procedure is very simple. After filling the mold with the material to be briquetted, the valve on the suction line is opened to admit water underneath the plunger; the pressure is gradually increased by operating the hand pump. The piston carried by the upper crosshead enters the mold and the material is compressed. In the discharge-main of the pump a pressure-gauge is inserted, in plain view of the operator; as soon as he thinks sufficient pressure has been exerted, he shuts off the water supply and, while the mold is kept in place, the bleeder is opened and the plunger lowered enough to admit

terrible explosion of an oxygen cylinder which occurred at the Technikum Winterthur, on April 4, 1905; the causes of this accident were systematically investigated by the authors. From an analysis of the contents of a cylinder, companion to the damaged one and furnished by the same firm, it appears that this had contained no less than 20% of hydrogen. The investigation (carried out by the authors) also brought to light the highly unsatisfactory conditions prevailing at the works from which the gas originated. The general control of the (electrolytic) process was slipshod, thus allowing the possibility of the production of such explosive mixtures as that which caused the accident. Only one pump was provided, with which both oxygen and hydrogen cylinders were filled. The accident has naturally caused consternation, and will presumably lead to stricter supervision of works engaged in the production of compressed gases.

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### The Estimation of Zinc.\*

BY H. NISSENSON AND W. KETTEMBEIL.†

At the last International Congress of Applied Chemistry at Berlin, in 1903, it was resolved to appoint a commission to collect all methods of determining the most important metals; and, after examining their relative value, to recommend for international use those which were considered best. The task of carrying out this work for the metal zinc, was assigned to one of the authors of this paper.

In the case of zinc it seemed particularly desirable to revise the methods hitherto in use, and, if possible, to secure uniformity. The gravimetric method is lengthy and difficult. Of the volumetric methods, two have found about equally general application; each offers certain advantages, but also certain disadvantages.

*Review of the Volumetric Methods.*—  
1. With  $\text{Na}_2\text{S}$  solution; (a) with white paper (polka paper) according to Schott. The following are the directions commonly followed in carrying out this method in Germany:

Weigh out into a flask a  $\frac{1}{2}$ -gm. sample of the substance, if this contains over 30% Zn; otherwise use 1 gm. Boil with HCl until the  $\text{H}_2\text{S}$  is expelled. Heat with a mixture of 7 parts sulphuric and 3 parts nitric acid until white fumes are evolved. Cool, add 50 c.c. of hot water; and, if Cu is present, 7 c.c. of 1:10 sodium thio-sulphate; or, if Cd is present, precipitate with  $\text{H}_2\text{S}$ . If the sample contains Cu, boil until  $\text{SO}_2$  ceases to escape; otherwise filter direct into an Erlenmeyer flask. If there is present Cu, Mn or Cd, oxidize with bromine water or sodium peroxide; precipitate with 20 c.c. of ammonia, boil, and filter into a beaker; rinse out the Erlenmeyer and the precipitate twice. Redissolve the latter into an Erlenmeyer flask, and reprecipitate with ammonia, after again oxidizing if necessary; boil, filter and wash. Make up the liquid in the beaker to 500 c.c. with cold water, and let stand over night. Titrate with a solution of  $\text{Na}_2\text{S}$ , containing about 40 gm. to the liter, and adding a pinch of  $\text{NaHCO}_3$ , to control hydrolytic decomposition. If a 5-gm. sample is used, 1 c.c. corresponds to about 2% of zinc.

For the standardization, two lots (0.2 to 0.25 gm.) of pure zinc are dissolved in beakers with 12 c.c. dilute HCl + 3 c.c.  $\text{HNO}_3$ . Dilute, add 20 c.c.  $\text{NH}_3$ , make up to 500 c.c., and let stand over night. Of these two standard samples, the one is titrated at the beginning of a series of determinations, the other at the end. This serves as a check that the same reaction (end point) has been observed throughout the series. So-called "polka paper" is used as indicator; this is a glazed lead-paper. Upon this a drop of the liquid is placed with a

glass rod; after counting twenty, a second drop is allowed to fall on the same spot, removing it again immediately, and observing whether the outline of the first drop shows on the paper. As a check, a further 2 c.c. of the sodium-sulphide solution is run in, and the reaction tried again. It should now be correspondingly more marked.

In Belgium it is customary to use 2 or 3 burettes together; the standard and the unknown sample are titrated, one after the other, using one standard sample for each analysis<sup>1</sup>. This seems quite unnecessary. In place of the polka paper F. Mohr has proposed the use of alkaline lead tartrate; Fresenius recommends lead acetate.

(b) Ferric chloride as indicator: Many other indicators have been proposed. The following should be mentioned: Thum<sup>2</sup> suggests that a little ferric iron be added to the filtrate from the precipitation by ammonia, and to take for the end-point the instant when (after precipitation of the Zn) the precipitate begins to turn black. This point is observed with the aid of a lens. This method is recommended by Streng, and also by Jensch<sup>3</sup>; Minor<sup>4</sup> uses freshly precipitated  $\text{Fe}(\text{OH})_3$  as indicator; Groll<sup>5</sup> and Künzel<sup>6</sup> suggest the use of nickel chloride; and Deus<sup>7</sup> that of cobalt chloride. According to M. Schroeder<sup>8</sup>, neither polka paper nor cobalt paper is suitable; with both, the end-point is affected by the presence of ammonia or ammonium chloride; he recommends thallium paper. Moreover, this method has the disadvantage that, with a large excess of ammonia, decomposition occurs between the zinc sulphide and the thallium salt before all the zinc is precipitated. The method is said to give good results in the presence of a large (and approximately constant) amount of ammonium chloride, and of a small (and approximately constant) amount of ammonia, if the same conditions are observed in the standardization. According to Corda<sup>9</sup>, good titrations can be obtained by means of sodium nitroprusside on a porcelain plate. Balling<sup>10</sup> recommends phenolphthalein, under certain conditions which are to be precisely observed. Lastly, Ballard<sup>11</sup> recommends that the end-point be observed by the aid of a silver plate, on which  $\text{Na}_2\text{S}$  produces a stain, while ZnS does not.

2. Titration with potassium ferrocyanide; (a) in ammoniacal tartaric acid solution: The idea of titrating zinc with potassium ferrocyanide in ammoniacal tartaric acid

solution was first published by Giudice.<sup>12</sup> The method was taken up again later by Donath and Hattensaur<sup>13</sup>; and by Voigt.<sup>14</sup> The last mentioned states that the main condition for success is that there shall be as little excess of ammonia as possible; otherwise, at the end-point, the color is indistinct and greenish-gray instead of blue. The mode of procedure is to place a series of drops of concentrated acetic acid on a porcelain plate, and to add a drop of the sample solution from time to time. The end-point is reached when a permanent blue color is obtained. It is claimed as an advantage of this method that the iron does not need to be filtered off. Moldenhaur<sup>15</sup> titrates zinc in ammoniacal solution, using a test paper prepared by soaking one-half of a strip of filter paper in  $\text{CuSO}_4$ . A drop of the test-liquid is placed on the half free from  $\text{CuSO}_4$ ; presence of potassium ferrocyanide is indicated by a red streak where the liquid flows over into the  $\text{CuSO}_4$ . Luckow prefers copper acetate as indicator.

(b) in acid solution: Galletti<sup>16</sup> in 1864 proposed the titration of zinc with potassium ferrocyanide in acetic-acid solution; the end-point is recognized by the liquid becoming turbid. According to the original method, the sample is acidified with acetic acid after separating the iron, is heated to 40° C., and titrated. Later the method was so modified that it was unnecessary to separate the iron. Fahlberg<sup>17</sup> recommends the following modification: 1, Titrate in HCl solution; 2, use uranium nitrate as indicator; the end-point is shown by a brown color. The advantage of HCl solution is that manganese ferrocyanide is soluble in HCl, while the Zn precipitate is not; so that the presence of Mn does not interfere. Mahon<sup>18</sup> eliminates the influence of Mn by precipitating the Zn in acetic-acid solution with  $\text{H}_2\text{S}$ , dissolving in HCl, and then titrating.

According to Zulkowski,<sup>19</sup> it is preferable to use ferric iron as indicator, and by the porcelain plate method; he also finds that the amount of precipitating agent used depends very appreciably on the concentration and on the strength of the acid. This method, slightly modified by von Schulz & Low<sup>20</sup> is the one in general use in America. It was proposed (by a committee appointed by the Colorado Scientific Society) to fix upon the best method for universal use; but it is specially emphasized, that the use of equal quantities of zinc, the same mean temperature, and equal quantities of acid, are assumed. A

<sup>1</sup> Compare Prost and Hassreidter, *Zeit. f. angew. Chem.*, 1892, 167.

<sup>2</sup> *Berg- u. hüttenmaenn Zeit.*, 1876, 225.

<sup>3</sup> *Zeit. f. angew. Chem.*, 1894, 541.

<sup>4</sup> *Chem. Zeit.*, 1889, XIII, 1566.

<sup>5</sup> *Zeit. anal. Chem.*, 1862, I, 21.

<sup>6</sup> *Berg- u. hüttenmaenn Zeit.*, 1864, 52.

<sup>7</sup> *Zeit. anal. Chem.*, 1871, IX, 465.

<sup>8</sup> *Berg- u. hüttenmaenn Zeit.*, 1882, 4.

<sup>9</sup> *Zeit. anal. Chem.*, 1890, XXIX, 266.

<sup>10</sup> *Chem. Zeit.*, 1881, V, 395; 1882, VI, 62; 1883, VII, 453.

<sup>11</sup> *Jour. Soc. Chem. Ind.*, 1897, XVI, 399.

<sup>12</sup> *Gior. Farm. Chim.*, 1883, XXXII, 337.

<sup>13</sup> *Chem. Zeit.*, 1890, XIV, 323.

<sup>14</sup> *Zeit. angew. Chem.*, 1889, 307.

<sup>15</sup> *Chem. Zeit.*, 1889, XIII, 1220; 1891, XV, 223.

<sup>16</sup> *Bull. Soc. Chim.*, 1864, II, 83. Fresenius, *Zeit. anal. Chem.*, 1865, IV, 213; 1869, VIII, 137; 1874, XIII, 189.

<sup>17</sup> *Zeit. anal. Chem.*, 1874, XIII, 379.

<sup>18</sup> *Am. Chem. Jour.*, 1882, IV, 53.

<sup>19</sup> *Dingl. Polyt. Jour.*, 1883, CCXLIX, 175.

<sup>20</sup> *Jour. Am. Chem. Soc.*, 1900, XXII, 198; W. R. Ingalls, "Production and Properties of Zinc," 99.

\*Abstract of a paper in *Chemiker Zeitung*, 1905, Vol. LXXIII, pp. 951-955.

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careful investigation of the method was carried out by Koninck and Prost.<sup>21</sup> They established the fact that, on adding the potassium ferrocyanide to the solution of zinc, the double salt,  $K_2Zn_2Fe_2(CN)_{12}$ , is formed; this, however, also contains a little zinc ferrocyanide, the latter being only gradually converted into the double salt by a further quantity of potassium ferrocyanide. It follows from this that, in titrating, a little time must be allowed before trying the end-point. It would be still better, however, to add an excess of potassium ferrocyanide from the start; and to titrate back, after 15 minutes, with a known zinc solution. This would offer the further advantage that the end-point could be more easily observed. Also, the reaction can be accelerated by warming.

The same authors also studied the influence of an excess of certain salts on the sharpness of the endpoint. They found that it is necessary to keep the conditions of concentration of the different reagents constant, as large quantities of  $NH_4Cl$  or  $HCl$  increase the quantity of potassium ferrocyanide required for the reaction. The  $NH_4NO_3$ , found in the oxidation of the iron by  $HNO_3$  is also said to oxidize a portion of the potassium ferrocyanide on acidifying. Bromine has a similar action, perhaps through the formation of  $NH_4BrO$  or  $NH_4BrO_2$ . In any case, the method is not likely to find general application, as the inverse titration is unsuitable for technical work.

Miller and Hall<sup>22</sup> noted that the sharpness of the endpoint is affected by the presence of  $CaCl_2$ ; acids, especially  $HCl$ ;  $M_2(SO_4)_3$ , and any considerable quantity of  $NH_4Cl$ .

Quite recently, Waring<sup>23</sup> has shown that low values may be obtained for the titration; if the solution is too dilute; or if the titration is made too rapidly, and especially in the cold. Too high a value may be obtained: (1) If there are organic acids present; (2) if a decomposition of the ferrocyanide by chlorine, bromine, oxides of nitrogen,  $H_2O_2$ , etc., takes place; or (3) in the presence of an unusually large excess of acid. The author further found that certain American ores (willemite, franklinite, etc.) cannot be dissolved by the ordinary methods, as Zn could be detected in the insoluble residue.<sup>24</sup> In such cases  $KHSO_4$  was used. In ores containing much Mn, Fe and little Zn, the presence of this last metal could still be detected even after the fourth ammonia precipitation. In the presence of Cd, the author condemns the use of  $H_2S$ , as a little zinc is always precipitated along with the Cd. The best method, according to Waring, is to remove the Cd by means of Al, which brings down the

whole of the lead group. If Ca is precipitated with oxalic acid before the Zn, the results obtained are too high. The author further states that the excess of oxidizing agent must be removed by means of  $Na_2SO_3$ . He has found, however, that  $KClO_3$  still has an influence even after the addition of sodium sulphite. One single example is quoted to show that excess of acid gives too high a result. He does not state clearly whether any further experiments were made. The titration is carried out with a solution containing 21.63 gm. potassium ferrocyanide and 0.7 gm.  $Na_2SO_3$  per liter. The indicator may be a solution of 4.4 gm. uranium acetate in 100 gm. of water, and 3 c.c. of acetic acid; or 52 gm. uranium nitrate per liter. The author considers it necessary to add  $NH_4Cl$  before each precipitation. Cu is precipitated with pure Pb.

Another method worked out by the same author does not seem very commendable. After Cu has been eliminated by Pb or Fe, the zinc is separated (from Mn, Fe and Al) by  $H_2S$  under slight pressure and in formic acid solution.

For small quantities of zinc, the following determination is recommended: Precipitate Ca, with oxalic acid; Mg, with phosphoric acid. Zn does not come down if there are sufficient ammonia and  $NH_4Cl$  present. Zinc cannot be titrated in the filtrate, but must be estimated as sulphide or phosphate. In the ordinary gravimetric analysis, Cu, Ag and Bi are eliminated by means of a strip of Fe, or, better, Al, as this last precipitates the Pb also.

*The Nissenson-Kettembeil Modification of the Ferrocyanide Method.*—The first part of the analysis is as described above; but, after precipitation (which is made with barely the requisite quantity of ammonia) filter into an Erlenmeyer flask; let stand over night in a warm place, so as to drive off as much ammonia as possible. We have not added any sodium sulphite in analyses in which the solution had been oxidized before the precipitation. The standard zinc is dissolved in 10 c.c. dilute  $HCl$ , and diluted to about 200 c.c.; 10 c.c. of ammonia is added, and the solution is allowed to stand in a warm place over night. To the samples for analysis and to the standard, 10 c.c. of dilute  $HCl$  are added. The next day they are boiled vigorously and titrated hot. As indicator, we use a 1% solution of uranium nitrate. In the literature it is usually stated that Ti, Mo and W also give yellow precipitates with ferrocyanide; we therefore made attempts to use titanium chloride, sodium tungstate and ammonium molybdate as indicators. Only Mo, however, gave a satisfactory end-point; excess of ferrocyanide shows an intense yellow coloration. As molybdenum indicator, we used ammonium-molybdate solution (whereby Pb is titrated according to Alexander's method), and which contains 9 gm. per liter. The end-point occurs 0.2 c.c. earlier with Mo than with uranium.

The sharpness of the end-point seems to be different for different observers. With molybdenum, the reaction is immediate; with uranium, it takes some little time. In order to be quite sure that the reaction between the zinc and the ferrocyanide was complete, the liquid was continually shaken while adding the latter. The shaking was continued while counting 50, and only then a drop taken out for trial. If the end-point was not then reached, 0.2 c.c. more was added, and the sample shaken while counting 20. Finally 0.2 c.c. was added as a check after reaching the end-point.

Renard<sup>25</sup> proposes to precipitate with an excess of ferrocyanide, and to titrate back with  $KMnO_4$ . Stone<sup>26</sup> modifies this method, determining Mn + Zn with ferrocyanide, and using cobalt nitrate as indicator. Uranium cannot be used here, as it reacts too quickly with the Mn precipitate. Mn is then determined separately with  $KMnO_4$ .

*Other Volumetric Methods.*—Mann<sup>27</sup> decomposes freshly precipitated  $AgCl$  with the moist  $ZnS$  from the  $H_2S$  precipitation. In the filtrate from the  $AgS$ , chlorine is titrated, and from this the Zn is calculated. For determining Zn in blends, Küster and Abegg<sup>28</sup> recommend the following process: Weigh out 0.1 to 0.2 gm. zinc blende in a porcelain boat, which is then gradually heated in a combustion tube to 500° C. in a stream of dry  $HCl$ . The  $ZnCl_2$  distilling off is determined by Volhard's method. The  $HCl$  should contain a little free hydrogen, as  $FeCl_2$  is not volatile at 500° C., while  $FeCl_3$  is. The gas must not contain any oxygen, as  $ZnCl, OH$ , if once formed, is not again decomposed by  $HCl$ . Balling<sup>29</sup> treats blends with sodium acetate and a known quantity of silver-nitrate solution, filters off  $Ag_2S$ , and determines Ag in the filtrate by means of thiocyanate. According to Schwarz<sup>30</sup>  $ZnS$  precipitated in the usual manner is treated with ferric chloride, thus:



The  $FeCl_2$  is titrated with permanganate. According to Mohr<sup>31</sup> ferricyanide may be used for the titration. The indicator consists of a strip of filter paper impregnated with a ferrous salt. The end-point is indicated by a blue stain produced by a drop of the liquid placed on this test paper. Benedict and Cantor<sup>32</sup> titrate a very dilute solution of zinc with phenolphthalein until an intense red color is produced; they add a few c.c. more  $NaOH$ , boil a few minutes, and then titrate back with  $HCl$ . The end-point is said to be very sharp if the precipitate has settled. Ac-

<sup>25</sup> *Comptes rendus*, 1868, LXVII, 450.

<sup>26</sup> *Jour. Am. Chem. Soc.*, 1895, XVII, 493.

<sup>27</sup> *Zeit. anal. Chem.*, 1880, XVIII, 162.

<sup>28</sup> *Zeit. Elektrochem.*, 1903, IX, 836.

<sup>29</sup> *Berg- u. hüttenm. Zeit.*, 1881, 63.

<sup>30</sup> Balling, "Probielkunst."

<sup>31</sup> Mohr, "Lehrbuch d. chemisch-analytischen Titriermethode," v. A. Classen.

<sup>32</sup> *Zeit. f. angew. Chem.*, 1888, 236.

<sup>21</sup> *Zeit. f. angew. Chem.*, 1896, 460.

<sup>22</sup> *Columbia School of Mines Quarterly*, 1900, XXI, 267.

<sup>23</sup> *Jour. Am. Chem. Soc.*, 1904, XXVI, 4.

<sup>24</sup> We have not hitherto met any zinc ore which could not be extracted by our method.

ording to Dementjew<sup>33</sup>, NaOH is added to the zinc solution until the precipitate first formed is redissolved; the liquid is then divided into two parts. In the one the sum of  $Zn(OH)_2$  and NaOH is titrated with tropæolin OO as indicator; in the other, the excess of NaOH is determined by titration with phenolphthalein.

*Experiments of the Authors.*—After inquiring what methods were commonly used at different works, it was decided to test experimentally the value of the chief of these, comparing them with the gravimetric hydrogen sulphide method. The results are expressed in the accompanying table. It should be noted that ores containing Cu were treated with sodium thio-sulphate, and were then oxidized with bromine water before precipitating with ammonia.

Sample Analyzed	Zinc Contents %			
	H <sub>2</sub> S Method	Electrolysis	Schaffner	Ferrocyanide
Zn SO <sub>4</sub> Solution.....	24.58	24.60	24.58	.....
.....	24.59	24.59	24.58	.....
.....	.....	24.60	.....	.....
Blende A.....	48.93	49.00	48.94	48.85
.....	53.35	53.30	53.25	53.29
.....	55.07	55.04	55.06	54.96
Blende B, containing Cu	51.31	51.30	51.26	51.21
.....	51.24	51.28	51.26	51.21
.....	51.42	51.50	51.48	51.50
Blende C, containing As, Cu and Cd.....	48.86	48.92	48.94	48.60
.....	48.28	48.36	48.31	48.25
.....	42.58	42.60	42.54	42.75
Blende D, containing As, Cu and Cd	45.56	45.50	45.62	45.65
.....	45.58	45.56	45.62	45.50
Calcined calamine.....	31.45	31.40	31.37	31.20
.....	58.94	58.90	58.97	59.10
.....	43.18	43.15	43.12	43.10
.....	33.42	33.40	33.42	33.19
.....	40.51	40.60	40.53	40.50
Zinc ashes.....	70.72	70.68	70.72	70.63
Blende E.....	59.43	59.34	59.40	59.40
Zinc dust.....	92.99	93.01	93.05	92.93
Blende F, containing Cu and As.....	49.35	49.37	49.41	49.44
.....	52.22	52.19	52.28	52.29
.....	51.18	51.20	51.26	51.25

From the table as given it will be seen that the results obtained by the several methods are equally good. The electrolytic method, also included in this table, gives good results but cannot be used at most works, owing to the absence of the requisite equipment. Both with Schaffner's method and the ferrocyanide method, care will have to be taken that the same conditions are observed throughout. Contrary to the statements of Koninck and Prost, we have not found any influence of the oxidizing agent upon the end-point. As regards the indicator in this method, we find that uranium nitrate or ammonium molybdate can be used equally well. For weak eyes, the latter seems to be more agreeable and more certain. The end-point is reached about 0.2 c.c. earlier with molybdenum; it also has the advantage that it shows itself at once, and in its full power, whereas in the case of uranium there is a gradual darkening.

As regards Schaffner's method, we have come to the conclusion that its best form is that used by us; while the Belgian meth-

od, using  $2\frac{1}{2}$  gm., has the disadvantage (especially if much iron is present) that it is apt to give too low results. The titration with two burettes should be unnecessary for an experienced analyst, though it may do good service in the hands of the beginner while he is making himself familiar with the method.

### Shaft Sinking for Salt.

It had been known for many years that large deposits of salt underlie the limestone and sandstone of Detroit, Mich., at a depth of 1,200 to 1,500 ft. Many drill holes have been put down into this salt bed between Fort Huron and Wyandotte, Mich., through which water was pumped; brine was made, and by different methods of evaporation the salt was recovered. From this boring it was learned that great difficulties would be encountered in sinking a shaft into the salt bed.

The greatest trouble anticipated was the large amount of sulphur water just on top of the ledge and directly under it. About 3 or 4 ft. in the ledge there existed a crevice that gave a flow of 400 to 500 gal. per min. of very strong sulphur water. To sink a shaft through this crevice and shut off the water at this point was one of the great difficulties. Men could not work in the shaft any length of time without becoming blind from sulphur fume.

By the drill borings it was learned that the overburden was 86 to 90 ft. thick; the first 30 ft. of this is hard clay, then 56 to 60 ft. of mud or silt, which is semi-liquid. At 60 ft. there is a seam of sand and gravel, 6 in. thick, from which flowed the first sulphur water. Again, directly on top of the ledge, is another seam of sand and gravel and more sulphur water. Two feet under the ledge is a crevice flowing sulphur water, and 7 ft. in the ledge is a second seam of sulphur water. Directly under this there is 4 or 5 ft. of gaseous oil-rock, full of a hydrogen gas, and from there to the point of the salt bed the ledge is composed of lime and sandstone in thick strata.

Several attempts had been made by different parties to sink a shaft at different places for the purpose of mining rock-salt; but, up to a year ago, all these attempts were failures. No one succeeded in reaching the ledge or getting through the mud and silt. Last December the Wallace Contracting Company, of Duluth, Minn., took the contract to sink a three-compartment shaft for the Detroit Salt Company, of Detroit; the dimensions of the shaft were 6 by 16 ft. inside. The plans of the shaft were submitted to the Wallace Contracting Company by the engineer of the Detroit Salt Company. This shaft was put down to a depth of 72 ft.; it was a failure, and was abandoned at that point, or 16 ft., before the ledge was reached. Then the Wallace Contracting Company prepared plans of

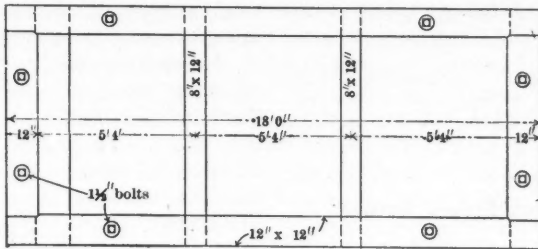
their own for a shaft which they thought would be practical, and one that could be put down to the ledge. The new shaft was started on Feb. 20, 1905; it was dropped and forced, from the top down, and was carried to the ledge successfully.

The shaft consisted of a crib, made out of 12- by 12-in. timbers, bolted together with eight  $1\frac{1}{2}$ -in. bolts; tar and oakum was used between every joint, and the crib was made absolutely water-tight from top to bottom, in a construction similar to the hull of a ship. This crib was built 2 ft. larger each way on the bottom, and gradually tapered up for 18 ft., so that as the shaft was pushed downward to the ledge it had a bell shape for the lower 18 ft. After the ledge was reached the shaft was carried into the rock with the same size as that of the bottom of the crib, or 2 ft. longer and 2 ft. wider than the shaft was intended to be when completed. It was sunk in this size 18 ft. into the ledge; and the two crevices of water were passed successfully. Then a crib was started in the bottom of the shaft of the intended size of the shaft, 6 by 16 ft. inside; 18 in. of Portland cement was used between the crib and the rock. The crib and the cement were built up to the second water crevice. Then 2-in. pipes were passed through the crib and into the crevice; the crevice was caulked between the pipes with oakum and tar, and the water was forced to pass out through the pipes. Then the crib and the cement work were carried up to the first water crevice; pipes were again put through the crib into this crevice and oakum and tar driven into the crevice between the pipes; the water was carried off as described. Then the crib was built up to the top of the ledge with cement behind; 2-in. pipes were passed through the crib to take care of the water running out on top of the ledge. The crib was then continued up into the bell of the drop-shaft, a distance of 6 ft.; cement mortar was filled tight between the two cribs.

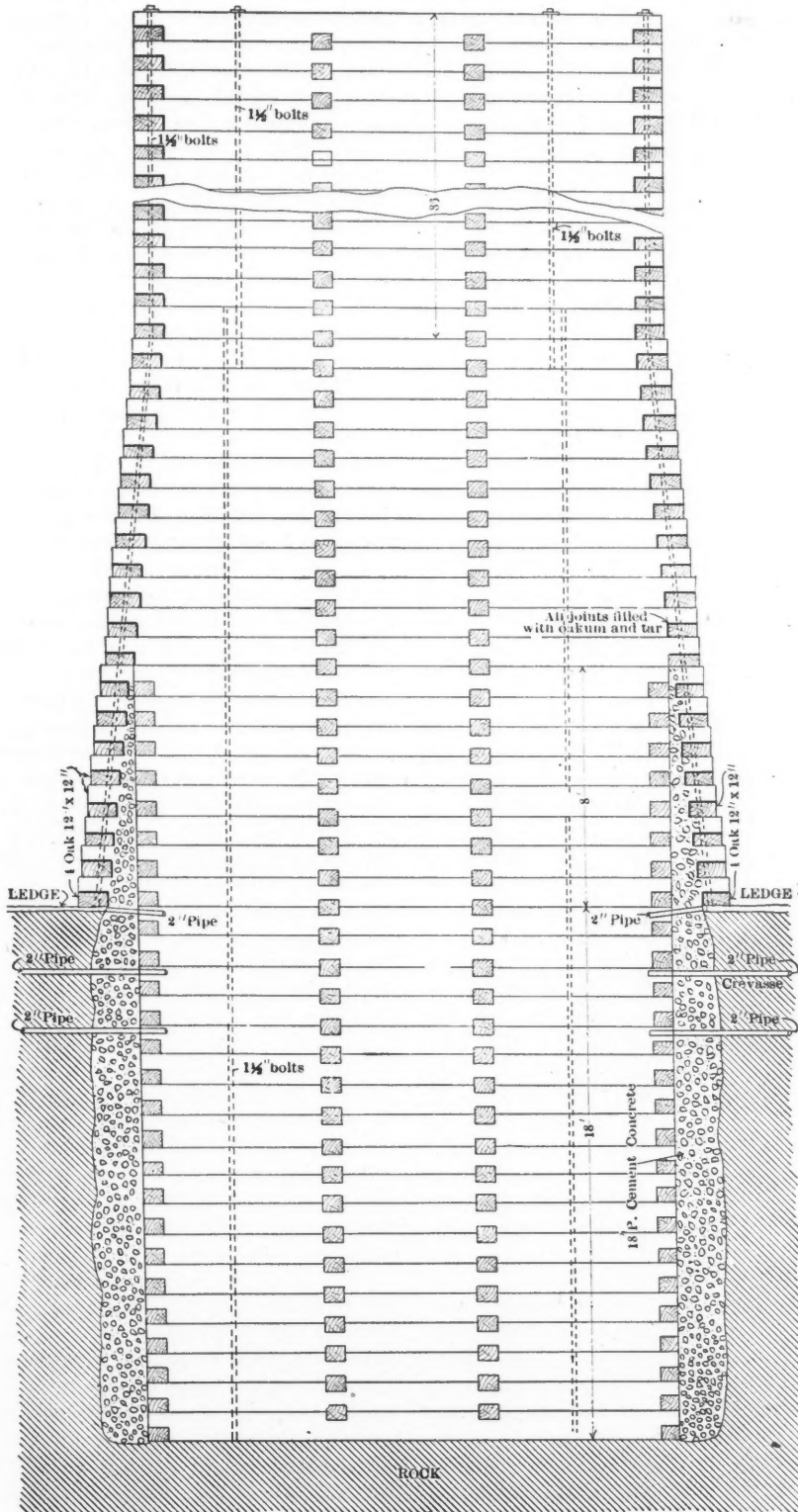
After all the cement had set, gate valves were used on all the pipes. When these valves were shut four-fifths of the water was shut off; the crib showed a small leakage at the top of the inside crib. After this the inside crib was carried up 2 ft. further, and cement was used as before. All the pipes passing through the crib were then connected together, and one pipe was carried to the surface, to which was attached a No. 8 pump; 75 bbl. of cement (of about the consistency of cream) were pumped into these pipes, when the flow of water was stopped. This practically assures the success of the undertaking, as from now on little difficulty should be encountered.

The sinking of the shaft so far has been fraught with danger from sulphur fume and gases. Two fans were employed for ventilating and driving out of fumes and

<sup>33</sup> *Chem. Zeit.*, 1896, XX, 327.



PLAN OF SHAFT



CROSS SECTION OF SHAFT

gases, one having a capacity of 3,000 and the other of 15,000 cu. ft. per min. But even with this great current of air going down one compartment and up the other, two men could remain in the shaft only a short time. Frequently a man would lose consciousness in thirty minutes, and several times during the progress of the work all of the men were taken out of the shaft in an enfeebled condition.

One great trouble the workmen had was with their eyes. The sulphur fume caused blindness and great pain. Some were obliged to stay in a dark room for 3 or 4 days after working as many days in the shaft.

Another serious trouble the contractors experienced was with the sulphur water; this was so strong that it would eat out the castings and iron pipes in a short time. The water end of the pumps had to be watched closely, as the water would eat off the threads on the end of the rods; the rods had to be changed every few days at the longest.

The Wallace Contracting Company has now turned over the shaft to the Detroit Salt Company, which will continue it. The Detroit Salt Company was willing to do this for the reason that it has been convinced that the shaft is now an assured success.

There is no question that, in the near future, other shafts will be sunk, and efforts will be made by other parties to reach this same great salt bed on account of its commercial value.

### River Silt.

In view of many vexed questions arising from problems relating to the disposal of tailing from gold dredges, in the following abstract of a paper by R. G. Kennedy (recently read before the Indian Irrigation Conference) appears a practical suggestion on sand analysis and classification:

If we take any specimen of sand and drop it into water, we find that the coarser particles reach the bottom first, or, in other words, that all sand consists of widely different kinds of grains. Some simple method of classification or analysis is required before we can reach any definiteness; and *the rate of fall in still water* seems to promise the most suitable basis on which to found any such gradation. A simple vertical tube was accordingly made for determining the actual data required. It is merely a vertical tube with the bottom tapering into a graduated glass tube, in which latter the sand settles, and the quantities so deposited can be seen and noted for the varying times of descent or fall from the water surface. The total distance fallen from water surface to the sand already deposited will vary slightly as the glass tube fills, but a correction has been introduced for this in the velocity deduced. In all cases the same total quantity of sand was dropped in, and the dif-

ferent times required to fill up to each graduation of 1-1000th of a cubic foot noted. The results for various sands from different localities show remarkable variations. It has been found that even a few yards apart the analyses may be quite distinct, due, of course, to the varying currents under which each was deposited. A specimen from Main Line, mile 4, Sirhind Canal, was found to drop 5.2 parts (out of 14.4 put in) in 33 sec., and at the end of the 33d sec. it was falling with a velocity of 0.20 ft. per sec.: as compared with this take the average river-bed sand at Rupar, which dropped only 1.3 parts (also out of 14.4 put in) in the same time. Again in time 61½ sec., a specimen from the Chenab river-bed at Khanki dropped 8.9 parts, whereas the Sutlej at Rupar sand dropped only 6.3, thus showing that the former is coarser. The particles which were falling at the end of the 61½ sec., fell at a rate of 0.10 ft. per second.

A velocity curve, drawn to scale and showing the rate of fall in still water in ft. per sec., exhibited the fact that the coarsest sand in the author's experiments was that in the specimens from the fourth mile of the Main Line, due, it is believed, to the action of silt stirrers, which have generally stopped just above the superpassage there, and began again lower down. The whole of the sand left in the bed of the Main Line, down to the Escape at 12th mile, is shown to be extremely coarse, as was to be expected, it being the residuum left after the annual autumn scour has taken place. On distributaries and outlets the deposit is very much finer than any on canal bed, though there is still a very small percentage of the coarser grains evident. Were the scouring power or velocity of these latter channels increased, analyses of their deposits would show a coarser sand; in fact, the bed sand analyses could be made indices of the velocity. What is taking place on this canal is not that the very coarse sand stops permanently on the upper reaches, but that it is carried down more slowly than the finer, and this action goes on even in the smallest channels, only the farther down we go the more admixture of finer stuff there is in the bed deposits, due simply to the decreased velocity. The same sort of action seems to hold good for the rivers themselves; thus the sand of the Sutlej at Ganda Singhwalla is very much finer than at Rupar.

The Chenab sand at Khanki, on the other hand, is very considerably coarser than at Rupar, and consequently will allow of much freer percolation.

We should now be able to definitely classify any sand merely by its velocity of fall in still water. Thus any one grade of coarseness such as falls at the rate of 0.10 ft. per sec. could be defined as sand of "grade 0.10."

To include varying grades between de-

finer limits—say, between grade 0.10 and grade 0.20—we could comprise such under the notation "class  $\frac{0.10}{0.20}$ ", meaning all sand which falls at rates between 0.10 and 0.20 ft. per second.

### An Improved Dipper Dredge.

BY F. F. COLEMAN.

Of the various forms of steam dredges, the dipper has proved itself of the highest value wherever hard digging must be done. Because of its direct, powerful action, the dipper dredge can be operated in almost any material except rock. Hard clay, gravel, soil which contains boulders, and ground full of other obstructions are successfully handled by dredges of this type.

The new dipper dredge which the Allis-Chalmers Company, of Milwaukee, Wis., has recently placed on the market is designed with the intention of producing a machine of the highest capacity and low operating cost.

According to accepted tables a chain absorbs 6% of the power applied in friction within itself, and in running over the five sheaves ordinarily used on dredges takes up 19% more, showing a loss altogether of one-quarter of the whole power. A rope, on the other hand, uses up only 1% in internal friction and in running over three sheaves would add but 8½% to the loss, making a net gain of 15½% in favor of the rope. This alone would mean a saving of nearly one-sixth in both the first cost of fuel, and in the cost for fuel handling.

The dredge is so arranged that the weight is taken from the turntable during the operation of hoisting and swinging, and this, added to the gain from discarding the chains, gives a net increase in lifting speed, using a like amount of steam, of about 41%. Added to this is the advantage of a better lifting angle.

Reference to the illustrations, Fig. 1 and 2, will make clear the general arrangement of the details. The hull is so designed and the machinery so arranged that the hull may be made in three parts where this would be desirable for passing through ordinary canal locks to its destination. All the working parts are carried permanently by the central portion of the hull except the *A* frame and the two forward spuds; when ready for work the three parts are fastened securely together and form one hull.

About midships, fore and aft of the central hull, stands the smoke-stack with the boiler aft of it. Forward of the boiler comes the main engine, connected by a single gear to the main shaft. The hoisting drum is on this shaft, and is operated by a friction clutch. At each end of the main shaft are winch heads for operating warping lines or other work; these are thrown in and out of operation by me-

chanical clutches. A chain drive from a sprocket wheel on the main shaft operates a winch below, which handles the after, or "walking" spud. Connected to the main shaft by spur wheels is a second shaft in the same frame. This shaft carries a drum in its center, used for hauling the backing-chain. On the two ends of this are drums which lift the two forward spuds.

Forward of the main engine, on the starboard side is the swinging engine. This is geared to a drum set amidships, which operates the turntable carrying the boom. The turntable is operated by a rope which passes around it and has its two ends passed over the drum in opposite directions—one over and one under. The engine is reversible; and when one end of the rope is wound up, the other unwinds and the boom is swung accordingly. The main novelty of the dredge is found in the boom and the manner of operating it.

If a single wire rope were used to operate the dipper direct, as a chain is used, it would require the same number of reevings and sheaves to reduce the strain on the hoisting engine that the chain does. This would call for sheaves of an abnormal size. For example, a 2-in. plow-steel rope should not be used over a sheave less than 8 ft. in diameter. Two ropes, each 1½ in. in diameter, equal the 2-in. rope in strength, and these only require 5-ft. sheaves to work properly. This principle is used in the dredge described, in which one rope goes from the drum of the main engine to the large part of a differential drum on the boom. The differential drum has two smaller parts of equal size fastened to it, one on either side. These are each about one-half the size of the central portion, and from them go two ropes, each of the same size as that going to the hoisting drum. These lead over the head of the boom and are fastened to the two sides of the dipper.

The two ropes from the dipper wind on the smaller parts of the differential drum in the direction opposite to that in which the rope from the engine winds on the larger part. When the engine unwinds the rope from the large part of the differential drum, it winds the two ropes from the dipper onto the smaller parts and lifts the dipper. As the differential drum has a ratio of about 2 to 1 between its parts, the strain on the single rope going to the engine is just about equal to that on each of the two parts going to the dipper.

The rope to the engine does not go direct from the differential drum, but passes first in a vertical direction up to a sheave hung from the *A* frame. Its vertical line is exactly at the center of the turntable, so that no movement of the swinging boom can throw it out of line. This arrangement is one of the features of the dredge. When the strain of digging comes upon the hoisting ropes their ten-

dency is to draw in a straight line from the top of the head sheave on the boom to the top of the sheave suspended from the A frame. A glance at the cut (Fig. 1) will make it clear that this strain will tend to lift the weight of the boom off the turntable, and that the greater the strain and consequent downward pressure on the turntable, the greater will be the

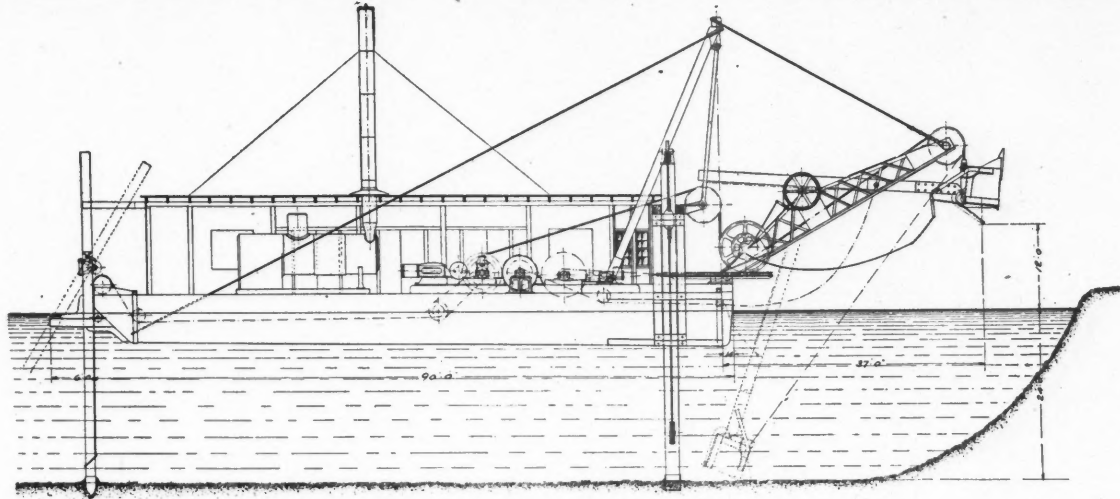
**Monazite in Queensland.**

The occurrence of monazite in the beach sands of Queensland, near the mouth of the Tweed river, has been known for some time. In the Walsh and Tinaroo fields it has also been found in tin-bearing gravel, but in greater abundance in gravels that are washed for scheelite; from this, monazite is separated

66% of the rare earths; a commercial sample, without cleaning or concentrating, yielded 2.6% thoria and 56.1% of the rare earths.

**Copper and Zinc Solutions.**

An explanation of the anomalous behavior of copper and zinc when dissolved in solutions of the alkali cyanides is given



- Elevation -

FIG. 1. ALLIS-CHALMERS DIPPER DREDGE.

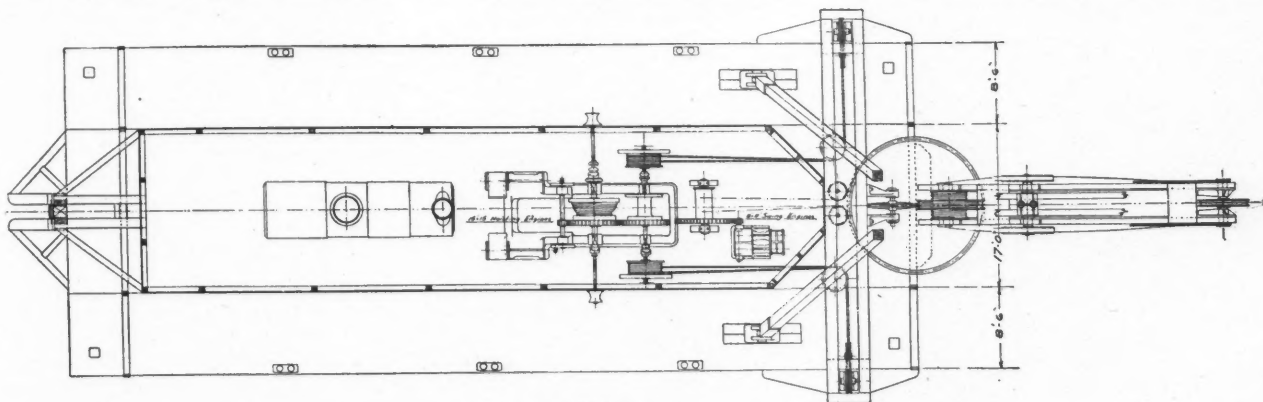
balancing lifting effect. The resultant reduction of friction on the turntable is responsible for the saving in time accomplished by the new dredge.

Among the most important of the incidental advantages of the new design is the absence of a bail on the dipper; the two ropes are fastened one to each side of the dipper, as shown. The dipper can take a full load and be in no danger of having the load struck by the bail. The pull of the ropes being direct instead of through a sheave and double fall, the lifting angle

with difficulty, being often confused with it by the miners.

At two localities monazite has been found in its original habitat, associated with wolframite and lesser amounts of molybdenite, scheelite, cassiterite and arsenopyrite. The Government geologist states that the monazite occurs in pure crystalline masses, sometimes several pounds in weight, and also in small cleavable grains, both forms being irregularly disseminated in quartz, biotite and chlorite. The deposits containing the monazite

by F. Spitzer's experiments (*Zeit. fur Elektrochemie*, 1905, p. 345). Copper precipitates zinc from potassium-zinc-cyanide solutions containing any excess of potassium cyanide; whereas zinc precipitates copper from potassium-cuprous-cyanide solutions containing less than about five molecular proportions of potassium cyanide per liter. It is now shown that when zinc is precipitated by copper, it combines with a portion of the latter, the alloy thus produced having a much smaller solution pressure



- Plan -

FIG. 2. ALLIS-CHALMERS DIPPER DREDGE.

is improved. The line of the draft is from the edge of the dipper to the outside of the head sheave instead of through the centers of the two sheaves. Another incidental advantage is that as the boom is effective from the outside edge of the head sheave instead of from the center of the sheave, the boom may be shortened by that amount.

are in granite, but close to quartz-porphry and slate. In the granite, and also at the junction of this rock with the porphyry and slate, irregular masses of greisen have been formed from the alteration of the granite, and it is in this, following closely the behavior of the wolframite, that the monazite is found. An analysis of a clean sample of monazite showed

than pure zinc. On electrolyzing solutions of copper and zinc cyanides in aqueous potassium cyanide, brass containing about 30% of zinc is deposited at cathode potentials much lower than the potential of the zinc in solution. When, however, these solutions contain a large excess of potassium cyanide, hydrogen is liberated at the cathode and the metals are not deposited.

### Geology of Sonora, Mexico.

BY F. J. H. MERRILL.

The State of Sonora, rich in its mineral resources, offers to the geologist and the mining engineer some interesting problems; but, while much work has been done in mining development, it appears that, in the press of commercial activity, comparatively little time has been found to put on record the varied details of its geology.

The observations of the writer have been chiefly made during the present year, in the Hermosillo, Ures, Arizpe and Magdalena districts, where I was engaged professionally in mine examination.

The formations of central Sonora are, to a large extent, igneous, though extensive remnants are seen, of a sedimentary series, chiefly Triassic and Cretaceous, consisting of sandstone, limestone and shale. These beds have been much disturbed and folded, and are really intermixed with and injected by granite, diorite, diabase, rhyolite, andesite and other igneous rocks, which, in some instances, protect the sediments from erosion by capping them, or hardening them through the metamorphic action of sills, dikes and plugs, thus producing some of the minor peaks and ranges.

Continuous mapping of geologic outcrops is not practicable in central Sonora, as the extensive plains (covered deeply with desert debris) and the alluvial river bottoms, yield few exposures of the subterranean.

It is on a desert plain that the Sonora railway has been built from Batamotal, near its southern terminus, to Santa Ana in the Magdalena river valley. From here to Imuris it follows the fertile river bottom to the junction of the Cocospera and Alisos rivers which, by their confluence, form the Magdalena; then the railroad ascends the valley of the Cocospera to a summit of 4,200 ft., about six miles south of Nogales, to which point it then descends.

The peaks and ranges observed near the railroad in passing from Guaymas to Torres are of volcanic origin. East of Torres, at Minas Prietas, the workings of the Gran Central mine are said to be partly in rhyolite and partly in quartzite. Around Prietas the exposures are mainly volcanic.

The city of Hermosillo, at the junction of the San Miguel and Sonora rivers, is built on limestone, which is quite crystalline through the metamorphic action of dikes of a basic eruptive. The steep hills which border the river at Hermosillo are mainly of limestone, which have been protected from erosion by a large number of dikes.

Limestone underlies the desert plain for many miles northward from Hermosillo, though numerous peaks and small ranges of rhyolite and other eruptives rise abruptly and picturesquely above its sur-

face. At Pesqueira station, an artesian well, bored by the railroad company, yields an abundant flow of water at a temperature of perhaps 80° F.

Following the Sonora river valley eastward from Hermosillo, we find the wide bottom lands rich and well cultivated, with volcanic ridges of rhyolite or tuff on either hand. About 12 miles east of Ures, the stream passes through a deep gorge in massive granite, known as "el Cajon" or "the box." Beyond this cañon, from Puertacito to Arizpe, the Sonora river occupies a north-and-south valley, with fertile bottom lands between volcanic ridges perhaps a mile apart.

West of the Sonora valley and having an approximately meridional course, is the San Miguel river; on a branch of this, the San Domingo river, are located the placer claims of the Green Consolidated Gold Co.

West of the San Miguel valley and north from the settlement of San Miguel (also known as Horcasitas), is a region of closely folded mesozoic rocks overlaid by rhyolite and great sheets of tuff and volcanic agglomerate. The last of these forms the summits of some of the high peaks, and evidently at one time had a great extent, though it is now tilted and partly removed by erosion. This is known as the Copete region, and lies about 20 miles southeast of Carbo.

Northward from Carbo in the vicinity of Llano, the desert plain is composed of granite debris, and the projecting peaks are mainly of rhyolite. The subterranean here, in some places, is of gneiss; but whether this is a variety of the granite or whether it is an older formation cannot now be stated.

Metamorphic schist has been reported from the Altar district to the westward, and this may be similar to the gneiss in question.

The limestones of central Sonora are regarded by the Mexican geologists as wholly Cretaceous. This conclusion is apparently questioned by Prof. Dumble; he collected Silurian fossils at El Trigo mine in the Alamos district, and observed what he regarded as possibly a Cambrian terrane beneath the Silurian strata.

Of the country eastward, but little geologic detail is on record. Near the margin of Chihuahua, rises the escarpment of the western Sierra Madre, with its Cretaceous limestone rich in silver. On the Matape river at San Marcial, and near the Yaqui river south of Soyopa, are deposits of Upper Triassic coal which are awaiting transportation facilities to encourage their development. At Cedros, in the Alamos district, are deposits of hematite, also in Triassic beds.

The mineralization of the rocks of Sonora is the main source of its commercial importance, and is varied both in material and character. The Sonora geologic province (which includes Arizona) is marked by its wealth of gold and cop-

per, silver being less abundant in its distribution.

In character the ore deposits vary greatly; some areas contain large amounts of precious metal, but without a commercial degree of concentration.

West of Llano, are many quartz veins in gneiss. The veins are associated with small greenstone dikes, and do not carry much gold; but irregular stringers associated with the veins are often rich in gold and silver. Here was observed the anomaly of a galena carrying high value in gold.

Further west, alluvial plains (derived from the talus fans from the low ridges) carry gold; and much dry placer washing is done by the natives.

In the Copete district, southeast of Carbo, is a great zone of mineralization. Here are the Copete copper mine, the Sultana gold mine, the Cerro de Oro property, and a large number of promising claims and prospects. The Sultana vein is of great thickness and extent and is said to be rich in gold. The veins are all in rhyolite, which overlies Cretaceous limestone (fossiliferous) and slate, and in turn, is covered on the mountain summits by volcanic agglomerate.

Still farther east, the Sonora river valley is bordered by richly mineralized zones in the volcanic ridges. Near Bavicanora is the rich silver mine known as "Las Chispas."

At present, the chief gold and silver mining camp of Sonora, is at Minas Prietas, where La Colorada and the Gran Central mines are operated on a large scale. The latter is controlled by the Chas. Butters, Ltd.; it is the site of an improved cyaniding plant, arranged under the Butters' patents. Here a wide vein of ore, averaging about \$7 in gold and silver, is worked at a satisfactory profit.

Copper prospects are numerous, and are attracting some attention in development work; but excepting those at Cananea and Nacosani, no large orebodies have yet been opened.

Some of the richest known orebodies of Sonora are near the Chihuahua border in the Moctezuma, Sahuaripa and Alamos districts. These, however, for lack of transportation, have not been developed on an extensive or modern scale.

At present, the projected Yaqui river railroad from Batamotal into the Sahuaripa district, promises the facilities required for a part of that region. The activity of the Greene Gold-Silver Company in the Sahuaripa and Moctezuma districts (with a promised transportation line from Terrazas south and west to the vicinity of Guaynopita and Pinos Altos, near the Sonora boundary) renders the opening of a territory of rich mineralization a matter of the immediate future.

The atomic weight of radium is uncertain; 225 and 258 are both calculated for it.



# THE ENGINEERING AND MINING JOURNAL

Published Weekly at

505 PEARL STREET, NEW YORK

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

To Foreign Countries, including postage, \$8.00 or its equivalent, 33 shillings; 32 marks; or 40 francs.

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

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

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

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THE ENGINEERING AND MINING JOURNAL.

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

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SHIPMENTS OF iron ore from the Lake Superior region in October amounted to 4,000,000 gross tons, and Minnesota mines sent out 2,817,000 tons of this total. There have now been forwarded from Lake Superior mines, by all ports of shipment, 29,500,000 tons this season, and from Minnesota alone 19,500,000. The gross total is 2,000,000 tons ahead of the record preceding full year—that of 1902—and the Minnesota business is 4,000,000 tons ahead of the same full year. This shows a slight falling off in the old ranges. Shipments are still active, but must slow up very soon, and many of the season contracts will run out in a trip or two. The weather has been unusually severe this fall, though the indications are for a somewhat warmer November.

FOR SOME MONTHS the proposition to erect a central distributing station for electric power to the mines on the Rand has been seriously discussed by South African engineers. During the visit of the British Association to South Africa in September, proposals were made that the Victoria Falls of the Zambesi should be utilized for the source of power. Electrical engineers, who have studied the subject, have come to the conclusion that a turbine plant at the Falls and the transmission across 600 miles of country would mean a far greater outlay of money than a central steam plant in Johannesburg, so that the proposition will probably fall to the ground, and the central generating house on the Rand will be proceeded with, as originally contemplated.

### Fissure Veins.

We publish elsewhere in this JOURNAL an interesting discussion on that old question of the "fissure vein." Irrespective of its origin, the term was instinctively appropriated, not only by some engineers of standing, but more eagerly and tenaciously by the practical man who thinks of his deposit as extending down through some "chimney" to a subterranean reservoir of "unlimited possibilities." The term has its meaning, and Dr. Raymond's remarks come fittingly from one who can speak with the ripe judgment of a mature student. A straw vote taken some years ago among young Western engineers disclosed the fact that the only quality common to all their views was that the "fissure vein" is a "vertically disposed" de-

posit in well defined form, and in material which is distinctly different from the country rock. This would suggest a "porphyry" dike, or the like, as a type accompaniment of the fissure vein. Whatever the case, it may be well for each writer to state, in some way, in what sense he is using the term. With all its failings, the theory of ore deposition is too well formulated to tolerate any hazy views on that part of any deposit which is available for actual operation and study; and, as Dr. Raymond points out, there are many large mines working in deposits which no one would call "fissure veins."

### The Rare Earths.

Time was when the mere mention of this phrase was enough to call up indistinct but troublesome memories of those close-leaded, small-type paragraphs in our old text-books; and, with a contemptuous shrug, the reader would pass on to the next page. But now the term is synonymous with much that is both interesting in a technical sense, and practical from a commercial standpoint.

It has been well said that the peculiarity about the rare earths is not that they are themselves so rare; but rather that the analytical knowledge and skill requisite for treating them are rare. Indeed, a curious feature of these rare earths is that they are not insuperably scarce; and as Professor Baskerville—whose paper appears in another column of this JOURNAL—remarks, no one need be deterred from working with them on account of this reputed rarity.

These rare earths comprise a large group, or rather a series of groups, most of which, in qualitative procedure, are precipitated with the iron-aluminum-chromium group, or with the zinc-manganese-cobalt-nickel group.

The name includes "earths" proper, together with oxides of elements which are acidiferous metals, or acid elements with basiferous properties in their lower oxides; but over them all broods one common property—the tendency to show refractory "earthy" properties when heated. Most of them are non-volatile or volatile with difficulty. It is a peculiar fact that this property, which for so long was a serious obstacles in studying them, is precisely one from which the rare earths now promise to develop great utility. Another quality is that of forming peculiar new

alloys, or of influencing the properties of old ones. The paper of Professor Baskerville, in admirably condensed form, shows both the very considerable work that has already been accomplished, and still more, the good promise of wider utilization that is to come in the future, and the near future. There are twenty or more of these elements, that are conveniently grouped as the rare earths. Surely this is enough to busy the best effort of the prospector, the technical chemist, the inventor, and the man of business foresight. But we pause; for from the old standpoint we have lost our text—the rare earths are no longer rare; but a new industry has been born.

#### The California Drought.

The drought in the upper part of California still continues, greatly to the detriment of mining operations. There has been practically no rain since last winter, and though a little fell this spring, some 200 days have passed without any rainfall whatever. The odd thing is that the extreme southern end of the State, where there is usually a very small average rainfall, has had heavy showers in November, but none have fallen north of Tehachepi. In consequence, not only have most of the Mother Lode mines been compelled to close down, but also those in other counties. Even in Nevada county the mines of Grass Valley and Nevada City have been limited to a "pump head" only, so that hundreds of miners are out of work temporarily. In case water for power has to be shut off altogether for a time, some of the mines will fill with water, and great expense will be entailed in subsequently unwatering them. Most of the larger reservoirs of the power companies have been entirely drained, for which reason the wet-season rains are being anxiously looked for by everybody. It will take now a very heavy and wide-reaching storm to meet the requirements of the situation. Most of the larger Tuolumne county mines had to close a month or more ago. Only two big ones are operating in Amador county. In Nevada county the companies having electric power are only allowed its use by day; and the water-using mines are only given enough to keep pumps running. The number of stamps dropping has had to be reduced on all sides, and the force of miners consequently reduced. Of course

no hydraulic mines can begin running. Another effect of the extreme dryness of the country is found in the countless forest fires, which are raging everywhere. The atmosphere is stifling with the smoke from these fires, and the damage to timber and grazing land cannot help being very great.

The power companies are assisting each other, and steam plants are being used to reinforce power as much as possible, water being used only when the heaviest loads are needed. The present difficulties are more serious than they have been from the same cause for years. The proposed Government reservoirs in the mountains to hold back waters for eventual agricultural use in the valleys will be advantageous to the miners as well. The dredge-men and the river-bed miners are the only classes of gold miners whom the present situation does not affect. The winter rains are now overdue, and show no present signs of attending to business.

#### The Anthracite Conciliation Board.

The Conciliation Board has now been in operation in the anthracite coal region in Pennsylvania, since it was established by the award of the Anthracite Strike Commission, nearly three years ago. Its constitution was originally based upon those of similar bodies on the Welsh coal-fields, but it has been modified as occasion called for local changes. The recent widespread rumors of coming labor troubles have drawn attention prominently to the Board, and its value as a mediatory power in industrial disputes has been debated. Its usefulness, however, is hardly open to question. An impartial inquiry into its operation will undoubtedly show it has amply justified its existence.

The primary object of the board is the prevention of strikes and of the dislocation of the coal-mining industries through industrial disorder; while one of its important subsidiary functions is to act as an impartial and skillful intermediary between employees and employers, whenever either as a party makes demands on the other. It is not claimed for a moment that the board has absolute power in preventing strikes. This can only be done by means of compulsory arbitration. The board, however, practically exercises a great influence in preventing strikes by removing amicably any cause that might result in them. The consensus of opinion among

those interested in the objects of the board, as our Scranton correspondent remarked in his letter recently, is that the board during the past three years has been a powerful element in the maintenance of peace in the anthracite region. It fills satisfactorily what was formerly a keenly felt want. It expedites negotiations between the miners and their employers, brings a high degree of knowledge of the coal industries and local industrial conditions to bear upon its decisions and recommendations, and does away with a large amount of expensive litigation. In addition to this, its actions possess an educational value that will have far-reaching effects. The work of the board demonstrates that fierce conflicts between capital and labor, with all their demoralizing consequences, as well as every kind of industrial difference, can be equitably adjusted by means of conciliation more expeditiously and cheaply than by other methods, and this can be done in a reasonable spirit without creating any bad feeling on either side. The board has the confidence of both the coal operators and the miners, and promises to become a factor of increasing usefulness in the anthracite country.

Apparently, all parties desire that its existence may be extended, the only change suggested being one of procedure, which will shorten the time required to obtain decisions. It is to be hoped that any settlement made on the conclusion of the present agreement will include continued life for the board.

#### The Production of Silver.

In the first of the accompanying tables we give a comparative statement of the silver production of the world in the years 1903 and 1904. The table is that which has been prepared for "The Mineral Industry," Vol. 13, and the figures given therein are derived, so far as possible, from official sources. In the United States the statistics are those collected by the director of the Mint, and in all of the important foreign countries the figures are those obtained by the respective governments. There are, of course, a few countries in which no statistics are available; that is, no complete statistics, owing to the absence of government action in the case, and in those countries it has been necessary to estimate the pro-

duction in part. The figures given are in troy ounces of fine metal.

It will be seen from this statement that although there was a considerable decrease in the output of the white metal in Mexico, that country, nevertheless, leads all the world in production. The United States is second and Australia comes third, the production of that country coming principally from the great mines of Broken Hill and the Barrier range. Nominally, Germany holds the third place, but the returns of that country are defective in that they do not discriminate between silver won from foreign ores and that obtained from ores mined in the country. As Germany is a large importer of base bullion, there is no doubt that the greater part of its silver product is from foreign ores, and should not properly be credited to the country. Setting Germany aside, we find that Bolivia was the fourth producer, although at a long distance behind Australia.

SILVER PRODUCTION OF THE WORLD.

	1903. Troy Oz. Fine.	1904. Troy Oz. Fine.
<b>America, North—</b>		
United States.....	54,300,000	57,786,100
Canada.....	3,198,581	3,718,668
Mexico.....	67,832,760	60,808,879
Central America...	2,100,000	655,357
<b>America, South—</b>		
Argentina.....	50,000	66,153
Bolivia.....	6,614,957	6,083,333
Chile.....	1,650,000	868,067
Colombia.....	2,000,000	946,066
Ecuador.....	40,000	
Peru.....	5,491,349	4,667,047
Uruguay.....	1,000	1,093
<b>Europe—</b>		
Austria.....	1,279,972	1,254,888
Hungary.....	619,877	643,000
France.....	751,890	609,638
Germany.....	5,830,000	12,532,938
Greece.....	1,090,367	895,172
Italy.....	784,084	757,777
Norway.....	240,898	257,200
Russia.....	260,776	172,912
Spain.....	4,090,000	4,876,076
Sweden.....	32,298	20,923
Turkey.....	486,297	564,685
United Kingdom...	174,896	174,517
<b>Asia—</b>		
Dutch East Indies..	124,678	175,479
Japan.....	1,770,152	3,208,620
Australia.....	11,909,040	14,558,892
Africa.....	450,000	486,408
Other countries.....	48,226	50,000
<b>Total.....</b>	<b>173,222,088</b>	<b>176,840,014</b>

The total production shows an increase of 3,617,926 ounces, or 2.1 per cent, over that of 1903. This gain was made in spite of a decrease of over 7,000,000 ounces in the Mexican output, and was due to the advance made in production in the United States, Australia, Spain, and nominally in Germany. The decrease in 1904 from the year of maximum production, which, during the period covered by our records was 1895, is not great, amounting only to 5,380,214 ounces. In the last ten years, indeed, the production

has not varied largely, as will be shown in the second table given herewith.

In this second table we have given the world's production of silver from 1875 to the present date. From 1875 to 1900, in order to avoid too extended a statement, the production has been given at intervals of five years, showing its general course, however, very clearly. This course differs somewhat from the general impression, the usual belief being that production fell off very heavily from 1870 on, whereas the fact was almost exactly the reverse.

Year.	Troy Oz. Fine.	Year.	Troy Oz. Troy.
1875.....	63,317,014	1900....	180,093,364
1880.....	79,731,936	1901....	174,851,391
1885.....	96,250,831	1902....	164,560,358
1890.....	134,404,104	1903....	173,222,088
1895.....	182,220,228	1904....	176,840,014

It will be seen that in ten years from 1875 to 1885 there was an increase of 60 per cent, while in the 15 years from 1875 to 1890 the production doubled. The output of silver in 1895, which was, as we have said above, the year of greatest production, was almost three times that of 1875, this remarkable gain having been due to the more extensive working of mines, the opening of new deposits and other collateral causes. From 1895 to the present time the production has not varied greatly, fluctuating from year to year, but in no startling fashion. At the present time, outside of Mexico and Bolivia, silver is very largely a by-product; that is, it is obtained in connection with copper, lead, and to a small extent with some other metals. The quantity obtained, therefore, does not vary directly with the demand for the metal itself, but rather with the demand for the metals of construction with which it is associated. In the United States at the present time, for instance, the number of mines which are operated for silver values alone can be counted on the fingers of one hand; nevertheless, our production increases and will probably continue to increase in the future, and perhaps even in faster ratio than it has in the past.

The commercial demand for silver last year was very good, and the prices were generally rather high. The same has been the case during 1905, and our latest quotation for silver—64 cents in New York—is quite up to, and, in fact, rather above, the level which has been maintained for some time. This increase in price is very largely due to the great demand for silver

for use in the arts. Both in this country and in Europe the times have been generally good, and people are fairly well supplied with money. It is in such times that the demand for silver grows. This year, according to the statement of the best authorities, it has been difficult at times to meet the demand for the white metal, so great has been its employment for household and decorative purposes.

As all who have studied the question know, the great demand for silver outside of the arts, and the comparatively moderate quantity which is now used for coinage, is found in the Far East. India has for many centuries absorbed silver steadily and without return. Exports of the metal from India are few and far between, and such as are made are generally in the form of manufactured wares, which are purchased rather for their artistic than their metal value. Silver not only furnishes a circulating medium in India; it is universally used for decoration, for personal ornaments and for household ware among those who are able to afford it. Moreover, the hoards accumulated by that country, which do not appear in banks or in other tangible form as with us, but are more often secreted, consist almost entirely of silver. The aggregate amount of these must be enormous, although probably only a few of them individually reach a very great amount. During the past 10 years, which have been years of large production of the metal, a little over half of all that reported has gone to the Far East, and of that half India has taken almost 75 per cent. The balance has gone chiefly to China and to the Malay peninsula. The latter, however, since the change last year in its currency standard, ceased to be a buyer of silver, just as Japan did some years ago. Whether this condition will continue in the Straits Settlements, or whether the people will demand silver when the present stock—which was accumulated before the change in currency—is exhausted, is uncertain. It appears altogether probable, though, that, like the people of India, they will again become buyers of silver. There is little doubt, in any case, that, taken altogether, the Far East will continue in the future, as it has in the past, to take at least one-half the silver which can be produced in the world, and will thus prevent any serious accumulation of the metal in the hands of the producers.

### Metallics.

An important factor in the efficiency of all ore-crushing devices, is the proper distribution of the ore over its anvil or path, in advance of the crushing member.

Collodion is recommended as a good material for restoring the surface of tracing cloth after erasing. It can be applied with a camel's-hair or sable brush.

The export of minerals from Algiers has increased largely during the last year, and important quantities of ore are now shipped from Algiers to Rotterdam and British ports.

Ferruginous blende, or marmatite, has several points of difference from pure blende. Marmatite is the more susceptible to magnetic separation, and in roasting it gives up its sulphur at a lower heat than pure blende.

In fast-motion Chilean mills the ore will distribute over the die more evenly if the die is somewhat dished, so that its face slopes upward to the outside, to compensate the natural outward or centrifugal throw of the ore.

A mechanical sampling device should be designed to make a square cut through a falling stream of ore, if accurate results are to be obtained. Any machine which does not comply with that requirement is defective in principle.

Kremnite, made in the neighborhood of St. Petersburg, is a new building material composed of clay, sand and fluorite, subjected to a high temperature and molded into any form required, while it can be colored to imitate the most precious marbles.

The addition of a small quantity of sulphuric acid has been found in some cases to cause slime to settle, which defied all other methods of treatment. The quantity of acid required is very small, say 1 lb. to the ton of slime. The reason for the action of the acid has not been satisfactorily explained.

In the charging of matte smelting furnaces from cars, which is now the common practice, it is advisable to bevel the sill of the charge door so that the ore will slide into the furnace. With such an arrangement the lumps will naturally shoot to the center of the shaft, while the fines will drop along the sides, which is the disposition that is desired.

Tantalum, used in the incandescent lamp, has a tendency to soften and become friable by use; and the osmium lamp has heretofore been difficult to make on account of the brittleness of the metal. It is reported, however, that osmium may be made into a paste with certain organic compounds, and then by passing through a die made available for the filaments of such lamps.

A material suitable for briquette-making can be obtained by heating separately the chief constituent, as anthracite, at about 140° C., and the binding material, which may consist of the residue from cellulose manufacture, at about 60° C., says the specification of a new French patent. The materials are then mixed in a triturating trough at a temperature of about 100° C. and pressed.

The splices used in transmission rope or in hoisting ropes or any form of what may be termed "running rigging," should always be of the kind known as the "long splice," and should be at least 15 (better 20) ft. long. The diameter is neither increased nor diminished, nor the strength of the rope materially altered, by a splice of this character. If properly made it cannot, after running a day or two, be detected by the most critical examination.

In fast-motion mills of Chilean type, the ore will form a better bed in the path of the rollers, when the crushing weight is in two rollers, than it will if the same weight is divided into three or four rollers. The mill with two rollers has the further advantage of being more simple and convenient. For similar reasons mills of the Huntington type are more efficient where rollers are not crowded in too thickly, as one roller disturbs the working bed for the next following one.

Gold, tin, wolfram and platinum are obtained from alluvial deposits in many districts in Australia by simple dry-blowing processes. Recently it has been proposed to extract cassiterite from rock in dry districts in Queensland by roughly breaking the ore, heating it to redness and dropping it into a tank of cold water. When the quenched and crumbled rock is sun-dried a large proportion of the cassiterite can be separated by winnowing by means of a steady current of air.

The great advantage of the tantalum lamp lies in its extremely high efficiency. It takes only half the current of an ordinary carbon-filament lamp of the same voltage and candle power; consuming at the beginning of its life about 1.7 to 1.93 watts per candle power, as against 3 to 4 watts per candle power, the usually accepted figures for a good incandescent lamp. Its high price is, therefore, not such a great disadvantage. The life of the lamp is rather short, about 500 hours.

A diamond-drill hole, 5,560 ft. deep, has been sunk at Doornkloof, South Africa. A 1 3/4-in. core was obtained. The time taken to drill this hole was 14 months, or an average of nearly 40 ft. per month. Three 8-hour shifts were worked daily. The rods were pulled out in lengths of 50 ft. At a depth of 5,000 ft. it required 3 1/2 to 4 hours to raise the rods, and almost as much more time to lower them. Another hole, 5,582 ft. deep, has recently been completed near Johannesburg, the

time required to drill it being 9 months, or an average of 620 ft. per month.

Blowing wells, sometimes known as breathing wells, are now being investigated by the United States Geological Survey. They have already examined many wells that emit currents of air with more or less force, sometimes accompanied by a whistling sound, audible for a long distance. The best-known examples of this type of well are found throughout Nebraska. The force of the air current in one of the Louisiana wells is sufficient to keep a man's hat suspended above it. The cause of such phenomena is mainly due to changes in atmosphere or to changes in temperature.

An alloy of two parts of aluminum and one part of zinc is equal to good cast iron in strength, and superior to it in elastic limit. Its color is white. It takes a fine, smooth finish and does not readily oxidize. It melts at a dull-red heat, or at a heat very slightly below, and is very fluid, running freely to the extremities of the mold and filling perfectly small or thin parts; in that respect it is said to be superior to brass, but it is brittle, and hence unsuited to pieces which require the toughness possessed by brass. The tensile strength of the alloy is approximately 22,000 lb. per sq. in., and its sp. gr. 3.3.

In the use of manila rope for transmitting power, a good plan to follow is that in use in a manufacturing plant where each rope, when placed upon the sheaves for the first time, had its maker, class and price, together with the date, entered in what was termed the rope log. The log was usually consulted when a new rope was to be purchased, and the maker's product which showed the best results commensurate with the cost, was selected for the new length. This system may be profitably applied to many of the supplies required in mining or mill practice, and should amply repay the small exertion necessary to keep the record up to date.

Russian statistics contain some interesting details concerning the platinum of the Ural region. It was not until about 1825 that platinum received the attention that it merited. On its discovery over a century ago it was regarded as of less value than silver. The Russian Government tried to use the metal for coins, and between 1825 and 1848 coins of three, six and twelve roubles were struck off in platinum in St. Petersburg, but the experiment was not repeated. In 1843 the output of Russian platinum amounted to 3,000 kg.; in 1848 the output fell to only 50 kg., and since that year the output has risen gradually. Since 1825 the price of platinum has varied from \$85 to nearly \$600 per kilogram.

The Sudan Goldfields, Ltd., is to use producer-gas for supplying power. Fuel is costly in that region.

### Colliery Notes.

In coke manufacture, what phosphorus may be contained in the coal is not passed off; it remains in the coke, after the process of coking is completed. On this account the use of coals high in phosphorus is productive of coke that is unsuitable for the manufacture of steel.

In New Zealand gas works producing 2,000,000 to 3,000,000 cu. ft. annually average 10,500 cu. ft. per ton of coal carbonized, without an exhauster. The excellent bituminous coal found here contributes largely to the good results obtained. Nothing below 12,000 cu. ft. per ton is considered a satisfactory yield in any well-equipped works.

The Bocas del Toro concession in Panama, owned by a French company, is said to contain a workable coal deposit. Three seams, one of 70 cm., another of 150 to 200 cm. and a third of 65 cm., have been found; the coal has given good results in industrial tests. The United Fruit Co., operating 50 steamers and a 100-km. railroad, is expected to offer a good market for the output.

Formerly Welsh fuel had a practical monopoly of the trade in Algiers, but since the imposition of the export tax in the United Kingdom German coals have been largely imported. German coal is being supplied by contract to the Paris-Lyons-Mediterranean railway, the last contract let calling for 20,000 tons, of sizes corresponding to the American classification of nut and lump.

No gas will explode until it reaches the temperature of ignition; the wire gauze used in safety lamps acts as a condenser and cools the gas to a point below this temperature. This restricts the size of safety lamps to a point where the small quantity of gas held inside the gauze would not produce an explosion of sufficient force, or a current of high enough velocity to overcome the cooling effect of the gauze.

The belt conveyor, as used in colliery operations, is apt to be run at the two extremes of speed. When used as a picking belt it travels, say, 20-30 ft. per min.; but if used solely for conveying, the speed can be run up to 600 ft. per min. The high speed at which belt conveyors can be operated is the characteristic that gives them their great capacity and which has been primarily responsible for their rapid development in the last decade; 10 years ago they were practically unknown.

In a Welsh colliery (that of the Cambrian Colliery Co.), has been installed a main and tail haulage gear of 220 h.p. The motor is of the slow-speed direct-gear type, working direct at 2,000 volts. Twenty-three cars, each of a total weight of 4,700 lb., are hauled at a time, and about 520 a day, giving a total output of over 1,000 tons. Two other haulage gears, one

endless, the other main and tail, each of 150 h.p., have also been placed in the same seam, and are driven by similar motors.

Tests of coals and lignites are being made by the U. S. Geological Survey, which are expected to give sufficient data to enable this material to be used to better advantage. Gas-producer tests, consuming about 10,000 lb., will be conducted for periods of 30 hours each. Tests already made have shown a development of 150% more power, when the coal is used in this form, than when used under a boiler in the ordinary manner. The Texas and North Dakota lignites show up well in these tests.

It may be taken as a general rule (there are a few exceptional cases) that coal seams individually become more tender as the depth below the surface increases. This is borne out by experience in British collieries, where seams become more powdery as they are worked at greater depths; the two deep seams at the Florence colliery, Staffordshire, furnish an example of this tendency. In some seams the coal appears to be crushed by initial strains in itself; in these cases the proportion of small coal runs as high as 20% of the total production of the seam.

When blasting is done at the face of a dusty mine, especially if the coal be soft and friable, the working face should be thoroughly wetted for a distance within a radius of 60 ft. around each shot before the same is fired. The purpose of sprinkling the face before firing is to prevent the dust being raised by the force of the blast. Strict regulations should be adopted and enforced in regard to the firing of shots so as to conform with the mine law in this regard, and to reduce the danger arising from the firing of unsafe shots, or from the firing of shots in the presence of any accumulation of gas or dust.

Where sights are not used in driving entries and rooms much trouble often results by the places holing into each other, and pillars become thick or thin in places, often causing heavy roof falls and the loss of coal when drawing back the pillars. There is also danger of inducing a squeeze or creep where such conditions prevail. When entries and rooms are driven on sights, these sources of trouble are avoided and much labor is saved in the surveying and platting of the mine workings. The dangers to life and property are much more where sights are not used, owing to the increase in the size and number of roof falls that occur, and the uncertainty in regard to the exact location of the working face of a chamber or heading with respect to other workings. The danger is increased when mining in the vicinity of abandoned workings that may contain gas or water.

### 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.

#### The "Sluice-head."

Sir—Concerning the recent question in this JOURNAL (Sept. 9, 1905, p. 456) regarding the meaning of a sluice-head, so far as I know the term has no technical definition, and the answer given as being "60 miners' inches," as applied in Yukon territory, may be correct as to quantity. But the term, "miners' inch," is little understood by practical placer miners in the Yukon.

What is generally understood to be a "sluice-head" is a sluice box, 12 ft. long (12 by 12 in. in the clear), with one end fitted in a gateway, which has  $\frac{3}{8}$ -in. grade to the box (or enough pressure above the gate to fill it); this is considered a "sluice-head" in the Yukon basin. The unit, if it can be called one, is practical and useful in shallow placer digging, where work is carried on by pick and shovel. When led into properly graded sluice boxes it will wash all the gravel that eight able-bodied men can shovel into one "string" of sluice boxes. More than eight men cannot be placed to advantage on one string of boxes; therefore more water is not needed, and any less than the above amount (whatever that may be) is not enough to agitate the riffing and carry off the tailing.

The term "sluice-head" is known among placer miners the world over; it varies in size of boxes and quantity of water in different placer deposits. Relatively, a sluice-head is to the placer miner what a mill is to the lode miner—one likes one kind, another prefers another; but unless each has the right kind of mill, he is liable to "go broke." It is the same in placer mining, if the right proportion of water or sluice-head is not applied to treat a given quantity of gravel.

FRED. GEFFROI.

Alamos, Sonora, Mex., Oct. 15, 1905.

#### Cyaniding Costs at the Palmarejo.

Sir—In your issue of Sept. 23, 1905, C. S. Richardson, writing from Paris, France, criticises your abstract, published Aug. 19, of Mr. Oxnam's paper, "Cyaniding silver-gold ores of the Palmarejo mine, Chihuahua, Mexico" (presented at the Washington meeting of the American Institute of Mining Engineers, in May, 1905, and printed in the *Bi-Monthly Bulletin* of the American Institute of Mining Engineers, No. 4, July, 1905), calling special attention to what he considers a mistake in printing or in writing the original

article, "or else there is an expense in milling that seems incredible."

The explanation of this "seemingly incredible expense" lies in the fact that all costs given by Mr. Oxnam were reported in Mexican currency and not in gold, as Mr. Richardson apparently assumes. During the time of the tests described by Mr. Oxnam, the average value of \$1 Mexican, as appears on p. 54 of the full paper (p. 858 of the *Bulletin*) was 47.5c. gold, or \$1 United States was equivalent to \$1.95 Mexican.

R. W. RAYMOND,  
Secretary A. I. M. E.

New York, Nov. 15, 1905.

### The American Mining Congress.

The opening session of the American Mining Congress was held in El Paso, Texas, November 14. The eighth annual meeting of the congress opened under favorable auspices, but with comparatively small attendance, most of the trains being late. Mayor Charles Davis and J. M. Dean welcomed the delegates. President Richards responded. The feature of the day was the annual address of President J. H. Richards. Committees were named, but little else was done.

President Richards, in his address, made a plea to put the association on a business basis, and said the time had arrived when the organization must cease existing on charity. He said he believed a department of mines and mining in the President's cabinet would be a great help to miners, and they were as much entitled to paternal consideration from the Government as the farmers, now looked after by the Agricultural Department, or the shipping interests, looked after by the Department of Commerce and Labor. He declared ridiculous the argument that the President's cabinet is already too unwieldy, and said the President could never get too many good advisers.

President Richards made a plea for honesty in high places, and said miners should stand together and make an honest fight for their rights and against the crooks and rascals in the mining business. He favored giving Alaska representation in Congress, declaring: "Alaska will yet be one of the most stable influences in our industrial development, in the hour of national strain, in sustaining the head of our Government, because of enormous quantities of precious and commercial metals which that country is capable of producing."

President Richards paid tribute to the work of the Geological Survey, but said it was not large enough, and a mining survey, with plenty of men, should be devoted to the work of the miners. He hoped to see the congress soon established in its permanent home in Denver, and urged that the home be fitted with a mining library, ore cabinets, maps, and all conveniences for the miner.

On the second day the chief incident

was the drilling contest. The sessions were held and papers read, according to the programme published in the *JOURNAL* for Nov. 18.

On Nov. 16, the committees reported, and presented a number of resolutions. Those adopted included the following: Urging the Government to preserve the desert water supply; asking the enactment of legislation enabling miners to locate and work mines on Spanish and Mexican land grants in Arizona and New Mexico, title to which has been approved by the United States Court of Claims; favoring the formation of State mining associations in every mining State in the Union to affiliate with the American Mining Congress; urging Government appropriations for the aid of State mining schools; recommending that Congress enact a law for the formation of mining drainage districts.

Secretary Calbreath's report showed that \$4,862 was received by the association during the year and that there was a balance on hand, after expenses were paid, of \$821. A considerable time was taken up in discussing whether the delegates or only actual members of the Congress who have paid their membership fee should vote on amendments to the by-laws.

The proposition to increase the membership fee from \$5 to \$10 was defeated. All the delegates were finally permitted to vote.

We give herewith abstracts of some of the more important papers read at the meeting:

#### MINING AND SMELTING RELATIONS BETWEEN MEXICO AND THE UNITED STATES.

BY JAMES W. MALCOLMSON.

Twenty years ago, practically all the gold and silver ores of Mexico were treated on the spot where they were mined, by various local methods, amalgamation and leaching being common. However, since 1885, a change has taken place. Most of the ore now mined is transported over the railroads to central smelting plants; the precious metals contained are reduced to bullion, with the aid of lead or copper. An enormous and prosperous smelting industry has thus developed, to the mutual advantage of the mine operators and the railroads.

This introduction of customs smelting into Mexico has radically altered the whole character of mining in that country, especially in those districts contiguous to the railroads. Formerly, after discovering an orebody, the miner was compelled to go to considerable expense in erecting a local mill; even then he was often unable to extract more than a small part of the gold and silver contained in his ores.

Today, the miner operating near the railroad, finds himself able to turn his ore into cash immediately, by shipping it to any of these smelters. He usually receives an amount which yields him as

great a profit as he could obtain from local processes or even greater; and this too, without any investment beyond the actual cost of mining the ore. The miner of refractory ores also finds himself almost as well off as the producer of free-milling ores who owns his own reduction plant; and it is only in those districts far removed from the railroads that the former cumbersome methods of local treatment are still employed.

In order to form some idea of the importance of this change, it has been estimated that, before 1885, 90% of all the silver and gold ore mined in Mexico was treated locally where it was produced; but today, over 75% of all the ore mined is shipped over railroads to the various smelters of the country.

Until 1890, lead ores were generally employed for this purpose. Mexican gold and silver ores were shipped to Denver, Pueblo, Omaha, Kansas City and San Francisco, where lead smelters were in operation. Extensive smelting works in the city of El Paso were also erected at that period, to handle ores from Mexico which were actually crowding the ore markets of the United States.

After the discovery and development of the lead mines of Sierra Madre and Nuevo Leon in northern Mexico, the lead-ore miners of Colorado, in 1892, fearing that the introduction of Mexican lead ores into the United States would destroy their control of the lead-ore market, succeeded in having a prohibitive duty imposed on this metal. The control of fluxing ores by the lead miners of Colorado at that time, enabled them to dictate such terms to the smelters that smelting charges on lead ore were not only abolished entirely, but for a time the smelters were compelled to pay more for the lead contents of the ore than its market value to them. The results of this duty were, first, that the gold and silver miners of the United States were still left at the mercy of the lead-ore miners, whose demands made it necessary for the smelters to obtain their margins from the miners of silicious ores, who were thus compelled to submit to higher treatment charges; and second, that several million dollars of United States capital was invested in Mexico for the erection of customs smelters at Monterey, San Luis Potosi, Aguascalientes, and other points.

However, during the past few years, on account of the enormous increase in gold and silver production in Mexico, it has become evident that the capacity of these lead smelters is insufficient; and that enough lead cannot be obtained to take care of the increasing production of gold and silver ores. One large smelter in the central part of the Republic has already substituted its lead base by copper, although more than one-half of the copper employed is shipped south from the United States through El Paso. On ac-

count of the unsatisfactory condition of the lead resources of Mexico, it is inevitable that others of the principal smelting plants will soon be partly altered from a lead to a copper basis. The greater part of the gold and silver produced in Mexico is found in silicious ores; the problem of the metallurgist is to get rid of this silica as slag, in the cheapest possible way, leaving the precious metals with the lead or copper used as a collector.

In a lead furnace, the charge cannot carry more than one-third of its weight as silica; and, owing to the relatively low temperature at which lead smelting is carried on, the speed of operations is not great. In a copper furnace, owing to the higher temperatures employed, the charge may carry as much as one-half of its weight in silica, and twice the amount of charge can be smelted as compared with a lead furnace of similar dimensions. In other words, a copper furnace will smelt three times as much silicious silver ore as a lead furnace of the same size, and in the same time.

Copper, as a collector, offers other points of superiority over lead. It can be enriched to a much greater extent with gold and silver. A copper furnace smelting gold and silver ores is often operated successfully with less than 1% of copper in the charge, the volume of matte produced being made up by the use of iron sulphide ores; while a lead furnace cannot be successfully operated with less than 7% lead.

There is, therefore, little reason to doubt that the bulk of the silver and gold ores smelted in Mexico will be reduced in copper rather than in lead furnaces in the future; and the question arises, Where will this copper come from?

The silver and gold output of Mexico is large and is increasing rapidly. The silver production of 1904 was 71,880,000 oz., or 18,000,000 oz. greater than that of the United States, Mexico being the greatest silver-producing country in the world. The value of the gold produced during 1904 was \$11,550,000, United States currency. The greater part of this gold and silver is found in the central plateau of the Republic and along the lines of the main railroads, the principal districts being Pachuca, Guanajuato, El Oro, Zacatecas, Mapimi, Parral, Santa Eulalia, Cuatrecasas and Matehuala.

The production of copper in Mexico has increased from 900 tons in 1891 to 57,500 tons in 1904, largely owing to the opening of the great mines of Cananea. The bulk of this metal is mined from northern Sonora and Lower California, a considerable distance west of the gold and silver-mining districts before mentioned. The adjacent territory of Arizona also supplies a large and steadily increasing output of copper, the output during 1904 being approximately 70,000 tons. At the same time, it is interesting to notice

that the copper ores of Sonora and Arizona usually carry low values in gold and silver. At present they are smelted locally, the copper produced being shipped to New Jersey and other points on the Atlantic coast for refining.

Therefore, there exists today a temporary and abnormal condition of affairs, which, when remedied, will have a profound influence on the development of mining and metallurgical enterprise, both in the United States and in Mexico.

On the one hand, we have in Mexico a steadily increasing output of silicious ores, rich in gold and silver, with a stationary or decreasing production of lead ores suitable for smelting. The result is that gold- and silver-mining operations throughout central Mexico are handicapped by excessive treatment rates, owing to the lack of smelting facilities; and many gold and silver mines are now shut down which were formerly operated with profit. On the other hand, there is, in Arizona and northern Sonora, a large and steadily increasing production of copper, which is eminently adapted to the requirements of customs smelting, but which is not yet utilized for this purpose.

After the attention of the great copper producers of Sonora and Arizona shall be once directed to the possibilities in smelting the gold and silver ores of Mexico, together with the copper ores of the West, there is no reason to doubt that much greater profit will be made than is now the case. Copper will then be shipped to the refineries rich in gold and silver contents, instead of being without precious metal values of importance as at present, and profits will be made by the combination which will benefit the miners and the railroads quite as much as the smelters themselves.

When this copper-smelting industry, now in its infancy, shall be developed along these lines, there can be little doubt that El Paso, lying, as it does, on the lines of communication between the copper mines of Arizona and Sonora and the gold and silver mines of Mexico, will become a copper-smelting center of importance and a promoter of prosperity to the many gold and silver mines of northern Mexico.

#### THE RELATION OF THE FEDERAL GOVERNMENT TO THE MINING INDUSTRY.

BY C. W. HAYES.

There is at present a tendency to increase the points of contact between the Government and the industrial life of the country, and an increasing demand for governmental supervision and regulation.

The earliest work carried on by the Federal Government which had a bearing on the mineral industry was the geologic investigation of the then unexplored great West. This began with the assignment of a geologist (who was usually

also a surgeon and all-around naturalist) to the various military expeditions sent into the trans-Mississippi country, between 1840 and 1860. Following the Civil War the expeditions sent out to explore routes for a transcontinental railway collected much geologic and topographical data. In the '70s four organizations were actively engaged in making geologic investigation in the West, popularly known from the names of their leaders as the King, Hayden, Powell and Wheeler surveys.

In 1879 these four distinct organizations were merged into the present geological survey under the directorship of Clarence King. Since 1893, when Mr. Walcott was appointed to the directorship, there has been a constantly increasing proportion of the survey's energy devoted to economic work. But there is a demand for even more economic work, and the demand is a reasonable one. It comes chiefly from those industries in which the work of the survey is best known, and is therefore the highest possible compliment to the character of that which has already been done.

The forms of governmental activity which bear more or less directly upon the mineral industry may be classified as follows. I shall confine my attention entirely to the work under the Interior Department, and omit more than a passing reference to the forestry service, the Mint and the reclamation service, although each of these organizations has vital connection with the mining industry.

*Public Land Titles.*—To the land office the miner must look for title to his claim and for a classification of the public domain as mineral or non-mineral. An intelligent comprehension of the miners' needs and of the varying conditions under which mineral deposits occur is essential to such efficiency.

*Topographical Maps.*—To the prospector the most valuable help, next to his pick and pan, is a good map of the region he is exploring, and it is almost absolutely essential to the economical development of mines, particularly in connection with water supply, drainage and transportation problems.

*Statistics of Production.*—The collection and publication of reliable statistics is essential to all industries, and in none is it more important than in the mining industry. This has been recognized as a function of the Federal Government. The appreciation is growing, as is indicated by the increasing willingness of producers to co-operate.

*Economic Geology.*—The primary purpose for which the Geological Survey was organized was the preparation of a geologic map of the United States. It seems to me that the investigation of the mineral resources of the country might be more distinctly recognized and more adequately supported. With adequate funds.

at least four classes of economic geologic work should be carried on by the Geological Survey, in addition to that which is incidental to the preparation of the geologic map of the United States:

First, there is the full and complete study of a developed mining district. Such a monographic report is undoubtedly the most important permanent contribution which the Survey makes to economic geology; but it may be of comparatively little immediate benefit to the mining industry in the region discussed, for a district must have reached its culmination before conditions are favorable for these final studies. Moreover, such studies can only be carried on effectively by the Government, for they require the expenditure of much time and money, and their benefits are to the industry as a whole, rather than to the individual.

Second, to satisfy the urgent and legitimate demand for early information regarding the geologic relations of ore deposits, every important district, as soon as it is fairly proved, should be studied with a view to giving prompt aid in its economic development.

Third, every important mineral-producing district should be visited at least once a year and a report made on current conditions. Such reports might be devoted largely to the technical and commercial aspects, though they should by no means exclude references to new geological discoveries and the correction of previous misconceptions.

The Government cannot examine into the standing of every mining company and vouch for the value of the stock which it puts on the market; but it is due the investing public that it should at least have a reliable statement of the actual conditions existing in a mining district as a check upon the possibly biased statements of the promoter. I am fully aware of the perilous nature of such work. In proportion as it touches commercial interests, it would be severely criticized whenever unwelcome truths were frankly stated. To make this class of work effective, the representative of the Government should be given authority to examine all underground mine workings. The refusal of access to one or more important mines in a district may greatly reduce the value of a geologist's conclusions on purely scientific questions. While the number of mines to which access is refused grows smaller, there still remains enough to render the geologist's work often difficult and occasionally impossible. He should be able to enter and examine every mine in any district, not by favor of the manager, but by right as a representative of the Federal Government.

Fourth, the preparation of reports summarizing existing information regarding particular mineral deposits. The value of such summaries has been abundantly proven by the few already prepared in

the non-metalliferous field. They are particularly useful in the case of those minerals which are widely distributed and whose production is relatively small.

*Miner's Needs.*—This Congress may safely be regarded as voicing the needs of the mining fraternity, and I therefore look to its official utterances for an expression of these needs. Among others less important, the following five may be enumerated: (1) Free assays and analyses of ores and minerals; (2) free advice in the development of mineral properties; (3) free investigation of technical processes in mining and metallurgy; (4) recording of individual mining properties; and (5) enforcement of regulations for the safety of operation.

It has been said that knowledge is the one gift which does not pauperize the recipient; it may be added that the distribution of knowledge is one governmental activity which carries the least danger of political mischief and the largest probability of general benefit. The duty of the State, in education of the citizen, does not stop with the establishment and support of schools; it goes further and reaches into the complex activities of modern society. Where the functions of the government should stop and those of the individual should begin, where wholesome governmental activity merges into paternalism, this is a matter not easy to determine. But the history of economic development in this country certainly proves that, in case of doubt, it is safe to trust to individual initiative. The legitimate field for governmental activity, in which there is no possible question of propriety or utility, is amply wide; but there is a strong and ever-present temptation to leave it and turn to the more attractive field in which the benefit is to the individual rather than to the community at large.

#### A MINING EXPOSITION.

BY WM. M. PORTER.

When we consider the indifference of wealthy men toward mining, we realize that little has been accomplished in making it an intelligent and safe business field. Nearly every State west of the Mississippi river, for the last thirty years, has contributed annually to the great wealth amassed from metallurgy and mining. When a new field is discovered, the rush that follows is made usually by the miner and the laboring man of the West—not the Eastern representative of capital.

The knowledge that the best business man of the East has on mining is limited. The people are venturesome—they seek opportunity with a degree of risk, but a large chance of gain. The conditions are ideal for accomplishing good results if once they learn the situation, but they can only be interested by a course of education by demonstration. They should have

tangible evidence of that which can be done with a little capital in the West by the same effort that will bring a living in the East. We must devise a plan to forcibly impress on them the fact that in the West the number of good properties is far in excess of the investors. We must turn to the East, the great Mecca of capital.

It is a plain business proposition; the mine owners of the West want to get in closer touch with the East—the source of capital.

The most satisfactory manner in which to gain a man's confidence is to give him an insight, so that he can judge for himself. This can all be accomplished by holding an exposition of every known mineral, oil, salt, chemical, etc., and of every mine appliance. There has never been a purely mining exposition held in this country.

I would suggest the co-operation of the Government to furnish an exhibit; to have each State and Territory make an exhibit; to invite all the nations of the earth to join in showing mining machinery and minerals from all over the world.

One of the main features of this exposition should be the exhibiting of products of properties. Mine owners should exhibit samples of ore and have an engineer present to explain the values and give desired information. Every property so exhibited should submit to an examination made by an engineer of ability and integrity.

All machinery pertaining to mining should be shown in operation.

I would recommend a board of control and a finance committee to be selected from the members of this Congress.

A resolution should be passed appointing officers and committees. Let the press be advised of our decision to hold this exposition in either Boston, New York, Philadelphia or Chicago, in February, 1907. Let foreign countries be asked to join. The holding of this exposition is necessary to stimulate the mining business. Our welfare demands it. We will find that public sentiment will endorse it. It can be consummated in a creditable manner by the American Mining Congress.

#### RELATIONS OF STATE MINING SCHOOLS TO STATE MINING BUREAUS.

BY VICTOR C. ALDERSON.\*

In the course of his remarks he made the following valuable suggestion, a suggestion by no means new, but worthy of emphasis:

In order to do its part the school must go beyond mere instruction and must enter the field of research. There is not at this time, to my knowledge, anywhere in this country a mining school which has a department of research in good working order. That such a department in a

\*President Colorado School of Mines, Golden, Colo.



school of mines would be valuable to the mining industry far beyond its cost is a matter beyond dispute. As agriculture has its experimental stations, so should the mining and metallurgical interests have their experimental stations. These should be located at the State Mining School and should work in conjunction with the Bureau of Mines.

**New Publications.**

*The Production of Magnesite in 1904.* U. S. Geological Survey, extract from "Mineral Resources of the United States." By Charles G. Yale. Pages 6; 6 by 9 in.; paper. Washington, D. C., 1905: Government Printing Office.

The domestic output of magnesite is confined to California, which in 1904 produced 2,850 short tons, valued at \$9,298, about the average output for the past few years. It is consumed entirely on the Pacific coast, not being able to stand freight charges to the East to compete with material imported from Greece and Austria. The production is consumed in the preparation of carbonated waters and in the wood-pulp industry. A new plant has just been built on the Coast for the manufacture of refractory brick.

**Abstracts of Official Reports.**

*Colorado Fuel & Iron Company.*

The present report compares the two fiscal years ended June 30, 1904 and 1905. The company's employees at the mines and the coke-ovens were out on strike from Nov. 9, 1903, until Oct. 1, 1904, or 7 2/3 months of the first and 3 months of the latter fiscal year. For this reason the increase in production during the latter year was marked, the iron department never before having been so productive. During the strike the iron and steel plant at Minnequa was cut off from fuel supply in order that the domestic consumers, railroads and other public utilities should not feel any shortage and so lend their sympathy to the strikers.

The company's products, in short tons, during the year ending June 30, 1905, were:

	Output.	Used by Company.
Coal.....	4,504,753	2,283,277
Coke.....	948,554	398,479
Iron ore.....	483,571	484,814
Limestone.....	213,007	210,989
Iron and steel.....	1,444,177	1,151,124

Stocks of coal and coke were augmented during the year; that of ore was reduced one-half, and of finished ore and steel by one-quarter. As compared with the preceding fiscal year, an increase of output was recorded in every product; coal by 1,113,205 tons, coke by 439,953 tons, iron ore by 290,701 tons, limestone by 104,245 tons, and iron and steel by 699,844 tons. Of the coal output, 2,211,212 tons were sold to outsiders, 129,453 tons

were used at the mines, 1,696,799 tons were made into coke, and 457,024 tons were used at the Minnequa plant. This shows an average of 1.79 tons of coal used in making a ton of coke.

Net earnings of the departments may be separated thus:

	1903-04.	1904-05.
Iron department:		
Gross earnings.....	\$5,005,911	\$9,171,203
Operating expenses.....	5,322,211	8,395,372
Net earnings.....	*\$316,300	\$775,831
Fuel department:		
Gross earnings.....	\$6,424,858	\$9,073,657
Operating expenses.....	5,691,818	8,144,006
Net earnings.....	\$733,040	\$929,651
Denver retail department:		
Gross earnings.....	\$413,899	\$363,296
Operating expenses.....	390,931	344,820
Net earnings.....	\$22,968	\$18,476
Miscellaneous net earnings.....	6,662	6,862
Total net earnings.....	\$446,370	\$1,730,820
General management.....	279,052	256,626
Income.....	\$167,318	\$1,474,194
*Loss.		

If to the income for the latter year are added receipts from securities and exchange, the total net earnings from all sources are \$1,922,047. From this must be deducted bond interest, \$1,062,095; taxes, \$163,228; provision for sinking funds and losses on railroad traffic agreement, \$1,016,069; prospecting, \$22,648; total deductions, \$2,264,040, showing a deficit of \$341,993 on the year's operations.

The company's capital liabilities include \$30,132,000 of common and \$2,000,000 of preferred stock; its total funded debt is being gradually retired, and is now \$19,979,000.

Development of the company's iron mines is continuous; for the present, part of the supply is obtained from the Lake Superior region.

**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 Nov. 14, 1905.

- 804,201. ROCK-CRUSHER.—Henry H. Blake, Pittsburg, Pa., assignor to Sterritt-Thomas Foundry Company, Pittsburg, Pa., a corporation of Pennsylvania.
- 804,221. BOTTOM-DUMPING AND HANDLING BUCKET.—Peter C. Hains, Jr., Washington, D. C.
- 804,227. MECHANICAL ROASTING OR DESULPHURIZING FURNACE.—Henry Howard, Brookline, Mass., assignor to Merrimac Chemical Company, North Woburn, Mass., a corporation of Massachusetts.
- 804,235. EXCAVATING, HOISTING AND CONVEYING BUCKET.—Robert W. Kaitenbach and Justin Griess, Jr., Cleveland, Ohio.
- 804,239. APPARATUS FOR CARBONIZING PEAT.—Theodor E. Ledermüller, Lemberg, Austria-Hungary.
- 804,245. STONE-SAW.—Charles L. Miel, Sacramento, Cal., assignor to the United States Stone Saw Company, Tucson, Ariz., a corporation of Arizona.

- 804,266. INCLINED ELEVATOR.—Jesse W. Reno, New York, N. Y.
- 804,268. CLAM-SHELL BUCKET. William B. Roberts, Ashtabula, Ohio.
- 804,304. FLEXIBLE PIPE-JOINT.—Jacob Coppersmith, Collinwood, Ohio, assignor of one-half to Martin Steiner, Erie, Pa.
- 804,330. COMBINED SMELTING AND REFINING FURNACE.—Chauncey C. Medbery, New York, N. Y.
- 804,379. ROASTING-FURNACE.—Arthur W. Chase, Avoca, Iowa, assignor to the Chase Furnace Company, Philadelphia, Pa., a corporation of Delaware.
- 804,398. SAWING STONE.—John A. Hall, Sacramento, Cal., assignor to V. S. McClatchy, trustee, Sacramento, Cal.
- 804,402. MACHINE FOR MANUFACTURING BRIQUETTES.—Gottfried Hoepfner, Bleckendorf, Germany, assignor to Willy Von Lewinski, Breslau, Prussia, Germany.
- 804,408. GOLD-SEPARATOR.—Frederick M. Johnson, San Francisco, Cal., assignor to Rose Gold Reclamation Company, San Francisco, Cal., a corporation of Arizona.
- 804,441. APPARATUS FOR THE MANUFACTURE OF GENERATOR-GAS.—Peter Stiens, Rotterdam, Netherlands.
- 804,466. CONCENTRATING AND AMALGAMATING TABLE.—John A. Hamilton, St. Peters, South Australia, Australia.
- 804,488. COAL-WASHING APPARATUS.—Robert L. Martin, Jr., Pittsburg, Pa., assignor to the Pittsburg Coal Washer Company, Pittsburg, Pa., a corporation of Pennsylvania.
- 804,515. PROCESS OF MAKING AND SEPARATING HYDROCHLORIC AND SULPHURIC ACIDS.—Paul Askenasy and Martin Mugdan, Nuremberg, Germany.
- 804,555. PROCESS OF MAKING RED PHOSPHORUS.—Rudolf Schenck, Marburg, and Paul Marquart, Cassel, Germany, assignors to the firm of Chemische Fabrik Bettenhausen Marquart & Schulz, Bettenhausen-Cassel, Germany.
- 804,562. MINING-MACHINE.—Jacob Stein, Mendelssohn, Pa., assignor of one-fourth to Morris Haas, thirty-five one-hundredths to Franklin A. Baxendell, and five one-hundredths to Luther K. Yoder, Pittsburg, Pa.
- 804,607. SAND-DRIER.—William King, Cedar Rapids, Iowa.
- 804,659. MINER'S LAMP.—David E. Herron, New Philadelphia, Ohio.
- 804,670. COKE-PULLER.—Harry F. Pearson, Redstone, Colo.
- 804,686. CHUCK OF ROCK-DRILLING MACHINES.—John H. Thomas, Johannesburg, Transvaal.
- 804,689. AUTOMATIC BLAST-REGULATING APPARATUS.—Samuel W. Vaughan, Lorain, Ohio, and John W. Cabot, Boston, Mass.
- 804,690. PREPARING IRON PYRITES FOR DESULPHURIZATION.—Uteley Wedge, Ardmore, Pa.
- 804,691. IRON-PYRITES CHARGE FOR DESULPHURIZING - FURNACES AND METHOD OF PREPARING SAME.—Uteley Wedge, Ardmore, Pa.
- 804,692. PREPARING IRON OXIDE FOR USE IN BLAST-FURNACES.—Uteley Wedge, Ardmore, Pa.
- 804,693. PREPARING IRON OXIDE FOR USE IN BLAST-FURNACES.—Uteley Wedge, Ardmore, Pa.
- 804,737. PROCESS OF GENERATING GAS.—Edward Krenz, St. Louis, Mo.
- 804,751. ROASTING-FURNACE.—August R. Meyer, Kansas City, Mo., assignor to the United Zinc & Chemical Company, Kansas City, Mo., a corporation of New Jersey.
- 804,775. GLASS-FURNACE.—Harry G. Slingluff, Hartford City, Ind.
- 804,780. ORE CRUSHER AND PULVERIZER.—Alexis Tetreult, Boulder, Colo., assignor of one-half to Edwin C. Pohle, Boulder, Colo.
- 804,785. TREATING IRON PYRITES FOR DESULPHURIZATION.—Uteley Wedge, Ardmore, Pa.
- 804,801. ARCH-PROTECTOR FOR FURNACE-DOORS.—George A. Fisher, Providence, R. I., assignor of one-third to Paul Shocker, Providence, R. I.
- 804,810. ELEVATING CONVEYOR FOR CRUSHING-MACHINES.—Thomas J. Gray, Chicago, Ill., assignor to National Drill & Manufacturing Company, Chicago, Ill.
- 804,812. STONE-SAWING MACHINE.—John A. Hall and Bartlett B. Chandler, Sacramento, Cal., assignors to V. S. McClatchy, trustee, Sacramento, Cal.
- 804,814. GAS-PRODUCER.—Edward Krenz, St. Louis, Mo.

### Personal.

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

Mr. Richard A. Parker returned to Denver last week from a trip to Boston.

Mr. George Schroeder, of London, is in Guanajuato, Mex., on professional business.

Mr. F. G. Farish has just completed a professional trip to Montana and returned to Denver.

Mr. Jesse Scobey returned to Denver last week from a stay in Mexico, covering more than a year.

Mr. W. W. Trowbridge, of the Boston Oaxaca Mining Co., Oaxaca, Mexico, is in Boston on business.

Mr. W. E. Defty, of Phoenix, Ariz., is making examinations in the States of Durango and Chihuahua during November.

Mr. Dennis Sullivan, of Denver, Colo., is on a trip of inspection to his large holdings in Santa Eulalia, Chihuahua, Mexico.

Mr. Otto Sussman, of Salt Lake City, passed through Denver a few days ago on his return from a professional trip to Arizona.

Mr. Clarence T. Dantziger, a recent graduate of Columbia School of Mines, leaves New York for practical work in Montana.

Mr. George A. Packard, of Boston, is examining mines in California and Nevada, with headquarters at Poleta, California.

Mr. Thomas I. Curran, of Albuquerque, N. M., president of the Mogollen Gold & Copper Co., is in New York on professional business.

Mr. Edgar A. Ashcroft, of England, is visiting the United States in connection with a new metallurgical enterprise of large dimensions.

Mr. Jno. G. Winkelbiller, mining operator at Joplin, Mo., has returned from New York to his mine, the Carnegie Galena, near Joplin.

Mr. H. V. Wright, manager Alsatian mine, near Joplin, Mo., has been on a trip to New York in the interests of the concentrating mill.

Mr. Percy N. Furber, president of the Oil Fields of Mexico, Ltd., at Furbero, Vera Cruz, Mexico, has returned to Mexico; after a trip to Europe.

Mr. Geo. G. Blackwell, chairman of Geo. G. Blackwell Sons & Co., Ltd., Liverpool, England, is now in the United States, visiting the steel centers.

Mr. W. D. Munroe, formerly of Spokane, Wash., has returned from Spitz-

bergen, where he has been developing coalfields. He is now in Boston.

Mr. F. M. Murphy, president of the Santa Fe, Prescott & Phoenix Railroad, and largely interested in mining in Arizona, left Prescott for New York, November 15.

Mr. Ernest du B. Lukis, formerly with the Teziutlan Copper Co., Pueblo, Mexico, has been appointed general manager of the Cerro de Pasco Tunnel & Mining Co., Lima, Peru.

Mr. Floyd W. Parsons has resigned his position as assistant professor of mining at the Michigan College of Mines, to become chief engineer for the Victor Fuel Co., at Denver.

Mr. Jas. C. H. Ferguson, the Pacific coast representative of the Midvale Steel Co., of Philadelphia, has gone to El Paso to attend the session of the American Mining Congress.

Senator W. A. Clark, of Montana, principal owner in the United Verde Copper mine and smelter, at Jerome, Ariz., was expected at that place, Nov. 13, to inspect the mine and smelter.

Mr. Charles W. Abbott, formerly with the Guggenheim Exploration Company, and recently engineer at Mercur, Utah, is now engineer for the Greenback Gold Mining Co., at Greenback, Oregon.

Mr. John Cassan Wait, the well-known engineer, is to deliver an address at the Founders' Day exercises of the Thomas S. Clarkson Memorial School of Technology at Potsdam, N. Y., Nov. 30, 1905.

Mr. L. H. Jansen, president and general manager of the Sonora Chief Mining Co., operating in Sonora, Mexico, has been a visitor in New York this week. He reports encouraging prospects for mining in Mexico.

Mr. Fred M. Russell has opened an assay and chemical office in Seattle, Wash. Mr. Russell was formerly with the New York Metallurgical Works and for the last seven years with Finch & Campbell, at Wallace, Idaho.

Mr. Frank M. Leonard has returned to Montana from southern Mexico, where he has been developing a copper mine during the last six months. Mr. Leonard formerly had charge of the Britannia mine, near Vancouver, B. C.

Professor Ostwald, of Leipsic, Germany, the founder of the modern school of physical chemistry, and who is giving "exchange lectures" at Harvard University, was entertained by the Brooklyn Polytechnic on Saturday, Nov. 11, 1905.

Mr. Henry Knippenberg, president of the Hecla company, who lives in Indianapolis, is visiting the property of the company at Glendale, Mont. He is accompanied by Mr. Samuel A. Barber, for 23

years superintendent of the property, who has been mining in Colorado recently.

Mr. Harry Franklin, who, for the past twelve years, managed the Golden Reward Mine, at Deadwood, S. D., has resigned the position. Henry Schnitzel, of Leadville, has been appointed by the E. H. Harriman syndicate to the management of the mine.

Prof. Rutherford, of McGill University, Montreal, delivered a lecture, illustrated by experiments, on his specialty—radium and radio-activity—before the Canadian Club, at Ottawa, Nov. 10. A statement that he intended leaving McGill, to take a position in an American university, is denied by the professor.

Mr. Charles McVicker has been appointed superintendent of the Hazel Kirk mines, Pittsburg, Pa., to take the place of John Hornickel, who was killed in an explosion of gas on Oct. 29. Mr. McVicker was formerly superintendent of the Gallatin and Sunnyside mines of the Monongahela Consolidated Co. His successor at the Sunnyside mines has not yet been named.

Mr. A. H. Wethey, general manager of the Clark properties, Butte, Montana, has been selected by the Butte & Boston company and the Montana Ore Purchasing company to examine the crosscut between the Rarus and Minnie Healy mines, which runs through the Tramway claim, and report to Judge Hunt concerning the advisability of extending this cut in order to insure the safety of the miners working in Mr. Heinze's properties and to provide them with better ventilation.

Mr. T. A. Rickard was the recipient of a great ovation tendered him by the mining fraternity of Guanajuato, Mex., on November 4. The following "after-dinner" toasts were given: "The evening's guest—T. A. Rickard"—by the toastmaster; "History and its bonanzas," W. Murdoch Wiley; "The introduction of electric power," Norman Rowe; "The search for the process," M. E. McDonald; "The resurrection of the dead," C. W. Van Law; "The optimist justified," G. W. Bryant; "The worker," Bernard McDonald.

### Obituary.

Philo P. Bush, general Western manager of the Vulcan Crucible Steel Co., died in Denver, Nov. 8, after a short illness of pneumonia.

Edward Brown, inventor and manufacturer of scientific instruments, particularly of a pyrometer which has been in general use in this country, died on October 22, at his home in Philadelphia, aged 71 years. He was born in Erith, England, in 1834, and came to this country when 23 years old, starting as a draughtsman with the Rogers Locomotive Works. Soon

afterward he began the manufacture of pyrometers, revolution indicators, and other scientific instruments. Under the name of Edward Brown & Son, the business of manufacturing pyrometers will be continued by Mr. Brown's son.

### Societies and Technical Schools.

*State University of North Dakota.*—A school of mining forms a separate college of the State University at Grand Forks, N. D., having been created and endowed by Act of Congress in 1890, at the time of admission of North Dakota as a State. Coal, building stone and clay, some of it of high grade, constitute the principal mineral wealth of the State. The college of mining engineering is well equipped with ore-dressing and metallurgical apparatus; tuition is free. It is intended to equip a testing plant to render service to the public, and a department of mineral resources is already active in public investigations.

### Trade Catalogues.

"Jessop's High Grade Tool Steel" is issued by the Jessop Steel Co., Washington, Pa.

The Scully Steel & Iron Co., Chicago, Ill., issues its stock list for November and December.

"The Effect of Preparations Applied to Belts" is issued by the Cling Surface Co., Buffalo, N. Y.

The Niles-Bement-Pond Co., 111 Broadway, New York, issues its "Progress Reporter" for November.

The National Electric Co., Milwaukee, Wis., issues its Bulletin No. 360, water-wheel type A. C. generators.

Voland & Sons, New Rochelle, N. Y., issue a new edition of Catalogue "E," of balances and weights of precision.

The Power & Mining Machinery Co., 52 William street, New York, issues two bulletins—No. 27, describing Huntington mills, and No. 28, descriptive of crushing rolls.

Jno. A. Roebling's Sons Co., Trenton, N. J., issues an illustrated booklet on suspension bridges, mine cableways, inclined planes and other products of its works.

The *American Wire Rope News* for November is issued by the American Steel & Wire Co., Chicago, Ill. The contents are of so much practical interest that we are glad to use notes from the publication in another column.

The Allis-Chalmers Co., Milwaukee, Wis., issues advertising matter as follows: Catalogue No. 127, sampling plants and equipment; Bulletin 1405, portable rock-crushing plants; Bulletin 1406, forged steel balls; Bulletin 1407, Bennett's pouring spoon.

The Westinghouse standard steam-engine is described in the new catalogue of that name issued by the Westinghouse Machine Co., East Pittsburg, Pa. The catalogue is an improvement in its form, but is hardly so full and complete as the old one of which it takes the place.

### Industrial.

The S. Rose Co. announces the retirement of Therese Rose. J. S. Rose will continue, under the same name, the firm's business as importer and dealer in diamonds and bort for industrial purposes.

The Chicago Portland Cement Co. has ordered of the Allis-Chalmers Co., of Milwaukee, two new rotary kilns, each to be 136 ft. long, for its plant near La Salle, Ill., and extensions for four of the 60-ft. kilns now in the plant, which will make these kilns 136 ft. long when they are reconstructed.

The new kilns will be 7 ft. in diameter for the first 70 ft. of their length; then a tapering section 9 ft. 11 in. long, reducing to 6 ft. diam., and finally, a cylindrical section 6 ft. diam. for the balance. Each kiln will have 4 riding rings, with steel tires and the necessary driving mechanism. The extensions for the four older kilns will each be 94 ft. long, utilizing 42 ft. of the 6-ft. sections of the present kilns. They will be 7 feet in diam. for 70 ft., the taper portion will be 9 ft. 11 in. long and they will run 14 ft. 1 in. at 6-ft. diam. until they join the older parts. Each extension will have two riding rings and tires. The order also includes six new front hoods for the kilns.

The Lindahl miners' candlestick is rapidly coming into favor, as is shown by large orders sent in to the Lindahl Manufacturing Co., of Denver, by dealers in miners' supplies. Its principal feature is a hollow steel handle, covered by a screw-cap, in which matches can be carried safe from dampness. The hook and the candle clamp are reversible, and any one of the five pieces constituting the stick is replaceable. The price of the candlestick is \$1.

The Shaw Crucible Steel Co. has been organized with a capital stock of \$100,000, to make tool steel from the magnetic oxide sands of the Pacific coast. The company has, after several years of experimental work, developed a method whereby it can produce tool steel from the magnetic iron sands, and is now erecting a mill and installing machinery at Damons Point, North Beach, Wash. It is hoped to have the plant in operation in the early spring. S. P. Wells, of Samuel Wells & Co., Cincinnati, is president; W. J. Shaw, general manager, and John A. Ringold, Room 21, Carew Building, Cincinnati, Ohio, secretary.

Within a few weeks the plant of the

Western Iron Mills Co., Denver, Colo., will be turning out light rails, shafting and other iron and steel products from scrap. The plant, which is being constructed on the Colorado & Southern tracks, is 100 by 400 ft., and will have a capacity of 150 tons per day. In addition to the scrap-iron yard adjacent to the new plant, the company has a yard on Third street and a large warehouse which occupies an entire block between Sixth and Seventh avenues, the railroad tracks and the Lorimer street viaduct. John S. Cary is president; Robert F. Cary, vice-president; and James T. Ritchie, secretary and treasurer.

### Construction News.

*South Chicago, Illinois.*—The Iroquois Iron Co., of this place, has plans under way for a new plant, to be erected on 30 acres of land adjoining its present plant.

*Apex, Colorado.*—The Elk Park Mining & Milling Co. will erect new shaft buildings and instal machinery on its property in Mine creek. C. A. McNeil, Apex, Colo., is manager.

*Rollinsville, Colorado.*—The Mineral Hill Mining Co. has leased the Southworth property in Moon gulch, and will erect a shaft-house and a small mill. W. H. Knowles, Rollinsville, is manager.

The Druid Mining Co. will put in a new hoist and air compressor. C. W. Anderson, Central City, Colo., is in charge.

*Tacoma, Washington.*—The Pacific Coast Gypsum Co. is erecting a new plaster mill. The machinery has not yet been purchased, nor the motive power determined, though it is probable that electric drive will be used.

*Bald Mountain, Colorado.*—The Goldfield Homestake Mining Co. is preparing to put up new buildings at the Gold Tort mines, and will purchase an 80-h.p. hoisting engine and boiler. J. Lyng, Bald Mountain, is superintendent.

*Georgetown, Colorado.*—The Prudential Mining Co. is preparing to put up a power plant, and will also purchase an air compressor and machine drill, the object being to extend the Montgomery Ward tunnel 1,000 ft. W. C. Hood, Georgetown, Colo., is engineer and manager.

The Annetta Mining Co., which controls the East Griffith property, is figuring on the erection of a mill at its property. W. C. Hoover, Georgetown, Colo., is manager.

*Pottsville, Pennsylvania.*—The old Thomaston colliery, in the Heckscherville valley in this district, is to be reopened. A power-house will be erected and pumps installed. The coal when mined, is expected to be treated at the West Pine Knot breaker, which is now in process of construction.

**Special Correspondence.****San Francisco.** Nov. 18.

George W. Howe was this week convicted by a jury in the United States District Court on an indictment charging him with having used the mails in furtherance of a scheme to defraud the gullible by means of several gold mines in British Columbia, to which mines Howe has no title. He had been selling stock in the so-called Yale Gold Mining Co., offering 36% interest, through the Stock Guaranty & Surety Co., of San Francisco. That company was organized to finance the mining company. The Government contended that neither the Yale Mining Co. nor the defendant owned any interest whatever in the mines mentioned in the circulars and letters, and that the dividends were paid out of the money received from the stock sold. In a pamphlet issued by the Yale Gold Mining Co. appears what purports to be a report signed by "Lucien M. Turner, C. E., M. E., F. G. S. and Sc. B.," to the effect that Turner had experted certain properties of the Yale Gold Mining Co., assayed some of the ore and found them to be valuable mining properties. Mr. Turner explained that he had been interested with Howe some years ago in the proposed purchase of mines in Napa county, and that purely as a matter of friendship he had formulated into a report, which he signed, certain data furnished him by Howe. He confessed he had never seen the mines and that his report was made up from clippings furnished by Howe.

In connection with this scheme Howe had used the names of several prominent men of San Francisco as directors, several of whom deny owning any stock or having given permission to use their names. It was by this means he was enabled to sell stock. He had sent these men certificates of stock, which they had declined to accept, yet he used their names nevertheless. The State Mineralogist is now hunting up the records of several similar companies, intending to prosecute them under the new State law providing for the punishment of men issuing untruthful prospectuses concerning mining properties.

A suit for the possession of the Royal Consolidated mines at Hodson, Calaveras county, has been commenced in the courts of that county. The complaint charges that J. C. Kemp Van Ee, the manager of mines, attempted to defraud a local company, of which Major J. D. Peters is president and A. C. Oullahan is secretary, out of valuable property. The plaintiff corporation sold Van Ee all of this property for a consideration of \$400,000. Van Ee paid \$60,000 down on the purchase price, and agreed to pay the remainder in part payments extending over a period of four years. The complaint recites that the plaintiff corporation has received nothing

more on the purchase price; that Van Ee sought to so encumber the property as to deteriorate its value. The plaintiff demands judgment against Van Ee, the company which he organized, and the various other defendants, for \$340,000, the amount still due, together with interest. The Royal is the mine which has made the lowest record for mining and milling quartz in California, and has a large and well-constructed milling plant.

The oil industry on the coast has now advanced to such a point that there is not sufficient steamer tonnage for prompt transportation of the commodity. A short time ago the Union Oil Co. purchased four of the largest oil-carrying steamers on the Eastern coast, and now the National Oil & Transportation Co. has contracted with the Newport News Shipbuilding Co. for a vessel that will be able to carry 50,000 barrels of oil. It is intended to run her between Monterey, which is the terminus of the company's pipe-line, and Portland, Ore. The Union Oil Co. expects the first of the new steamers to arrive at this port in about two months. Captain Matson, who is at the head of the National Oil & Transportation Co., has also purchased a steamer with a carrying capacity of 4,000 tons, to be used in the Hilo and San Francisco run.

In San Luis Obispo county, the Union Oil Co. has asked the supervisors to grant the company a franchise to run pipe-lines from the Santa Maria oilfields to Port Harford. The Union already has a pipe-line from its rich oil territory in Santa Barbara county to the Port Harford pier, but the right is for a limited time from the owners of the land. They now wish to obtain a franchise from the county. The pipe-line crosses the county road in a number of places. The Union did advertise for a franchise, but obtained only a permit to use the road, and is now appearing before the board to obtain a franchise in a legal manner. The board met the oil company with a counter proposition, namely, if the Union Oil Co. will give the county an option for a site to build the wharf that the county voted to build last October at some desirable point along the Avila water-front they will, in turn, grant the pipe-line franchise.

Judge Welborn, of the United States Court, has rendered a decision in the case of the Dustless Roads Co. against the city of Redlands, which concerns the entire State of California wherever oil is used on the public highways. The suit was to establish patent rights to the process of oiling roads, and had been in the courts for three years. Judge Welborn, in his oral opinion, said: "The evidence of a prior use in California of asphaltic oils is, to my mind, overwhelming, and satisfies me beyond a reasonable doubt that there was such a use; not only in one, but in many instances. . . . I am of the opinion, and so hold, the defendants are entitled

to judgment in the case, and judgment will be so ordered."

At a meeting of the boards of supervisors of the different counties of the San Joaquin valley, a resolution requesting the railroads to make lower rates for the transportation of oil for use on the county roads was passed. The resolution was also indorsed by the San Joaquin Valley Commercial Association.

The air-compressor building of the Globe Mining Co., at Dedrick, Trinity county, has been destroyed by fire. After the fire started, 600 lb. of giant powder exploded, blowing the compressor machinery into bits. The Globe mine is one of the leading quartz mines of Trinity. The present owners acquired undisputed possession of the property only a month ago, when a suit that had been pending for six years was compromised upon the payment of \$10,000.

The first shipment of ores to Reno, Nevada, from the Masonic Mountain district, in Mono county, California, brought the owners, Weite & Eastwood, an even \$20 a ton. The sale was made to the American Smelting & Refining Co., which has a sampling plant in Reno. Another shipment from Masonic will be made in a few days from the Liberty mine. Regular shipments will be made from now on.

**Bisbee.** Nov. 17.

In the past 30 days the Hoatson shaft of the Pittsburg mine has beaten the best record of the camp. The shaft is going down in solid crystalline limestone and is 7 by 23 ft. outside dimensions. The month it was sunk and timbered completely. It is expected that as much will be done during November. Six men were in the shaft during the month, three shifts, and four air drills were used. This shaft is now down 600 ft. One of its three compartments is 5.5 by 10 ft. inside timbers, and the others are 5.5 ft. square. The Briggs shaft at this mine is sinking a sump from the 1,126-ft. level, and a chamber is being cut out preparatory to extensive drifting there. The shaft is handling about 2,300 gal. of water per minute, practically the same as for the past 18 months. In winzes that were being run from the 910-ft. level off this shaft little progress has been made, and the southeast drift on that level is now being cleaned out preliminary to sinking there.

Duluth mine has driven crosscut 12' clear through the Alhambra claim and into the Summit, and there has run into a high-grade body of soft oxide of copper. This is a rather remarkable find for several reasons. In the first place it is 1,400 ft. from the nearest known porphyry, much further than any other orebody so far found in the camp; and in the second it is almost 2,000 ft. underground, making it by far the deepest ore opened in the camp.

The presence of oxide ores at that depth is striking. This ore is some distance from the east side of the company's ground, and the find has added much to the prospective ore-bearing ground of the company. It also widens the probable formation of the camp material. Altogether it is one of the most remarkable discoveries ever made in Bisbee.

In a few days regular shipments will be made daily to smelter by the Oliver shaft of Calumet & Arizona. This mine has recently added another rich find to the many already known in its southerly ground. There has been talk of an increase in capital stock of this company to \$4,000,000 of issued stock, thus doubling the amount now out. This new stock will be given to shareholders, as the company has put more than the \$2,000,000 that may thus be issued into smelter and other improvements, all of which have been paid out of current earnings. It has at the present time a surplus of more than \$2,000,000 in copper and cash. There has been talk of listing the company on the Boston exchange, and this would have been done ere now, but for the discussion of the stock increase. All talk of any consolidation of this company and the rest of the "Bonanza circle" group has been dropped, and if any consolidation comes up it will be along other lines. The company is expected to pay a quarterly dividend during December of about \$2.50 per share. It is said to be earning at the rate of \$17 per share per annum.

Copper Queen made 7,100,000 lb. of blister copper during October, and is producing at that rate steadily. The small furnaces that were brought down from Bisbee have been put out of commission, and big No. 5 has been started up. There will be little new construction at the smelter for some time after No. 6 and 8 are completed, in December, and the rate of production will not vary greatly from 8,000,000 lb. per month.

November output of the Calumet smelter is estimated at 4,000,000 lb., of which about two-thirds will be Calumet & Arizona and the rest from the two new properties. There is little hope that Junction can begin production for a year, or that Pittsburg can begin for eight months.

Ore hoisting has commenced at the Cole shaft, Lake Superior mine, the new steel hoist having been installed. Stopping will be carried forward on the 9th, 10th and 11th levels, and some ore may be mined on the 8th. The shaft is being driven to the 1,300-ft. level and drifts will be run there to cut beneath large bodies of leached and lean ores.

Daily ore shipments from Copper Queen shafts average 1,850 tons and will be increased to nearly 2,500 tons as soon as the smelter is ready to handle the additional ore. The orebodies developed in this mine are steadily increasing in size and importance, and at no time in the

company's history has there been so much in sight as now, nor so long a future assured the company.

The orebodies that have been opened into by Shattuck since early summer look as though they might develop into among the largest in the camp. Ore is cut on three levels and for a length, on the 700, of 180 ft. This company has done some remarkable work, as it is only 16 months since it began work. The first spade driven into the site of its shaft was in August, 1904, and there was much preliminary work to be done, in the way of building roads and bridges, grading a shaft and engine-room site, etc. This shaft is 1,000 ft. above Bisbee, and it is impossible for a track to be built to it. Arrangements are about completed for driving a tunnel on Copper Queen ground from near the nearest railway terminal to a point below the bottom of the Shattuck shaft, through which all mining will be done. The company is considering the question of a smelter, and in a few months will probably settle upon a site and plans. The site will be in all probability, in the Naco valley, which is close to the mine and can be reached with ease.

Important finds have been made within the past few days in Paradise district, which are in reality the first big finds ever made there. The Chiricahua Development Co. is now cutting some excellent ore.

At Jerome the United Verde is mining more ore than ever, and a further enlargement of the smelter is promised. This was enlarged a year ago and has been running very successfully since. Mining is now under way in the "fire zone" of the mine, where the sulphides are still on fire.

#### Socorro. Nov. 18.

The coal properties of Colfax county are quite active. The St. Louis, Rocky Mountain & Pacific Coal Co. has lately acquired the Raton Coal & Coke Co.'s holdings, at Blossburg and Van Houten, and is enlarging its mining and coking operations all along the line. The foundations for 50 new coke-ovens at the Gardiner plant are already completed, and there is talk of erecting 100 more ovens in the spring. This company is building an extension of the Santa Fe railroad's Blossburg branch up Dillon cañon to reach their new Brilliant mine, just opened on a coal seam in the upper measures, that cokes well and will find a ready sale for domestic use in the surrounding region.

The coal mines at Dawson are shipping unusual quantities, as an average of 100 cars of coal and coke daily is passing El Paso, bound for Sonora and Arizona points. The Mexican Central-railroad is arranging to handle this coal for Mexican points in its own cars, to save the present expensive transfer at Juarez from the steel cars of the Dawson company.

In Grant county, the Central district,

comprising the camps of Central City, Hanover, Santa Rita and Fierro, is now very busy with above 1,000 men at work. Robert Musgrave, the superintendent for Phelps, Dodge & Co., is working 26 men on the old Hanover copper mine and shipping about 500 tons of ore monthly to the Douglas smelter. At the same place the Hermosa Copper Co. is installing new boilers at their Ivanhoe and Copper Queen mines, and also developing the Tourmaline claim; while on the Humboldt a 90-h.p. boiler and a 1,000-ft. capacity hoist have been erected. The Empire Zinc Co., at Hanover, is shipping to its smelter at Mineral Point, Wis., several cars per week of zinc carbonates. It is still experimenting to discover some suitable method for local treatment of its zinc sulphide, now existing in large bodies, of too low grade for shipment direct. The Santa Rita Copper Co. is working 50 leases and has lately completed a two-compartment timbered shaft to a depth of 214 ft. At Pinos Altos, F. Preston Jones has just started a force of men to develop the Langston mine, that has lain idle for several years.

In Stein's Pass, the National mill has at last been repaired and has started up, a new orebody in the National mine assaying above \$50 a ton. Near Leopold, the addition of tables and vanners to the 200-ton copper concentrator of the Burro Mountain Copper Co. is under way. H. F. Brinkman recently struck a 6-in. streak of tungsten ore in his mine near Lordsburg.

In Rio Arriba county, at Headstone, the Dixie Queen Gold Mining Co. is drifting to explore the Red Jacket vein, with satisfactory results. Their new Huntington mill is on the ground, and erection is in progress. Considerable placer gold has come from Eureka gulch, near by, and the quartz-mining outlook is now hopeful here. At Tres Piedras, development of the Royal Purple group has been resumed.

In Sierra county, Las Animas district is lively. The Empire Co. recently shipped a car of ore and concentrates from its Bonanza stamp mill. Parties from Cleveland, O., have bought seven of the Hillsboro placer claims, and have options on several more.

#### Salt Lake City. Nov. 17.

Litigation, in which the title to the Kempton lode mining claim in Bingham is involved, is again pending in the Federal court in this city. The injunction suit of the United States Mining Co. vs. Leonidas M. Lawson, *et al.*, which was recently withdrawn by the decree of the United States Circuit Court of Appeals, has been reinstated by order of Judge Marshall, and mining in the disputed ground has been discontinued by the United States Co. In the testimony following the application of the attorneys of the defense for a reinstatement of the case, the fact was brought out that the

United States Co. had been mining an average of about 100 tons of ore per day of the estimated value of \$22.50 per ton; that there is approximately 750,000 tons of this class of ore available for extraction, which, figured on the basis mentioned, has a valuation of \$16,500,000.

In the initial trial of the case the defense won out and the plaintiff then appealed to the Circuit Court, where the decision of the lower court was reversed. The case was then taken up to the Supreme Court of the United States. Through some technicality the attorneys for the defense succeeded in getting the case reopened as stated.

The orebody encountered in what is known as raise No. 132 in the Consolidated Mercur mine, at Mercur, is opening out into great proportions. General Manager George H. Dorn states that there is every reason to believe that the body will develop into the largest ever encountered in the mine. The ore is all oxidized and carries values of from \$10 to \$15 to the ton. The company's mill is grinding away on 800 tons of ore per day from the old Mercur mine property. The Golden Gate mine shaft, which is the main exit for ores, is being re-timbered, and in the meantime ore is being brought out through the original Mercur shaft.

The Godiva mine in the Tintic district is to be equipped with a new mill. The plant formerly in use at the Tip Top mine, at Hailey, Idaho, is being moved there.

The Fortuna mine, at Bingham, will soon have facilities for the treatment of its extensive bodies of milling ore. An old milling plant, erected on the property several years ago, is to be equipped with new concentrating tables. Sidney Bamberger, of Salt Lake, is general manager.

The Uteland Mining Co. is the name of a new corporation to operate in the Uintah reservation, where it has acquired title to 213 acres of ground. The incorporators are George F. Timms, Washington, D. C., A. C. Hatch and others, of Heber City, Utah. The company has taken over the hydrocarbon lands once owned by the Florence Mining Co., which acquired concessions in the Uintah reservation through a special act of Congress, prior to the opening of the reservation to settlement. The capital of the Uteland company is 4,000,000 shares, per value \$1 each.

The last of the caves in the Ontario drain tunnel at Park City, which has dammed up the waters of the Ontario and other mines of Park City, has been passed and the properties that have been affected through the stoppage which occurred last March, are rapidly being unwatered. The fact that the hazardous undertaking has been accomplished after many months of anxiety and without the loss of a single life has been the occasion for much rejoicing in camp.

The coke situation at the local smelters has rapidly improved during the past few

days and the managements of the several plants are confident that the worst is over. The Pleasant Valley Coal Co. will be able by the end of next week to furnish two-thirds of the normal output previous to the late fire.

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Denver. Nov. 18.

The mine owners in the Cripple Creek district have adopted the assessment plan in connection with the construction of the second deep drainage tunnel. Each company will, under that arrangement, agree to pay 2% of its net returns after July 1, 1907, from its ore, into the tunnel fund. Several large companies, which at first were reluctant to join, are friendly to the present plan, under which \$800,000 will be raised by July 1, 1906, and the Cripple Creek Drainage & Tunnel Co. will at once be incorporated, with a capitalization of \$1,000,000. Stock in it will be offered first to the mine owners. The tunnel is to be constructed under the plan suggested in his report by D. W. Brunton, which was published in full in the JOURNAL of November 4.

John Milliken, president of the Golden Cycle Mining Co. and one of the most prominent operators in the Cripple Creek district, has purchased almost the entire stock of the Independent Gold Mining Co., owning the Hull City placer and a large amount of valuable Gold Hill properties. About \$400,000 is mentioned as the price.

J. Ferguson, stenographer of the district court of Pottawattomie county, Iowa, who has been appointed a special commissioner of said court, in the celebrated Doyle-Burns case, in which an interest, valued at about \$1,000,000, in the Portland mine, is involved, is at present in this State, taking depositions.

Before leaving for El Paso, to take part in the drilling contest on the occasion of the Mining Congress, in session there at present, Hupp and Lundquist, surnamed the "Terrible Swedes," did some fine practice work at Ouray, where they reside, and drilled a hole 42 in. deep, in a block of Gunnison granite, in 15 minutes, which is a remarkable record, and Colorado people naturally hope to see these men come out winners.

Charles Boettcher, of this city, accompanied by Aman Moore, the manager of the large Portland cement works, near Florence, has started for Utah, where they expect to incorporate a new company and build a large plant on the Union Pacific railroad, about 30 miles east of Ogden. They expect to expend about \$1,000,000 for a plant having a capacity of 2,000 bbl. daily, as they have secured an enormous deposit of an excellent cement shale, fully as good, if not better than that near Florence.

The Moffat road will be completed to the mouth of Gore Cañon about Jan. 1. It is rumored that the Government expects

to continue the fight for possession of the cañon for irrigation purposes.

In the presence of Governor McDonald and a number of State officials, a souvenir piece of metal was struck off at the new mint, bearing the imprint, "Denver, 1905," the die used being the size of a \$20 gold piece. The souvenir is to be placed in the rooms of the State Historical Society. Coinage is expected to commence Jan. 1 next.

Progress in the construction of a number of new plants in the southwestern part of the State is being seriously impeded by a congested condition of freight traffic and a shortage of cars.

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Leadville. Nov. 17.

The long, tedious and expensive fight against water at the Penrose, in the downtown section, is ended and the company comes out victorious. One triple-expansion and one large compound pump are now in place at the bottom level of the shaft, and the remaining compound will be set this week. The three pumps will have a capacity of 2,500 gallons per minute, which will control the situation. The fight against the water has cost the Western Mining Co. \$250,000, but in the end will come out winners, as the ore is in the territory to be explored. When the last pump is installed, drifting will commence north and south, with the north drift being pushed toward the Coronado; when the drift reaches this property all of the water will be diverted to the Penrose, and so lessen the cost of pumping.

The work that is being carried on in the down-town section, outside of the Coronado and Penrose, is very encouraging to the owners. At the Cloud City drifts are being run from the bottom of the Cloud City and Home Extension shafts; 50 ft. above this point a body of iron and manganese ore has been opened, which is 70 ft. thick, and whenever the connections are made shipments will be started. At the Bohn shaft, East Second street, sinking proceeds without a hitch, with the shaft in contact; another 150 ft. should see it in ore. From the Northern, Poverty Flats, 125 tons daily of a good grade of iron is being sent to the smelter. The other shafts in this section are shipping small lots of iron daily.

During the week an important strike was made in the Flagstaff mine, Adelaide Park, at the 200-ft. level. The shaft was sunk 550 ft. when several small streaks of ore were opened; drifting followed, but the main ore-shoot was not encountered; work was then started at the 400-ft. level, with the same result, and from this point an upraise was started and carried up 200 ft. when the ore was struck. The extent of the orebody is not yet determined; shipments have been made that give returns of several hundred dollars in silver and lead per ton; the management refuses to give out the exact figures, simply stating

that the ore runs well and there is plenty of it. The general opinion is that the ore channel encountered is the extension of the old Mikado ore-shoot, and if this proves to be the case the Flagstaff will take its place as one of the heaviest shippers in the camp.

The Nevada, South Evans, has been following a small streak of ore at the 200-ft. level, and after driving over 300 ft. the streak did not widen, so work was stopped and resumed at the 400-ft. level, with better results, as a good body of ore has been opened running well in gold. Connections have been made between the Little Ellen and New Year mines, which will enable the former to nearly double the daily output, which at present is 25 tons.

Seemingly, there is no end to the ore in the Little Jonny property, as hardly a week passes but some set of lessees open ore in ground where it was thought ore did not exist. The last fortunate set of lessees, H. Platt and Dr. Jeannotte, caught the ore-shoot northeast of No. 2 shaft, and are now shipping regularly, the ore running over 3 oz. gold per ton. The lessees combined are shipping in the neighborhood of 7,000 tons per month. Below the Jonny, to the north, the Gold Basin is shipping 50 tons daily of a silicious ore that runs \$15 per ton; and the Golden Eagle is sending out 25 tons daily. The work of sinking has started in earnest at the Silver Nugget, and the first lift will be 700 feet.

The Mammoth shaft, Big Evans gulch, is down 530 ft. and in another 100 ft. should open the sulphide orebody found by the diamond drill. Water has been struck in the shaft, but not in sufficient quantity to interfere with sinking. The other properties in the gulch are shipping the regular quota of ore.

#### Cripple Creek. Nov. 18.

The proposed construction of the new drainage tunnel still continues to be the principal topic of interest in mining circles. Several meetings have been held by the drainage committee of the Mine Owners' Association with regard to ways and means of raising the necessary funds for the work. As far as can be determined at present the site most favored is the one known as the "window in the rock" one. Just when the work will be started is not known.

General mining conditions are much the same as usual in the district. The recently reported strike on the Mary Nevin, on the west slope of Beacon hill, still looks good. A number of new leases are starting operations in various parts of the district. On Tenderfoot hill the Hoosier is being gotten in shape to work by B. G. Shell and associates. On Gold hill the old Moon-Anchor is doing some work on what is known as the Fitch lease. On Bull hill a good deal of work is going on on the properties of the Stratton estate, as well as others. Probably, however, the

most active hill in the district at present is Ironclad. On this hill are a number of leases on the Jerry Johnson, the Forest Queen, Pride of Cripple Creek, Montrose, Long John, Midway, Teutonic, and several others. The Norfolk property is also doing a little work and it is expected that work will soon recommence on the Home. On the Isabella, on Bull hill, some work is being done on a lease by Murphy and associates, and also some work is being done by the company. On the whole affairs are looking good in the district.

#### Butte. Nov. 14.

United Copper has cut off one shift of miners at its Belmont mine and reduced the number of men on the other two. It has also stopped driving the crosscut north of the 900-ft. station, the lowest workings in the mine. The face of this opening is in between 500 and 600 ft. About 300 ft. north there is a vein in which there are bunches of copper ore. This vein is being mined and is yielding between 60 and 100 tons a day. Outside of the Belmont the company is extracting about 1,300 tons per day from its Rarus, Cora and Minnie Healey mines. It is about ready to begin tanking water from the Lexington, but will not be pumping for a while yet, as the pumps are not at hand.

The property of the Hecla company, located about 45 miles southwest of Butte, is to be sold and the proceeds divided among the stockholders. Henry Knippenburg of Indianapolis, president and manager of the company, arrived here yesterday with authority from the directors and stockholders to dispose of the property. The company invested \$40,000 originally, and has paid \$2,250,000 in dividends without an assessment. Last year it incurred a debt of \$30,000 and the property was sold at sheriff's sale to satisfy the claim. Later, the purchaser assigned the certificate of sale to Mr. Knippenburg and an attempt was made to reorganize the company and proceed with the operation of the mines and smelter. It failed, the stockholders refusing to contribute the amount necessary for redemption.

Joseph A. Coram, of Boston, who has been in Butte during the last two weeks, has about finished his work of organizing a new company to operate in the Butte district, and expects to leave for the East this week. He has succeeded in getting hold of several claims, some of which are in the heart of the city. His latest acquisition is the Colorado, which was bought yesterday for \$65,000.

Pittsburg & Montana Copper shipped a carload of blister copper to New York yesterday, and will send out another carload Nov. 17. The plant of the company is working in good shape and the orebodies are improving with the advancement of the drifts. The average quality of

the ore is better than that found in the mines further west, little of it running less than 4% copper and 10 oz. silver.

#### Calumet. Nov. 18.

Two new copper-mining enterprises, located in the southeastern section of the Lake Superior district, were launched this week. The King Philip Copper Co. has been incorporated under Michigan laws, with a capitalization of \$2,500,000, divided into 100,000 shares of a par value of \$25 each. At a preliminary meeting in Houghton temporary directors and officers were elected as follows: President, R. R. Goodell; vice-president, J. H. Rice; secretary and treasurer, F. W. Nichols; directors, John W. Stone, J. D. Looney, W. B. McLaughlin and A. N. Baudin, all of Houghton. Another meeting will be held in Boston when a new board will be elected. Some of the Michigan men will resign to make room for representatives of the St. Mary's Mineral Land Co. In one respect the King Philip Co. is unique among Lake Superior copper mining enterprises. It will begin its development work with sufficient money in its treasury before the first spadeful of earth is turned, to insure the fullest development of its property, with shaft and connecting lateral openings, to a depth of 800 ft., and without a single share of its stock going into the hands of the public.

As previously stated, the King Philip will have a capitalization of 100,000 shares. One-half of this amount will be issued to the holders of the land in exchange for deeds to their property. As the St. Mary's Co. owns about seven-tenths of the property, it will receive 35,000 shares. There will remain 50,000 shares after paying for the land, and the St. Mary's Co. will purchase 20,000 of these for cash, leaving 30,000 shares for subsequent issue. In this way, the St. Mary's Co. will obtain 55,000 shares, which will give it control, whether the remaining stock is issued or not.

It is not the purpose of the King Philip Co. to enter into any work of an exploratory character, but it will proceed with development operations on a broad scale, the value of its property having been already proven to its own satisfaction by diamond-drill borings and other work. The St. Mary's Co. expended considerable time and money in locating the lode on the property two or three years ago, but after the investigation had been completed, it was decided to await further developments on the southerly portion of the Winona property before starting a shaft. During the last few weeks the Winona reached the line of the King Philip tract in its third and fourth level drifts and the indications at that depth, together with its own diamond-drill work and other developments on the Winona property, led to the organization of the King Philip and

the determination of a fixed policy for large development work.

The King Philip Co. will sink its shaft in the foot-wall, sufficiently distant from the lode to permit a complete extraction of the vein values without weakening the shaft. It is not planned to investigate the condition of the lode until a depth of 800 or 1,000 ft. has been attained. Thus much time will be saved and the property opened to great depth in the shortest time possible.

An option on the Aztec and Algomah properties in Greenland township, Ontonagon county, has been secured by W. L. Stannard, of Greenland, member of the State Legislature, and C. D. Hanchette, a Hancock capitalist. Exploratory work has been started on the Aztec tract. A few men are opening the easterly extension of the Knowlton lode, which has shown favorable results at the Adventure lately. The Aztec is located between the Hilton tract of the Adventure Consolidated Co. and the old Belt mine. It comprises 1,534 acres and is owned by Boston people. During the early days of the lake copper industry, when it was active, 800,000 lb. of copper were taken from the mine, but it has not been worked for a number of years.

The Algomah is located north of the Aztec and consists of 320 acres. It is owned by Greenland people, and is of value because it carries the underlay of the Knowlton and other lodes traversing the Aztec property.

#### Platteville, Wis. Nov. 16.

One of the most important items of interest in the Plattville district, the past week, has been the successful operation of the new gas producer that has been experimented with by one of the largest mine manufacturing concerns in the district, in which they are utilizing the oil-rock, mention of which has been made in the columns of the JOURNAL, from which they are producing a fuel gas.

Three new producing mills, located in the Cuba City camp, will be adding their quota to the output of the district about the middle of the month—the Wicklow, the Baxter and the Roosevelt. The latter property has been in course of development since the discovery of lead, half a century ago, down to the year 1901. It was a large lead producer when it fell into the hands of a party of gentlemen who began to prospect for "jack." In sinking their shaft to oil-rock, a 13-ft. vein of disseminated ore was penetrated, at the bottom of which a 150-ft. drift crosscut the vein in several places. The equipment at the Roosevelt consists of an Ingersoll-Rand compressor plant and a 50-ton concentrating mill, with all modern improvements. The zinc ore is of such a grade that no roaster will be needed for the present.

The Togo mine, located a little to the south of the Roosevelt, promises to become a good-paying property. The reports as the development work is being carried on, are very encouraging to the owners.

The old Celtman property, on the Benton camp, recently passed into the hands of Chicago business men, who have organized under the laws of Wisconsin as the Chicago-Benton Mining Co. They have a complete 50-ton mill, and are at present installing power drills, and it is expected to have the property producing in the near future. Like nearly all of the other good zinc mines, it was originally a dry-bone and lead producer. Recent developments show good milling ore. At the present time the mill is being operated with ore from the dumps, from which large returns are obtained.

Pittsburg parties, represented by O. A. Rogers, have secured a lease on 400 acres of what is reported to be very good mining land, in the Elmo camp. Work will be started as soon as drillers can be secured. A great number of the prospectors are being forced to purchase their own drilling outfits, as nearly all of the contractors have work enough engaged ahead to keep them busy for a year.

The Dawson Mining Co., formerly known as the Jack of Clubs, has let a contract for the erection of a 50-ton concentrating plant. Foundations are to be put in at once before cold weather sets in.

A marked improvement is taking place in the orebody at the Gillillan mine, located to the west of the Platteville camp, and the owners feel confident that they are nearing the main vein. The range can easily be traced across the property, and is some 50 ft. in width. There has been little or no prospecting done below the water level in this locality before. A large amount of surface lead has been taken out, and it is an easy matter to pick up lead anywhere on the surface of the range. The property is being developed by a local pool.

#### Scranton. Nov. 20.

Following the transfers of the division superintendents of the Lehigh Valley Coal Co., consequent upon the acquisition of the Coxe properties, the following promotions are announced: Chief Clerk F. M. Chase to be assistant general manager; Chief Shipper William Fregans to be chief clerk; Division Engineer A. B. Jessup to be chief mining engineer; Charles Enzian to be engineer in charge of the Wyoming division; C. F. Seeley to be engineer in charge of the Lackawanna division.

Although its plant is situated within a stone's throw of a large culm bank, with thousands of tons of cheap fuel, the Scranton Forging Co. is equipping its plant with oil furnaces to take the place of the coal-burning furnaces. They claim

that it will be more economical when the cost of carting ashes and other features are considered, in addition to being more satisfactory for quick firing.

Surveys have been completed by the Delaware & Hudson Co. for a branch road between South Wilkes-Barre and Yatesville, in order to reach some of the coal properties.

During the past few months 2,800 tons of coal were taken out of the bed of the Susquehanna river by two men between Almedia and Bloomsburg, a distance of four miles. This coal had been washed from the various collieries on the river banks.

A new slope has been opened at the Cranberry slope of the Lehigh Valley Co.

The Kehley Run colliery on the Girard estate has been purchased by the Thomas Coal Co., the consideration being \$165,000.

The rockmen of the anthracite region, who were not a party to the award of the strike commission, will ask the Shamokin convention that they be taken into the mine workers' union, so as to benefit by the new agreement.

The Lehigh Valley Co. last week completed the concreting and ground work of the new storage yard at Ransom, and commenced filling it with coal. It has a capacity of 300,000 tons.

The Lehigh Valley Co. is building a large electric plant at the Hazleton shaft colliery to take the place of the existing plant, which has proved inadequate.

The work of mining coal at No. 3 slope, at Silver Brook, near Hazleton, was resumed on Monday, after an idleness of three years.

Tests have been made with a new powder during the past week in some of the mines in the Shamokin region. It was demonstrated that the new explosive is more powerful than the common black powder now in use, while it is absolutely odorless and smokeless. The tests were made in narrow workings, where the air is not good, and there was not the least trace of smoke. It was also given a test in the hardest coal and with only one-half the quantity of black powder generally used, and did better work. It is also claimed for the new explosive that it will not freeze, and that it is not affected by atmospheric conditions. During the test a keg was taken out in the open air and a lighted fuse placed in the powder, which failed to explode, simply burning slowly away. The inventor is John M. Brown, of Reading. It is a slow burning powder, and will explode only when confined. It has aroused considerable interest in the anthracite region whenever the tests have been made.

John Young, of Tamaqua, associated with William Dunkleburger, in an independent mine operation, near Tamaqua, died last week.

Notices have been received here for a meeting of the national executive board



of the United Mine Workers, to be held in Indianapolis Nov. 28 next.

Delegates from the Shamokin district to the Mine Workers' convention on Dec. 14 will go uninstructed.

Three large shipments of men have been made from the Hazleton district for Virginia, where the men will work in the coal mines. They have been hired by W. G. Clifford.

At a meeting of the United Mine Workers' executive board of the First district, held in Scranton, it was decided to present a petition to the Luzerne courts, asking for the annulment of the appointment of the miners' examining board in that county, on the ground of incompetency.

The new Avondale breaker of the Delaware, Lackawanna & Western Co., near Plymouth, has been completed, and is equipped with the best modern machinery, including patent slate pickers. It will be run by electricity, and instead of being built over the shaft, like the old breaker, will be some distance from the opening. The mine has been idle for four months.

Five men were injured at No. 3 mine of the Lehigh & Wilkes-Barre Coal Co. on Saturday, owing to the engineer not stopping the cage at the proper place. The cage struck the bottom of the shaft with great force instead of stopping a distance of 35 ft. above. This meant one revolution of the drum, and it is thought that the engineer miscalculated the revolutions, a very unusual occurrence in the region.

#### Sudbury. Nov. 17.

The mining regulation embracing the Cobalt region that went into force on Aug. 28 last, closing the lands temporarily to exploration, sale or lease, has been rescinded by another Order-in-Council appearing in the *Gazette* of Saturday. The subsequent Order-in-Council reduces the area of locations to 20 acres, in lieu of 40 acres, as heretofore existing.

Mining meetings have been held in Sault Ste. Marie and Sudbury in response to the invitation issued by the Minister of Lands and Mines. Resolutions were drawn by appointed committees, submitted to the meetings and adopted, for presentation to the Government. The amendments proposed to the Mines Act were many, and several very good suggestions were presented. The principal features were the granting of leases and patents in a more expeditious manner; performing development work on a claim at a fixed amount per annum, or allowing the prospector to spend the entire amount in one year if desirable, thus dispensing with the services of the inspector of claims; a court to hear and determine all disputes of claims, award of said court to be final, there being no appeal to the Minister as at present; that hereafter, all crown lands be open to the prospector for mineral, irrespective of timber values. At both

meetings the question of exacting a royalty on the ore production was speedily voted down, the delegates expressing themselves that such a means of providing a revenue could not be too strongly condemned. A general conference will be held in the city of Toronto at an early date, of a Provincial nature, for the further discussion of a question that has ever been the stormy petrel in the politics of the Province of Ontario.

At the meeting held in Belleville the mining men requested the Government to place a duty of 75c. per ton on iron ore. This may be helpful to the county of Hastings, in which Belleville is situated, but we fail to see what benefit it would be to the Province or Dominion at large. It would most assuredly put to sleep the large industrial works at Sault Ste. Marie, and nip other infant industries.

Large orders have been booked by the rail mill of the Lake Superior Corporation at Sault Ste. Marie, from the Michigan Central and the Great Northern railway. The Canadian Pacific has also been a large purchaser, the latter's orders amounting to 75,000 tons. The mill has enough orders on hand at present to keep it running at full capacity well on in 1906.

The new smelting plant at Copper Cliff for the refining of Cobalt silver ores is nearing completion, and all will be in readiness in two weeks. Its capacity will be from 10 to 20 tons per day, and can easily be increased to 40 or 50 tons if demand warrants same.

Winter has fairly set in, in the Cobalt region, and many of the smaller lakes are frozen over. The weather conditions are such that prospectors are forsaking their tents and are erecting log-cabins. Development work and shipping ore still continue. Purchasing agents are on the ground prepared to buy, and in many instances giving a substantial advance on the purchase before shipment.

The vendors of the Savidge mine at Cobalt will defend an action in which William McVittie is the plaintiff. The latter is suing Messrs. Savidge & Wright, the original owners, for a commission on the sale, amounting to \$4,000. The case comes up for hearing at North Bay, Nov. 20. The case in point is an important one, and will, it is hoped, establish under what conditions commissions must be paid.

#### Toronto. Oct. 21.

The Provincial Bureau of Mines has received a detailed report from H. L. Kerr in charge of the party sent out to explore the Abitibi region. The greater part of their work was done on the Mattagami river. The country is described as a vast plain, with occasional abrupt elevations of considerable height. Most of the rock exposures consist of Huronian schists, with intrusive masses of diabase and in places the rocks have been much disturbed. The only economic mineral found

was a small vein of galena, but the general make-up of the rock exposures suggests that the country might be worth prospecting. The muskegs, which were met with only occasionally in the southern part of the area covered, but which became more frequent toward the north, embracing considerable areas, were some of them found to contain several feet of excellent peat, which may eventually prove valuable. From the little work done on the Frederick House and Abitibi rivers it is inferred that peat bogs are more abundant in that region. On the Mattagami river several waterfalls were encountered offering splendid facilities for the development of power.

The attention of European metallurgists is being directed to the ores of Ontario. Several inquiries from Continental houses have been received at the Bureau of Mines in regard to the purchase of metals. Johann Otten & Zoon, Rotterdam, Holland, are prepared to contract for supplies of iron, copper and nickel ore and especially for iron ore high in phosphorus. The Antwerp Trading Co., of Antwerp, Belgium, wants to purchase silver-cobalt and copper ores.

The annual meeting of the Dominion Iron & Steel Co. was held at Montreal on the 18th inst. Frederic Nicholls, of Toronto, resigned the vice-presidency of the company, which he had held for three years, stating that he had only accepted the position on the understanding that he should retire as soon as the company was upon a firm business basis. Hon. Louis J. Forget was elected first vice-president in place of Mr. Nicholls. He is the head of the firm of L. J. Forget & Co., Montreal, and closely identified with many important corporations, including the Montreal Street railway, the Richelieu & Ontario Navigation Co., and the Dominion Coal Co. Graham Fraser retired from the position of director of works, his position being filled by the appointment of F. P. Jones, lately selling agent of the company. E. R. Wood, of Toronto, was added to the directorate. The financial statement already published, showing the company's earnings to May 31 was supplemented by a statement from President Plummer showing earnings to Oct. 1 of \$73,000 per month, interest charges being \$56,000 per month, which left between \$16,000 and \$17,000 per month to be applied to sinking fund or other purposes. The August and September returns showed a marked improvement over the other months.

The tank system of shipping oil is causing some discussion in the trade. It is asserted that the frequent handling necessary in the tanks has caused loss, increased cost and resulted in higher prices. Inquiries among leading merchants in Toronto, however, seem to show that the tank system is generally approved as being more economical and causing less waste

from leakage, evaporation, etc., than shipment in barrels. In place of increasing the price to the consumer it is claimed that the effect has been to reduce the cost and supply a better quality.

The following mining companies have been incorporated under the laws of Ontario.

Chester Silver Mining Co., Ltd.; capital, \$25,500; head office, New Liskeard; provisional directors, Samuel Solomon, Charles E. Binkley, James A. Pritchard and A. V. Summers.

Ruethel Mining Co., Ltd.; head office, Windsor; capital, \$250,000; provisional directors, Wm. A. Thorpe, Henry C. Rees, Wm. W. Newcomb, Chas. M. Hovey, Arch. McPhail, John W. Wolst and Geo. J. Munsell.

Imperial Silver Mining Co., of New Liskeard, Ltd.; capital, \$250,000; provisional directors, Murdoch McLeod, James M. Young, Wm. E. Kerr, Wm. J. Middleton, Herbert Bennett, R. G. Zahalan and Albert N. Morgan.

Silver Hill Mining Co., Ltd.; head office, Mattawa; capital, \$50,000; provisional directors, John M. Deacon, Louis H. Timmins, Octave N. Gamreau, Henry Morel and Edward R. Legg.

Majestic Oil Co., Ltd.; head office, Toronto; capital, \$100,000; provisional directors, John T. Mullany, George L. Lovejoy and Thomas H. Graham.

#### Victoria, B. C. Oct. 28.

*Crofton.*—The Britannia Smelting Co., Ltd., is adding more storage bins and installing a brick-making plant at its smelting works at Crofton, Vancouver Island, British Columbia. Four new bins, of a holding capacity of 300 tons each, are being built for concentrates. The brick-making plant includes a Chambers (Philadelphia) No. 7 machine, having a capacity of 60,000 to 70,000 bricks a day, and two Scott's patent elevating brick cars, for taking the newly made bricks off the racks without handling. The building to house this plant is 72 by 35 ft., constructed of lumber, and roofed with the Parraffine Paint Co.'s "malthoid" roofing. The dry shed, of similar construction, is 104 by 78 ft. In the latter building, overhead in the gable, are four sets of steam coils—in all, about 5,000 ft. of 1-in. iron pipe, encased in a wooden box; these will heat the air, which will be drawn between and over them by a No. 6 Sturtevant fan, operated by a 5-h.p. electric motor, and be discharged into a 12-in. galvanized-iron air main. Six-inch branch pipes, perforated every 18 in. with  $\frac{3}{8}$ -in. holes and running the full length of the tracks, will distribute the hot air among the bricks. There will be 18 car tracks in the dry shed, with room for the tiers of bricks on trays between the tracks. Steam for the coils will be supplied by a 100-h.p. boiler, housed in a separate building, 18 by 35 ft., erected near by.

*Grand Forks.*—The Granby Consolidated Mining, Smelting & Power Co., Ltd., has completed the installation of two 48 by 210-in. water-jacketed blast-furnaces at its copper-smelting works at Grand Forks, Boundary district of British Columbia. These are fitted with 24 tuyeres on each side, this being double the number generally used and of half the customary area. They are the largest blast-furnaces in British Columbia, and together with the six 44 by 160-in. furnaces previously in operation, give these works a daily treatment capacity of about 2,800 tons of ore per diem.

*West Kootenay.*—The construction of the double high-tension electric-power transmission line of the West Kootenay Power & Light Co., Ltd., is building from its hydro-electric power-house at Bonnington Falls, near Nelson, B. C., to Grand Forks, Phoenix and Greenwood, in the Boundary district, to supply electric power to smelters and mines, is being expeditiously proceeded with. An order for copper cable wire for this line was placed last summer; it was for about 728,000 lb. of cable about  $\frac{1}{2}$  in. in diameter and containing six Brown & Sharpe wires wound about a jute center. The line will be 70 to 80 miles in length, and the current will be transmitted at a voltage of 60,000 volts. A sub-station, 50 by 54 ft., with walls 40 ft. high, for stepping the current down, is in course of erection at Phoenix, where are situated the Granby Co.'s big mines. It is probable power will be available for the Granby Co.'s smelter, at Grand Forks, in November, but the line will not be completed to Greenwood until about February next.

*Boundary.*—It is announced that the Dominion Copper Co.'s smelter at Boundary Falls, which was closed down before the acquirement by this company of the mines and smelter of the Montreal & Boston Consolidated Co., and has since remained inoperative, will shortly be running again, starting about Dec. 1. Ore and coke have been arriving at the work during the last two weeks, and a number of men have been engaged in effecting repairs and making improvements preliminary to the furnaces being blown in.

Boundary ore production for October shows an average daily output shipped to the smelters of nearly 3,000 tons, the month's aggregate having been 88,381 tons. Four-fifths of this quantity was the product of the Granby Co.'s mines at Phoenix. Five of the smaller mines shipped a total of 320 tons of high-grade silver-gold quartz. Individual shipments were as follows:

Mine.	Tons.
Granby mines (Granby Co.).....	70,957
Mother Lode (B. C. Copper Co.).....	16,544
Brooklyn (Dominion Co.).....	300
Oro Denoro.....	170
Emma.....	90
Providence (high-grade).....	150
Other high-grade mines.....	170
Total.....	88,381

#### Mexico. Nov. 6.

In Guerrero a new company has been formed, known as the Guerrero Mining & Exploration Co., headed by A. B. Adams, president of the Copalquin Mining Co., of Durango, with Ferdinand P. McCann as managing director, to take over and explore for placers and mines a large zone of some 400 sq. kilometers, in the vicinity of the towns of Chilpancingo, Tlacotepec and Atoyac, conceded for a period of three years to J. L. Riqueña, of the Dos Estrellas mine, who will be interested in this new venture. Mr. Adams is also said to have bought the property near the above-mentioned zone of exploration, known as Las Gradass, about three day's ride from Rio Balsas station of the Mexican Central railroad, and will erect a 5-stamp mill. Wm. Niven is organizing a large company to put dredges on the Rio Balsas for working the Balsas placers.

German Roth, the wealthy Toluca brewer and mine-owner, has just been in Chicago, Ill., and it is understood has arranged with Chicago capitalists for the construction of a railroad from Toluca to his mines, near Sultepec, for which he has agreed to pay a good royalty in addition to freight. It is expected that the road may be running in March of 1906.

In Parral, Chihuahua, a deal is pending between a French and English syndicate and James I. Long, the American consul in Parral, for the purchase of the properties of the Hidalgo Mining Co., including the Parral & Durango railroad, the figure being placed at \$3,000,000, gold; and a number of French engineers have been in Parral making examinations, among whom were T. E. Capdeville and E. Bremond, of Paris.

Near Jimenez, the Gibosa, purchased by the late Ed. Doerr for the Guggenheim Exploration Co. for \$125,000, Mexican, is said to be shipping 1,000 tons a month of 10% copper ore, and making over \$50,000 per month. Taylor & Howat, attorneys for the Premier Exploration & Development Syndicate, have filed on a large tract of ground in the district of San Juan Nepomuceno. At Batopilas, the mines left by the late "Boss" Shepherd, of Washington, D. C., are again in bonanza, and it is said that profits this year will pass \$2,000,000, Mexican.

The offices of the Candelaria Mining Co. have been moved from El Paso to San Pedro, Chihuahua, where the mines are located. The Pittsburg-San Jose Railroad Co. is said to be surveying from Gavalana to Parral. At the smelter of the Encinillas Mines, Ltd., everything has been dead since early in August, while the directors and stockholders are fighting it out in London and Paris, a stockholders' meeting having supposedly been held in London on Oct. 18 for the purpose of increasing the capital stock and raising much-needed funds; but as

yet no information has reached Mexico regarding the results of said meeting, but the general manager, C. A. Bohn, has asked the company to obtain someone else to take the position and relieve him of his contract.

London. Nov. 11.

During the current year many rumors have been afloat relating to the acquisition by German capitalists of certain steam-coal lands in South Wales. There was much popular indignation in England when it was heard that some of the most valuable assets of British naval supremacy were being handed over to commercial and naval rivals. However much the Englishman may feel hurt, on patriotic motives, the business has been definitely concluded. An English company, called the Whitworth Collieries, Ltd., has been formed with a capital of £600,000, of which £300,000 has been subscribed in Germany and £200,000 in England, and there are £170,000 in debentures which will be taken by the German promoters. It is estimated by Welsh and German mining engineers that there are 400,000,000 tons of coal on the estate, of which one-third will be the highest class naval steam coal. The company will be directed and managed by Englishmen, but the whole of the output, of 1,000,000 tons a year, will be handed over to the German agents. No doubt in case of war between England and Germany the British Government would stop further exports, but this would only be shutting the stable door after the horse was stolen, for the Germans would always have a year or two's supply on hand. There is something quite humorous in this idea of the German settling himself down in possession of some of John Bull's most cherished naval assets.

Mining in Egypt and the Sudan is not proceeding very quickly. The properties under the direction of John Taylor & Sons get along as quickly as anybody's, but even in their case the natural difficulties of the country have made progress slow. Six months ago I mentioned that their Um Rus mine in Eastern Egypt had commenced milling. I have now to mention that the Om Nabardi mine in the Sudan has developed so well that a milling plant is to be provided forthwith. This mine was acquired by the Sudan Goldfield, Ltd., a year ago, and under the superintendence of Mr. Arthur Llewellyn, formerly of Mysore, the developments have been actively conducted, and the presence of ore over 3,000 ft. in length and varying from 1 to 4 ft. in width, assaying 10 to 30 dwt., has been definitely proved. Before much active work could be done, a light railway 30 miles long was built, to connect the property with the Sudan railway; otherwise heavy machinery could not possibly have been brought up. Also the question of water supply had to be studied. By means of sinking, ample supplies of un-

derground water have been secured. It is interesting to note that power is to be supplied by gas producers.

Paris. Nov. 10.

The principal French mining companies are busy at present with their annual meetings. The financial year now ending has been favorable and the preceding year's dividends have been maintained and in cases increased. Although France is not a mining country, and takes a very low place in the list of European producing countries, as regards minerals, yet the companies formed to exploit French mines are generally in a flourishing state and are well based financially.

M. Serpollet has, it is stated, succeeded in making use of the heavier mineral oils in the ordinary burners used with his steam generators. He mixes alcohol and water with the mineral oil to the extent of about 10% of the volume, varying with the nature of the oil. The evaporation of the water, when the mixture is burned, creates an excellent draft and prevents the residue formed by the combustion of the oil from adhering to the tubes and chimneys, as well as aiding combustion.

The first commercial application of the Lartigue monorail has been made in a mine at St. Sebastian. The line is about two miles long and the locomotive hauls the load by means of a gasolene engine, although the system is applicable to trolley line or steam traction. The locomotive weighs 4,000 lb. and can travel, with 7 or 8 tons of mineral, at the rate of from 2 to 10 miles per hour. The monorail used weighs 11 lb. per yard, and the trucks lay straddle-wise over the rail, which is supported every 8 ft. by supports at a convenient distance from the ground.

The Krupp engineering and ordnance factories are exceedingly busy just now. The firm has never had such a prosperous time since its foundation. There are now at the works some 56,000 men in constant operation and making overtime, and it is seriously thought of creating new shops at Essen, in addition to the present enormous works. The French Creusot engineering works have a very similar story. They have obtained an excellent order from Turkey amounting to 14,000,000 fr., the work including a gigantic bridge erected close to Constantinople, and an important lot of ordnance. This contract has probably been obtained in response to recent French demands on the Porte.

It is pretty well recognized in the United States that the shaking received by Spain in the recent war has done her a world of good. For instance, much surprise is felt here in respect to the success obtained by the Alton Hornos, the Bilbao firm, in obtaining the order for 14,000 tons of rails for Mexico. The price was 115 fr. per ton, f. o. b. Bilbao, and it is thought that unless there is a further drop in the rate of exchange with Spain, the price will

carry a decent profit. The German firms competing for the order were especially concerned.

In Spain, generally, there are signs of activity in mining circles. There are at the present time several companies being formed on the French market, and it appears that Spanish concessions are not difficult to obtain. The Creusot firm has embarked considerable capital in light railway lines to transport mineral to the coasts. The lead mines of Malaga can especially be mentioned as productive. The lead ores afford a percentage of 80% and contain, besides, between 1 and 3 oz. of silver per ton. It is estimated that 100,000 tons of sulphate of lead are annually exported from this district alone, and operations have not been long commenced.

In Italy some attention is being given to Korea, now freed from the invading armies. There is an important company being formed to exploit the minerals of Korea, and it is being backed by Italian financiers.

A new use for acetylene has been tried recently in salvage operations. Caissons are sunk around the ship to be lifted, and the sea-water allowed to obtain access to the carbide previously stored in the caissons thus sunk. The acetylene gas thus freed displaces the water in the caissons, which escapes from orifices in the bottom, and if a sufficient number of these tanks are attached to any sunken ship it is of course lifted by the buoyancy thus obtained.

Sydney, N. S. W. Oct. 23.

It is gathered that the firm of Bewick, Moreing & Co. contemplate the extension of their sphere of influence to the Broken Hill field, but their exact intentions have not been made public. H. C. Hoover, of this firm, has recently completed a visit to this field, and in a published interview he is reported as saying that it appeared to him the progress of Broken Hill depended on the price of lead and zinc. The deposits, he admits, are enormous, but the cost of working, together with their average value, make them in a sense low-grade deposits. He added that, given the present high prices ruling for the metals, there could be no doubt of the prosperity of the field, but at the same time no considerable fall in prices was necessary to wipe out the margin of profit in the lower-grade mines, and to seriously impair profits in the richer mines. The Broken Hill Proprietary Co. is maintaining its output on the usual scale, the production of metals for the past four weeks being 358,614 oz. silver, 5,008 tons lead, and 28 tons of antimonial metal. At the Central mine, the difficulties occasioned by the recent creep are being rapidly surmounted, and such progress has been made in connection with the equipment of the new main shaft, the aerial tramway, and receiving bins, that the work of pro-

duction should be resumed by the middle of September. It is announced that Block to Co. has accepted a satisfactory offer at a fixed price per ton for 100,000 tons of zinc tailing, and an option has been given over an additional parcel of 500,000 tons. This company's tailing heap contains about 700,000 tons, the average of the parcel disposed of being about 21% zinc. The South Co. contemplate the erection of a new plant at a cost of at least £120,000. It is proposed to defray this expense out of the profits, after allowing for dividends on the usual scale, but if necessary recourse will be had to the unpaid capital. The directors of this company are fully alive to the fact that an increased output means decreased working expenses, and an accumulation of profits in greater degree to the proportionate increase in the tonnage of the ore treated.

The gold yield of the State of Queensland for the month of August amounted to 50,258 oz. fine, which is some 2,200 oz. less than for the same month last year. In New South Wales increased activity is noticeable, although the output for the month of August was only 20,489 oz. fine. This record is, however, much better than for the corresponding month in 1904, and the increased yield for the past two months has considerably lessened the decrease exhibited in the returns for the earlier months of the year.

The discovery of rich quartz at the great depth of 4,226 ft. in the New Chum Railway mine, Bendigo, Victoria, is the subject of much favorable comment. The reef, which varies from 5 ft. to 2 ft. in width, is of a very promising nature, and shows gold freely. The results of the crushing which is shortly to be made are being awaited with interest. Following on the discovery of gold in this mine, gold has been found at a depth of 4,090 ft. in the Victoria quartz mine, which goes to prove that the precious metal may yet be found in payable quantity at another point on the New Chum line of reef.

The gratifying announcement has been made that the water at both the New Havilah and Charlotte Plains deep lead mines has at last been overcome, and that the work of opening out on the wash will be started immediately. The pumping plant, which is the first of its kind to be employed in deep alluvial mining in Australia, has justified expectations, and has established a record both as regards efficiency and cost of working. The time occupied in overcoming the water, although longer than was at first expected, is also a record.

In all the respective centers the high price ruling for tin has given a marked stimulus to this branch of the industry. The Mount Bischoff Co., Tasmania, is taking advantage of the present conditions to operate largely on low-grade ore. The last dividend declared by this company brought the amount distributed to shareholders up to £2,004,000. The output of

tin-ore from the Briseis mine, Tasmania, for the past month was 70¼ tons. The returns from the dredges operating at Cope's Creek (N. S. W.), which are now a feature of the industry, are very satisfactory, and work is being prosecuted with much vigor. During the month of August one dredge won 15¾ tons of tin-ore, which leaves a very handsome margin of profit.

The Mount Lyell Co., Tasmania, records an increased metal production for the past month, the figures being as follows: Copper, 702 tons; silver, 60,256 oz.; gold, 1,839 oz. An interesting development at this mine is the striking of a seam of ore at a depth of 722 ft. in the main shaft, which is taken as a good indication that the lode will be proved to exist down to a deep level.

Although the gold-mining industry of Australasia showed a slight improvement during the September quarter of this year, the output for the nine months indicates a decrease of 67,147 oz. when compared with the same period in 1904. The following are the figures for the nine months, in fine ounces:

State.	1904.	1905.	Changes.
Western Australia.....	1,479,618	1,469,353	D. 10,265
Victoria.....	559,339	526,167	D. 33,172
Queensland.....	466,394	436,286	D. 30,108
New South Wales.....	197,780	189,288	D. 8,492
South Australia.....	21,750	21,750	.....
Tasmania.....	49,440	53,100	I. 3,660
<b>Total com'nwealth.....</b>	<b>2,774,321</b>	<b>2,695,944</b>	<b>D. 78,377</b>
New Zealand.....	363,606	374,886	I. 11,280
<b>Total Australasia.....</b>	<b>3,137,927</b>	<b>3,070,780</b>	<b>D. 67,147</b>

It will be noticed that the largest decrease is recorded in the State of Victoria. The yields for the Bendigo field have fallen far short of those of the previous year, but the output for 1904 was one of the largest in the history of the field, and the mines reaped the advantage of a large amount of dead work. In Queensland the decrease is spread over all the principal fields, but the greatest falling off was at Charters Towers. Western Australia has slightly improved its position during the last quarter, and has reduced the deficiency shown at the end of the half year by some 9,000 oz. The yields have recently been much more satisfactory, and there is every possibility that the close of the year will see the deficiency more than made good. These remarks also apply to New South Wales, which has already pulled up 21,000 oz. of the shortage shown for the half year. New Zealand and Tasmania are in the gratifying position of being able to record increases, and the prospects favor a well-augmented yield for the year.

*Silver.*—The value of the products of the silver-lead mines of New South Wales exported during the first nine months of the year totals £1,755,700. This is an increase in value of £306,000 over the corresponding period in 1904; and the output for the nine months is already in excess of that recorded for the whole of either the years 1902 or 1903. Large as the production has been, the lead and silver have

found a market. The demand for lead, especially, has been heavy this year.

#### Johannesburg. Oct. 14.

There has been much comment here and abroad over a number of crimes recently committed by the Chinese. It is more than a coincidence that the outbreak of crime followed fast upon the agitation of the Chinese question in England. The Chinese are the shrewdest race in the world, and they soon noted the relaxed discipline, taking full advantage of the changed state of affairs. Numbers of the coolies deserted from the mines, and wandered away. There are some bad characters among them, who no doubt considered it possible to form robber gangs, such as exist in China.

The police authorities have acted with commendable promptness, and few of the desperadoes remain at large. In a number of cases whole gangs of absconding coolies have been captured within 24 hours of their desertion.

Just now there appears to be an epidemic of desertions among the Chinese. A system of roll calls every Sunday morning has been instituted on the mines employing Chinese. The number of deserters is reported to headquarters every Monday morning, and immediate steps are taken to find them. When caught the coolies are sentenced to imprisonment with hard labor, for a fortnight or month. They do not have a nice time in jail. Thirty deserters who were returned to a certain mine the other day, after a month's imprisonment, said they would never run away again.

Finger impressions of every coolie who has entered the Transvaal are kept at headquarters. It is astonishing how quickly the experts can identify any coolie, whose finger impression is sent in.

Because of some regrettable crimes and numerous desertions, a few weak-minded people have cried out against the Chinese experiment. As a matter of fact, the pall that hung for months over the Transvaal, has disappeared since the advent of the Chinese. The coolies may be an objectionable addition in many ways to our community, but the fact remains that they have saved the industrial situation. There are 43,565 coolies at work on the mines of the Rand. A vessel is on the way from Chefoo with 1,901 additional laborers.

Several new appointments to the staff of the Transvaal Technical Institute have just been announced. From this institution will no doubt spring the future Transvaal University. Messrs. Yates, Morece and Jamieson have been appointed to the chairs of mining, law and biology respectively. The appointment of John Yates, a well known Rand mining engineer, is of much interest to the mining community. In the development of South Africa, the engineers of Europe and America have played the leading parts.

**General Mining News.**

*Petroleum Exports.*—Exports of mineral oils from the United States for the ten months ending Oct. 31 are reported as below, in gallons:

	1904	1905
Crude petroleum.....	81,303,974	86,847,256
Naphthas.....	17,519,105	24,846,352
Illuminating oil.....	629,369,135	730,332,265
Lubricating oils.....	69,349,010	88,337,357
Residuum.....	26,298,456	51,910,703
Total.....	823,839,680	982,273,933

Paraffin is included in lubricating oils. The total increase was 158,434,253 gal., or 19.2%, this year.

*Sault Ste. Marie Canal Traffic.*—The monthly statement of the commerce of the Sault Ste. Marie canals shows that 6,046,187 tons of freight were transported through the canals during October, being the heaviest movement of any October since the canals were opened and heavier than the movement of any month of any year prior to the present year. Up to Nov. 1, 37,993,930 tons were transported through the canal, surpassing by over 2,000,000 tons the total commerce of the year of 1902, which up to the present was the record-breaking year in the history of the canals. The items of mineral freight included in the totals for the season up to Nov. 1 were as follows, in short tons, except salt, which is given in barrels:

	1904.	1905.	Changes.
Anthracite.....	818,998	749,322	D. 69,676
Bituminous.....	3,818,694	4,849,791	I. 1,031,097
Totals.....	4,637,692	5,599,113	I. 961,421
Iron Ore.....	16,134,123	27,852,943	I. 11,718,820
Pig and man. iron.....	188,512	182,958	D. 5,554
Copper.....	83,417	86,414	I. 2,997
Silver Ore.....	1,318	41	D. 1,277
Building Stone.....	25,611	8,649	D. 16,962
Salt, bbl.....	329,882	357,147	I. 27,265

The division of the total freight was: East-bound, 31,608,316; west-bound, 6,385,614; total, 37,993,930 tons. The total number of vessels passing through the canals was 18,752, showing an average cargo of 2,026 tons.

**CALIFORNIA.**

**AMADOR COUNTY.**

*Kennedy Mining & Milling Co.*—The ore being milled is now coming from between the 2,100 and 2,700 levels, and the 100 stamps are crushing about 450 tons daily. There is plenty of ore in sight, and the mine continues to pay regular dividends.

*Burlington.*—At this mine, Sutter creek, the 5-stamp mill will shortly start up on ore already on the dump.

**CALAVERAS COUNTY.**

*Union Copper Co.*—The new smelter of this company, at Copperopolis, is completed and ready for operations.

**EL DORADO COUNTY.**

*Idaho.*—At this mine, Kelsey, under bond to Frick and others, preparations are being made for a mill.

*Sunrise.*—Grading is being done for a new mill at this mine, Kelsey. New ground is being opened up in the mine.

*Bonded.*—The Toombs Boys property, at White Rock, has been bonded for \$15,000 to C. E. Seymour.

**INYO COUNTY.**

*Redland Mills.*—This section is 8 miles south of Ballarat, and within 1½ mile of the place 17 mining claims, owned by M. J. Terry, have been sold to Pittsburg, Pa., men, who are about to open them up. The lead is wide and the ore is free-milling. Near by is the Anna Barbara mine, with a 10-stamp mill; and the Redlands, also with 10 stamps. There are now about 600 men in the district.

*Pleasant Cañon District.*—The World Beater, owned by George Montgomery, has a 10-stamp mill and cyanide plant, and more machinery has recently been shipped in. The Stone Corral mine, at the head of the cañon, has been leased by Eastern men. There is a 5-stamp mill on the claim and five more stamps are to be added.

*Mount Whitney Mining Co.*—At this property, Lone Pine, grading for the mill is completed and more men are being put to work.

*Cecil R. Mining Co.*—This property, near Ballarat, closed for some time owing to disagreement among the stockholders, is about to be started up again.

**NEVADA COUNTY.**

*Sierra Madre Corporation, Ltd.*—This English company has bought the Marcotte quartz mine, 8 miles from Washington. Fred. Marcotte has been steadily developing this claim for the past 9 years. A 10-stamp mill is to be erected by the purchaser.

*Poorman & Hastings Claim.*—This claim, in the bed of the Middle Yuba river, near the Delhi quartz mine, is being worked by hydraulic elevator process. After the first rains work will have to cease until low water next year.

*Delhi.*—At this mine, Columbia hill, H. Eddie, superintendent, they are crowding the work of installing the compressor and putting in a new pipe-line and reservoir.

**PLACER COUNTY.**

*Gold Run Gravels, Ltd.*—J. D. Stewart has recently been appointed manager of this company at Gold Run, vice J. E. Doolittle, deceased, and it is expected that work will shortly be resumed.

**SAN BERNARDINO COUNTY.**

*Big Lode Mining & Milling Co.*—This Los Angeles company has purchased two mining locations 3 miles east of Rock Springs and 1 mile north of Old Holcomb Valley. This is some of the property located this summer when there was some excitement over finding nuggets in the "wash." In the same district the Los Angeles Mining Syndicate has bought 10 claims for \$8,000 from Shirley Cummings and Henry Allen.

**SHASTA COUNTY.**

*Uncle Sam and Shasta Copper.*—These mines, known as the Dakin properties, at

Kennett, have been placed under bond to J. W. Neill for Eastern men. The Uncle Sam once belonged to the Sierra Buttes mining company and was a large producer.

**SISKIYOU COUNTY.**

*Eliza & Spencer.*—C. A. Patterson, owning these mines on Humbug, has started his 12-stamp mill, with plenty of ore blocked out in the Eliza. The Spencer mine is to be re-opened at once.

*Ethelyn Mining Co.*—This company has bought and is equipping the Horse Creek placer mine, and a contract has been let to clear out and repair ditches and flumes preparatory to hydrauliclicking.

*Blue Gravel.*—The Seattle Co., which recently purchased this ground on Greenhorn, is preparing to re-open the claims. Litigation has kept the mine idle some years. It paid well when worked.

**SIERRA COUNTY.**

*Mountain Mine.*—This company, near Sierra City, L. H. Carver, superintendent, has acquired the \$38,000 mortgage on the property and paid the back taxes. The 20-stamp mill is running steadily, and 35 men are employed.

**COLORADO.**

**GILPIN COUNTY.**

*Elk Park.*—Pennsylvanians interested will erect new top buildings and instal machinery on their Annie H. property in Pine creek district. C. A. McNeil, Apex, Colo., is manager.

*Mineral Hill Mines Co.*—Denver people are interested in the operation, under lease, of the old Southworth property in Moon gulch, and will erect new shaft building and instal plant of machinery. W. H. Knowles, Rollinsville, Colo., is manager.

*Mining Sale.*—H. Capron, of Rollinsville, Colo., has sold to W. Woodworth, of Ashland, Okla., one-half interest in the 99 group of claims situated north of Rollinsville, near North Beaver creek.

*Old Kentuck Group.*—Samuel Lesem, of New York city, was a visitor this week, and it is reported that his visit will result in the resumption of operations on this group in Hawkeye district, as outside people are now investigating the property.

*Druid Mining Co.*—The present buildings are to be increased, and the improvements include the installation of an air-compressor plant. Paisley, Scotland, people are owners, with C. W. Anderson, Central City, as superintendent, and the property is developing into a regular shipper.

*Goldfield - Homestake Mining Co.*—A new shaft building, 25 by 50 ft., is to be erected on the Gold Retort mine, and a plant of machinery, consisting of 80-h.p. hoisting engine and boiler, will be installed. J. Lyng, Bald Mountain, Colo., is superintendent.

*Straub.*—Arrangements are under way for a resumption of operations at this property, on Gunnell hill, by the Benzie Investment Co., of Denver. J. M. Shrote, 14-15 Nevada Building, Denver, is manager.

## CLEAR CREEK COUNTY.

*Prudential Mining Co.*—The Montgomery-Ward tunnel is to be extended 1,000 ft., and it is reported that a power plant will be erected, at which time machine drills and compressor will be installed. W. C. Hood, Georgetown, Colo., is manager.

*Annetta Mining Co.*—This company, with Eastern backing, controlling the East Griffith property, is reported to be figuring on the erection of a mill at its property near Georgetown. W. D. Hoover, Georgetown, Colo., is manager.

*Centennial.*—Denver people have taken a lease and bond on this claim in East Argentine district, and have made a payment on the property.

*Pay Rock.*—Operations have been resumed on this property by its Denver owners, and with Frank Kendall, of Silver Plume, as manager. The property has been largely worked under the tribute system, and is credited with a production of over \$1,500,000. There is a first-class plant of machinery on the property, and employment will be given to a liberal force of miners.

## SUMMIT COUNTY.

*Summit Mining & Smelting Co.*—An option of \$250,000 has been given on the Delphos group, on Elk mountain, and the Wilfley group and mill, situated in the Ten Mile district, near Kokomo, to Charles W. Buck, of Denver. It is reported that a strong Eastern syndicate will take hold of the entire property, make large improvements and operate along heavy lines.

## BOULDER COUNTY.

*Penn Mining & Milling Co.*—Good ores are being opened on these holdings, and Superintendent W. A. Jumps, of Wall Street, Colo., is authority that they will erect a 10-stamp mill for the treatment of their own ores.

*Virgilla Gold Mining Co.*—The first dividend of 5% has been paid by this company, operating the Ragged Top mine, situated in the Sugar Loaf district.

## LAKE COUNTY.

*Iron Silver Mining Co.*—This company has declared another dividend—No. 43—of 10c. per share. It is payable Nov. 30 to stockholders of record on Nov. 11, when the transfer books close.

## IDAHO.

## SHOSHONE COUNTY.

*Hercules.*—J. B. Adams, the Duluth man who has a bond on 15-32 interest in this mine at Burke, on the basis of \$4,000,-

000, has been visiting the property and sampling the ore. The bond extends six months from Aug. 1, and during its existence dividends accruing will be credited on the purchase price. A payment of only 1% was made down.

*Tamarack & Chesapeake Mining Co.*—

This company, owning a promising silver-lead property in the Cœur d'Alenes, near Burke, is having trouble over title to some of the ground claimed by the corporation. Dr. D. H. Brien, the manager, asserts that the company only owns one claim and two fractions and he sets up title to other claims commonly presumed to be in the group. He says that while all were in the property turned over to the company at its incorporation, the president of the company then refused to do assessment work, and he had to undertake it at his own expense. He has offered to settle for \$5,000 cash and 200,000 shares of stock. The securities have jumped lately from 12 to 30c a share, and there is a strong element in the company, including Harry Day, which is refusing to make a settlement.

## MICHIGAN.

## HOUGHTON COUNTY—COPPER.

*Calumet & Hecla.*—This company makes its December dividend \$15 per share. This compares with \$10 in September and \$10 in December, 1904. This dividend will make the total for this year \$50 per share, against \$40 in 1904 and \$35 in 1903.

## MONTANA.

## POWELL COUNTY.

*New York-Montana Gold Mining Co.*—This company, working the Mammoth mine at Coloma, near Garnett, has commenced shipping ore. The mine is developed to a depth of 270 ft. Some high-grade ore has been opened up. The last shipment consisted of two carloads, and netted \$68.40 per ton.

## SILVER BOW COUNTY.

A despatch from Butte, Nov. 14, says: "Judge Hunt, of the Federal court, has refused to grant Heinze permission to run a crosscut through the Tramway mine to connect the Rarus and Minnie Healey. The Butte & Boston, which owns an interest in the Tramway, objected and the court finds that while the crosscut would be a great convenience for the miners and employees, it is not a necessity."

*Johnstown Mining Co.*—In the United States Circuit Court in New York, Nov. 17, application was made by counsel for this company, which is a Heinze company, for a bill of discovery against the Boston & Montana Consolidated Copper & Silver Mining Co., to enable the first-named corporation to secure evidence that will assist it in prosecuting its suit against the Boston & Montana to recover \$37,000,000 for copper ore which it is contended

the latter company surreptitiously mined from the lower levels of the Johnstown company's property in Butte.

Judge Lacombe reserved his decision, giving the lawyers time to file additional affidavits.

## NEVADA.

## EUREKA COUNTY.

*Beowawe District.*—The old Cortez mine, of Cortez, which produced so much in past years, has been for some time working only a small crew of men. Mr. Godfrey, a mining man of San Francisco, has for several weeks been making an examination of the mine with a view to purchasing.

There is considerable activity, in the Mill Cañon camp, notably the Kyle property, which is making regular shipments of ore, and the John Irvin mine, under lease and bond by Geo. Montanden, which has some carloads of high-grade ore on the dump ready for shipment.

In the old Bullion camp two companies are operating extensively, and also many prospectors are at work doing development work. The Gold Quartz Mining Co., under the management of Geo. M. Anderson as foreman, has recently erected buildings on their property and put a force of men to work doing development work, and are also making shipments of the best grade of ore to the Salt Lake smelters. The Reliance Mining Co., whose ground adjoins the property of the Gold Quartz Co., has reached 100 ft. in depth in one shaft and is preparing to put on a hoist. The lead, which is 8 ft. in thickness, is dipping more nearly vertical at this depth, and the higher grade of ore is being sacked for shipment. The work of the Reliance Co. is under the management of Edward Raleigh, of Salt Lake City.

## OREGON.

## BAKER COUNTY.

*Mayflower.*—This mine in the Cornucopia camp, which made rich strikes during the summer, is now rapidly approaching the time for the opening of its new mill and cyanide plant. Manager Geo. W. Boggs, of the Stampede Mining Co., owner of the property, has just returned from the camp satisfied with the progress of work. A new strike has been made this week in the south workings of the 165 level, where the men for several months have been constantly blocking out the ores from the other shoots discovered in these tunnels and the crosscuts. Samples shown are free gold inlaid in white quartz, and are as handsome specimens as the Cornucopia camps have ever produced. Mr. Boggs reports that the new mill building has been completed, the machinery almost entirely installed and the upper tramway finished, the lower tramway put well under construction, the cyanide building finished and the tanks

well under way. It is expected to get the whole plant in working order before the first of the year.

*Smuggler-Potosi.*—Manager W. E. Hurd, of this group in the Greenhorn camp, 35 miles northwest from Baker City, reports that the big tunnels on both properties are being pushed by contract work. About 1,800 ft. of work has been done on the Potosi and 1,000 ft. on the Smuggler. Mr. Hurd says he will block out his ore before putting on machinery.

*Chelan Group.*—Contractors are driving the tunnel on this group in the Red Boy camp, 14 miles north of Sumpter, the property of W. E. Hurd. About 1,000 ft. of work has already been done on this group, and it will be pushed during the winter.

*United Elkhorn.*—Remarkable results have been obtained in the United Elkhorn mines by Manager Edward I. Field. On the 500-level the ledge is opened up on an average of 16 ft. and on the level immediately above that 12 ft. of ore is in sight and sufficient blocked out to run the mill for over a year. Sixty-four men are at work in the mine, 50 men and 50 teams on top. The concentrates from the mill are hauled by teams to the shipping station in Baker for the Sumpter smelter. These concentrates run better than \$100 to the ton, and the shipments are averaging more than 20 tons a day. Work is progressing on the 8,000-ft. tunnel, which it is hoped to complete in another year.

## SOUTH DAKOTA.

### CUSTER COUNTY.

*Saginaw.*—The new vein of ore encountered at the 300-ft. level in the Saginaw shaft has been widened to 9 ft., and the general average is \$12 a ton. The same vein has been encountered in an 80-ft. drift from the 200 ft. level. The company has enclosed all of its buildings and is prepared to go to the 500-ft. level. L. P. Woodbury, of Custer, is general manager, and J. J. Berry, of the Berry-Maybrun Co., Chicago, is the secretary.

*Ruberta.*—Preparations are being made to complete the cyanide plant at this mine. W. W. Olds, of Custer, is general manager.

### LAWRENCE COUNTY.

*Homestake South Extension Co.*—A steam hoisting plant has been purchased and will be installed immediately. A double-compartment shaft has been started, to be sunk 200 ft. A. H. Oleson, of Deadwood, is general manager.

*Iron Creek Mining Co.*—This company is sinking a shaft on the property adjoining the Deer Lick mine. The shaft is 75 ft. deep.

*Imperial Co.*—New development work on the old McGovern ground by this company has opened up a second contact of ore under the Reindeer shoot.

## WYOMING.

The State authorities have taken steps to suppress the publication of misleading mining prospectuses. The most recent offender is the North Platte Copper Mining Co., against whom State Geologist H. C. Beeler will testify in a suit in Philadelphia. Another company in the Grand Encampment district has been compelled to recall and destroy its circulars containing misrepresentations of fact.

## Foreign Mining News.

### CANADA.

#### ONTARIO.

*Bannockburn Gold Mine.*—Theodore H. Dimon, of Rochester, N. Y., president of this company, writes us to correct a statement made in our Toronto correspondence. He says: "The mine is known as the Bannockburn gold mine. Instead of the main shaft being 40 ft. in depth, it is now 70 ft. in depth, 7 by 12, and is to be sunk 100 ft. further before we drift. Over this shaft, known as the south shaft, is a shaft-house 50 ft. high, well equipped with ore-sorting rooms, ore-bins, steam hoist, Cameron sinking pumps, etc. We are sinking on a true fissure contact vein, with a slate for the foot-wall, and a granite for the hanging wall. The gangue is a blue quartz in stringers and lenses through the schist between the vein walls, and seems to be uniting with depth. In sinking, there has been some very rich ore, showing visible gold, taken out and sulphide averaging \$50 to the ton. At 64 ft., a floor of granite intruded through the vein, and beneath this one shot threw out several hundred dollars in visible gold, one piece carry 10 oz. regularly distributed through the quartz and schist, another piece 3 oz., etc. For several feet below this, we went through black rock, with no quartz showing, but at 70 ft. are coming into ore again, one stringer showing visible gold through its center."

### ASIA.

#### INDIA—MYSORE.

*Kolar Goldfield.*—The gold production of the mines on the Kolar Goldfield, and one outside mine (the Hutti Nizam's) for October was 52,291 oz., an increase of 252 oz. on the returns for the previous month. The total yield for the ten months of this year amounts to 522,308 oz. bullion, as compared with 512,484 oz. for the same period last year. The bullion reported this year was equal to 470,977 oz. fine gold.

#### KOREA.

The Korean government has granted an extensive mining concession to the Korean Syndicate, London. The area embraced is 20 miles by 14 miles. The area contains the famous Suan gold mine. This is the first mining concession granted under the new régime.

## SOUTH AMERICA.

### DUTCH GUIANA.

The Mines Department reports the production of gold in the colony for September at 71,584 grams. For the nine months ending Sept. 30 the total was 749,129 grams; equal to 24,047 oz. gold.

## Coal Trade Review.

NEW YORK, Nov. 22.

### ANTHRACITE.

The hard-coal market continues brisk, although it cannot yet be said to have attained a condition of unusual strength. Coal is disposed of immediately upon its arrival at tidewater, although no especial shortage has yet developed. The steam sizes are in strong demand, for the purpose, it is supposed, of laying by supplies for the winter. The price of these coals remains steady, and nothing has yet caused any premium on the domestic sizes. Car supply is exceedingly short, many mines having to run on part time for this reason. Wholesale prices remain as follows: \$4.75 for broken and \$5 for domestic sizes. 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.

Trade along the Atlantic seaboard is holding its own better than it has for some time. The supply arriving at tidewater is a little better, but producers are no more than keeping up with the demand, because orders which they have been able to fill are offset by new inquiries. It has developed into a question of car supply; if this remains somewhere near the needs of shippers, the situation will be saved, but any further diminution will entail just so much more pressure. No immediate alleviation is expected.

Trade in the far East is absorbing a large quantity of coal, consumers apparently desiring to fill their storage capacity to the limit and keep it there. Along the Sound, trade is a little easier than it has been, but demand, particularly for specialties, is exceedingly strong. New York harbor is suffering a shortage; in general there is no stock anywhere to work with. Prices are about \$2.80@\$2.90 f. o. b. New York harbor shipping points for ordinary steam grades.

All-rail trade is calling for more coal than producers will allow. On this business, \$1.50 at mine is readily obtained for any steam grade. Car supply is short of demand, and everybody is looking for a further reduction. Transportation is fairly good.

Vessels in the coastwise trade show a large supply of big boats but a scarcity of small ones. Rates have remained steady for some weeks at the following quotations: To Boston, Salem and Port-

land, 80c.; to Lynn, Newburyport, Gardner and Bangor, \$1; to Portsmouth and Bath, 85¢@90c.; to the Sound, 70¢@75c.; to Saco, \$1.10 and towages.

## COAL TRAFFIC NOTES.

Shipments of anthracite coal in October and the 10 months ending Oct. 31 were as follows, in long tons:

	1904.		1905.	
	Tons.	Per Ct.	Tons.	Per Ct.
Reading.....	9,328,635	19.7	10,408,312	20.6
Lehigh Valley.....	7,840,646	16.6	8,299,353	16.4
N. J. Central.....	5,989,910	12.7	6,579,344	13.0
Lackawanna.....	7,671,039	16.2	7,706,734	15.2
Del. & Hudson.....	4,363,538	9.2	4,727,674	9.3
Pennsylvania.....	3,939,913	8.3	4,022,458	8.0
Erie.....	4,721,064	10.0	5,160,687	10.2
N. Y., Ont. & W.....	2,171,041	4.6	2,358,837	4.7
Del., Sus. & Schuyl..	1,279,504	2.7	1,330,105	2.6
Total.....	47,303,310	100.0	50,593,504	100.0

The tonnage of the Delaware, Susquehanna & Schuylkill—better known as Coxe Brothers & Co.—will probably be included with the Lehigh Valley hereafter. The total increase for the 10 months was 3,288,194 tons, or 7%, this year.

**Birmingham.** Nov. 20.

The coal production in Alabama is increasing and a notable improvement in the output is reported from the Pratt mines division of the Tennessee Coal, Iron & Railroad Co., which heretofore has been affected by the strike of the union miners. The Tennessee Co. reports a production of 922 tons at No. 4 mines, Pratt City, the largest single day's output since 1901.

The report of the Alabama Car Service Association shows that more than 6,000 cars were handled in October, 1905, over the number handled a year previous. Last month the railroads reporting through the Car Service showed 69,859 cars handled.

**Chicago.** Nov. 20.

The coal market continues very firm. Supplies are short, and the demand is increasing every day. Western bituminous is in such demand that shipments are being confiscated, and manufacturers, expressing anxiety about their winter supplies, are buying as much as they can on spot deliveries. There was a general reluctance of consumers last spring to enter into contracts, because of the loose and flabby condition of the market. Consequently there is more than usual activity outside of the contract business.

Speculative tendencies continue, with comparatively high prices for bituminous. A variation of 10¢@25c. from day to day in quotations is common. So far as the best-informed men in the trade seem able to see, this state of things will continue up to the first of the new year. Western mines are working only one-half to two-thirds of the time, and there are few stocks of coal anywhere in Chicago territory.

Demand for anthracite continues to increase, and it is only a question of a little time before really cold weather taxes all

the facilities of the trade and the railroads for prompt shipments. As it is, every little cold wave sends a lot of orders into wholesale offices, showing that retailers, in both city and country, are doing business without any stocks to speak of.

Smokeless is variable in quotations, depending on the supplies, and in very good demand. Run-of-mine brings \$3.30@3.50. Hocking is in large demand and small supply, with lump at \$3.40@3.85, and the tendency toward higher prices. Youghiogheny is in active demand, owing to the scarcity of shipments; three-quarter coal bringing \$3.40.

Illinois and Indiana bring \$2.50@2.85 for lump and egg; \$2@2.45 for run-of-mine, and \$1.35@1.75 for screenings. Fine coals, heretofore weakest, have strengthened notably.

Anthracite supplies at the docks are fairly heavy, and promise to be up to normal by the end of the navigation season. Chestnut continues to be in greatest demand and short supply.

**Cleveland.** Nov. 21.

All through the coal market the question of cars is the ruling factor. Productive capacity, if actively engaged, would more than fill all normal wants of the market. In the absence of anything like an adequate supply of cars there is nothing for the operators to do but run their mines short of their capacity, thus cutting down the available supply for the open market.

The demand for steam coal is on the increase in this territory, and it is a bull market. The price of Ohio run-of-mine has gone to \$1.15, with higher prices in sight for the immediate future. The price of slack has also been marked up, Ohio selling at 75¢@80c. at the mines; Pennsylvania 70¢@75c. at the mines. The supply is short.

The shortage of coke is one of the puzzling spots in the market. For spot shipment the best grades of 72-hour foundry coke are selling at \$4 at the oven, although contracts running through the first half of the year are possible on the basis of \$3.90 at the oven. The best grades of furnace coke are selling at \$3.25@3.50 at the oven.

**Pittsburg.** Nov. 21.

*Coal.*—The car shortage this week has caused a number of mines to suspend operations, but all of the river mines are running full, and more empty barges arrived during the past few days. The rivers almost reached a shipping stage, and preparations were made for sending out a number of tows. Prices are firmer than at any time during the year, the minimum rate being \$1.20 a ton at the mine for run-of-mine coal and the customary differential of 10c. a ton for other grades. Slack is higher, being quoted at 85c. a ton. The

meeting of bituminous coal operators in Chicago tomorrow promises to be well attended, but none of the Pittsburg coal interests will be represented. The object of the meeting is to form an organization, but its promoters say it will not participate in the joint conference at Indianapolis in January, when the mining rate is adjusted. It is reported that this is one of the chief objections of the proposed federation of bituminous operators.

*Connellsville Coke.*—There is but little change in the coke situation. Shipments are a trifle lower on account of a shortage of railroad cars, but prices remain about the same, furnace coke being quoted at \$3@3.10 a ton for delivery this year and \$3 a ton for next year. Foundry coke is quoted at \$3.50 a ton for any delivery, although premiums have been made for small tonnages for prompt shipment. The production for the week in the Connellsville region was 272,306 tons, and the shipments aggregated 11,721 cars, distributed as follows: To Pittsburg and river points, 4,215 cars; to points west of Pittsburg, 6,233 cars; to points east of Everson, 1,273 cars. The combined shipments from the Connellsville and Masontown fields amounted to 345,118 tons.

**San Francisco.** Nov. 16.

The market continues steady, with no noticeable change, either in demand or in prices asked.

For coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, \$8; Roslyn, \$7; Seattle and Bryant, \$6.50; Beaver Hill and Coos Bay, \$5.50; White Ash, \$5.25. For Rocky Mountain coals, in car lots, quotations are: Colorado anthracite, \$14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, \$8.50. Eastern coals are nominal at \$14 for Pennsylvania anthracite, and \$13 for Cumberland. For foreign coal quotations are, ex-ship: Welsh anthracite, \$13; cannel, \$8.50; Wellsend and Brymbo, \$7.50 per ton.

**Foreign Coal Trade.**

Nov. 22.

United States Vice-Consul-General Gorman, of Montreal, reports that Canadian manufacturers have started a movement with a view of obtaining coal from Wales, and have had experiments made to ascertain its value, compared with the product of the United States. He writes: "Some months ago the Canadian Manufacturers' Association shipped to coal owners in Wales samples of six different grades of coal. These samples were of coal such as is used every day in the factories in Canada, and were imported from the United States. The English collieries requested the coal for testing purposes, and to ascertain whether or not coal of similar



properties could be delivered to points in Canada, at prices to compete with the prices for which the United States coal was sold. The investigations are still being carried on, and the feasibility of the project has not been decided."

Exports of fuel from Great Britain for the 10 months ending Oct. 31 are reported as follows, in long tons:

	1904.	1905.	Changes.
Coal.....	38,559,640	39,472,736	I. 913,096
Coke.....	611,782	610,279	D. 1,503
Briquettes.....	1,059,992	947,361	D. 112,631
Total.....	40,231,414	41,030,376	I. 798,962

In addition to these exports, the coal sent abroad for the use of steamships in foreign trade was 14,394,306 tons in 1904, and 14,480,308 tons in 1905; an increase of 86,002 tons. The total fuel consumed beyond the limits of the United Kingdom this year was 55,510,684 tons.

Exports of coal to the United States, included above, were as follows:

	1904.	1905.	Changes.
Pacific ports.....	74,272	75,160	I. 888
Atlantic ports.....	26,606	49,354	I. 22,748
Total.....	100,878	124,514	I. 23,636

There was an increase this year, but the total quantity was not large.

### Iron Trade Review.

NEW YORK, Nov. 22.

Reports from the leading centers of the trade indicate rather a lull in the rush to buy material. This was to be expected after the active buying of the past few weeks, and is not unwelcome to producers, as it gives them a chance to take breath and see where they stand. It is not at all improbable that this lull may last for several weeks, bringing us well on toward the close of the year.

The United States Steel Corporation has bought more pig iron from outsiders, but apparently has not filled all its requirements. Its purchases set a new high price for bessemer and basic iron. Foundry grades seem to be up also, and some people are looking for a further rise.

In finished material the heaviest business has been in plates, which are needed by the steel-car builders and by the Lake ship-building yards. Structural steel has quieted down a little, though there are still requirements to be filled.

The flurry in ferromanganese continues, and prices are likely to go still higher, owing to the short supply of manganese ore. Russian shipments of ore have been cut off by the troubles in that country, and no new supplies are immediately available.

The New York Supreme Court has made permanent the injunction against the letting of the contract for the new Manhattan bridge over the East River to the Pennsylvania Steel Co. This is a large contract, involving about \$7,000,000. An appeal will be taken, but in any case the contract will be tied up for several months.

Birmingham. Nov. 20.

The available iron in the Birmingham district is rather limited, in fact none of the companies here are able to deliver on orders booked recently within the next two months at least. A few lots, from 50 to 150 tons to the lot, have been sold in the last few days as spot iron, and the best of prices obtain. No. 2 foundry, in small lots, has sold in this district as high as \$15 per ton, and it is believed that this price will be the regulation quotation during the coming week.

Some sales are being made in this district for delivery during the second quarter of the year. The furnaces expect to have a large quantity of iron for delivery during this period, and offers of business are being entertained. The quotations are around \$14 per ton for No. 2 foundry for delivery during the coming year. At this price the Alabama furnaces will make good profits.

The following quotations prevail in this district: No. 1 foundry, \$15@15.50; No. 2 foundry, \$14.50@15; No. 3 foundry, \$13.50@14; No. 4 foundry, \$13@13.50; gray forge, \$12.50; No. 1 soft, \$15; No. 2 soft, \$14.50@15.

Chicago. Nov. 20.

The last week has seen a jump in the local demand for iron, and prices of both Northern and Southern have advanced materially. To all appearances, the present firmness and heavy demand for both pig iron and finished products will continue up to the close of the year, repeating the experience of 1904. There is a scarcity of iron for early deliveries, and prices seem very likely to advance.

Northern iron is now selling for \$19@20 for No. 2 foundry, with other grades in proportion. Southern brings \$14.50@15 Birmingham for No. 2. Lake Superior charcoal is readily sold when available, at \$19.50@20.

Finished materials are active and strong. Railroad supplies alone are not in so great demand as a month ago, but sales are still heavy and the indications are for continued strength.

Coke is in active demand, with prices about the same as last week, Connellsville 72-hour bringing \$3.75@4 at the ovens, or \$6.40@6.65 Chicago. Southern foundry coke brings \$6.40@6.60 Chicago.

Cleveland. Nov. 21.

Iron Ore.—The shortage of boats, due to the demand from other quarters of the market, has advanced the wild rate on ore to \$1.25 from the head of the lakes, which has been paid in a few instances. The use of wild boats is limited by the car shortage and the fact that most of the shippers are about cleaning up for the year. They have only a few more cargoes to be moved, other than those which will

move in contract boats. The shipment is strong. Some few sales have been made on the basis of \$4 f. o. b. Lake Erie docks for bessemer Old Range for next year's delivery, but it is hardly believed that any considerable volume of the business will move for less than \$4.25.

Pig Iron.—Foundry iron for quick shipment is scarce for the present, with producers able to command almost any price. No iron is now selling for less than \$18 in the Valleys for No. 2, for either quick shipment or through the first quarter. A little iron is for sale for first half delivery at \$17.50, but most of the furnaces are holding for \$18, although they have a good deal of material yet to be sold for second-quarter delivery. Bessemer, basic and malleable are extremely scarce. The price holds now about \$17.25@17.50 in the Valleys.

Finished Material.—The market is unusually strong. Sheets, which have been weak, have moved up \$1 a ton on blue annealed and \$2 a ton on the other products. The stock prices on blue annealed have not been changed, but those on one-pass cold-rolled and galvanized have been advanced. Bar iron is a ready seller at 1.25c.@1.80c. at mill, Youngstown, with few mills having any for sale through the first half of next year. Billets are extremely scarce, with buyers anxious to pay almost any price. Some forging quality have sold as high as \$32@33 at mill. Plates are in better demand, due to increased buying by the ship interests. On all lines of material specifications against old contracts are extremely heavy.

New York. Nov. 22.

Pig Iron.—A large business is still in sight, but for the moment comparatively little is doing. Most large buyers are supplied for the time, and there is rather a lull. Apparently this condition is only temporary.

For Northern iron in large lots, we quote: No. 1X, \$18.75; No. 2X, \$18.25; No. 2 plain, \$17.50@17.75; forge, \$16.50@17. Basic is still in demand; \$17.75 is asked for Alabama, and 25c. less for Northern. Virginia foundry is held around \$18.60 for No. 1 and \$18.10 for No. 2. For Southern iron, on dock, quotations are higher: No. 1 foundry, \$18.75; No. 2, \$18.25; No. 3, \$17.50; No. 4, \$17; No. 1 soft, \$18.75; No. 2 soft, \$18.25; gray forge, \$16.50; No. 2 foundry and No. 2 soft are still rather scarce.

A little more business was done in the warrant market on the Produce Exchange. Late quotations are: December delivery, \$17.35 bid, \$17.75 asked, for regular warrants; \$17.10 bid, \$17.60 asked, for foundry warrants.

Cast-Iron Pipe.—Business continues good. Quotations are: \$27.50 per net ton, carload lots at tidewater, for 6-in. pipe. Higher prices are expected.

**Bars.**—Business is good and prices firm. Iron bars are 1.795c., tidewater, for plain, and 1.845c. for refined. Steel bars are 1.745c., tidewater. Store trade is good, with 2.25c. the current price, but premiums are asked on special deliveries.

**Plates.**—Steel plates are still in strong demand. Tank plates are 1.745@1.825c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745c. up, according to width. For early delivery premiums are asked, depending on the necessities of buyers. Nearly all business is on a premium basis.

**Structural Material.**—Small orders continue to come in, and deliveries are uncertain. Prices are nominally unchanged. Beams under 15-in. are 1.845c. for large lots; over 15-in., 1.895c.; angles and channels, 1.845c., tidewater delivery. Premiums are asked on special deliveries.

**Tin-plates.**—A general advance has been made, of 10c. per box, to a \$3.40 base price.

**Steel Rails.**—No change in standard sections. Light rails are in demand, prices ranging from \$25 for 35-lb., up to \$32 for 12-lb. rails.

**Old Material.**—Demand is strong, and prices are firm. No. 1 railroad wrought is \$22@23; No. 1 yard wrought, \$20@21; machinery cast, \$14.50@15; heavy steel melting scrap, \$18@18.50. These prices are on cars, Jersey City or other terminal delivery.

#### Philadelphia. Nov. 22.

**Pig Iron.**—The past week was the first quiet week in pig iron we have had for a long time. The furnace companies are glad of the opportunity to find out where they are, and they are now chiefly concerned with taking care of the business they have secured. Quotations remain where they were last week, and very few inquiries have been made, though it is known that there are several parties in eastern Pennsylvania who would be willing to purchase more heavily if the prices were a little lower. It is believed that from now on much less iron will be sold and that things will quiet down. Prices for No. 2X are quoted today at \$18.50; No. 2 plain at \$18; Southern No. 2, \$18.50; standard gray forge, \$16.50; and low phosphorus, \$24.

**Steel Billets.**—The billet makers are endeavoring to retire from the market and wait to see how things go. Ordinary billets are quoted as high as \$30.50, and no heavy business has been heard of since last week. There has been some business in forging billets, and \$38 was paid for two or three lots.

**Muck Bars.**—Muck bars are selling better than for several weeks, at \$28 the present asking price.

**Bars.**—The bar-iron market is fairly active; business is plenty and premium

prices is the rule for fully over 50% of the business.

**Sheets.**—The sheet market is very strong, and there is not the slightest possibility of obtaining any concession, no matter how big the order. At least this is what the sheet-iron people say.

**Pipes and Tubes.**—The tube market is very active and business is being sent to the mills very frequently.

**Merchant Pipe.**—Merchant pipe is the only weak article on the market, but concessions are extended only to buyers of very large quantities.

**Plates.**—The plate market is extremely active and the steel-car builders are virtually monopolizing the output. Steel plates are in extremely urgent demand and large orders are awaiting acceptance.

**Structural Material.**—The structural market is stronger than ever and orders for very large lots are coming in; the figures that are given as representing the sales of the past week look almost incredible, but the manufacturers say they are doing the business.

**Steel Rails.**—The feature of the market at present is the inquiries that are being made for material for electric roads.

**Old Material.**—Large sales are being made of all kinds of old material, and the scrap dealers say they are commanding their own prices. Almost everything in the scrap line is selling. No. 1 steel scrap is quoted at \$18; machinery scrap, \$16.50; old car wheels nominally \$17.50; old iron rails, \$25; choice railroad scrap, \$23.50; and phosphorus scrap the same figure.

#### Pittsburg. Nov. 21.

The pig-iron market has not been particularly active, but a number of small transactions have been made and it is reported the Midvale Steel Co. bought 6,500 tons of bessemer, at prices ranging from \$17.25 to \$17.50, Valley furnaces. While the report has not been officially confirmed, it is known the company was in the market and did get some of the iron. Furnaces are not anxious to sell for first quarter at this time, and inability to agree on a price is said to have been responsible for tying up a large deal with the United States Steel Corporation. The sale of 50,000 tons of bessemer at \$17, Valley, was practically closed early last week, but the contract was not signed, as the Corporation, according to reports, wanted a greater tonnage at the price named, which the Bessemer Pig Iron Association was not inclined to concede. It is said the Corporation agreed to take 150,000 tons for delivery through the first quarter at the \$17 rate, contending that if only a part of it was taken the price would immediately advance and it would be forced to pay a higher price for the additional

tonnage. The production of pig iron is unusually heavy, and none is being piled. According to the latest reports and estimates it is now confidently believed that the production for the year will reach 23,000,000 tons, or about 5,000,000 tons in excess of the record, which was in 1903. The iron is going into consumption, indicating an enormous steel production. There is a heavier demand for iron and steel scrap and prices are advancing, the minimum for heavy melting stock being \$18. There is scarcely any ferromanganese available, and unless there is an improvement in production, \$100 may be offered before the end of the year. Two small sales were made this week, one for November and the other for December delivery at \$90 a ton, an advance of \$15 a ton within a week. The scarcity is due chiefly to the curtailment of the supply of ore on account of the troubles in Russia.

All the steel mills in this district are being operated to capacity, and new records of production are being made almost daily. Despite the heavy output, they are unable to keep up with specifications on a number of important lines, principally plates, steel bars and structural material. New business is being booked in these lines, but the tonnage is not great and premiums are paid on small lots for early shipment. Additional steel-rail orders are coming in and the new year will open with over 2,000,000 tons on the books. The demand for light rails is increasing and prices are advancing, sections from 25 to 45 lb. being quoted this week at \$26.50, and \$1 a ton premium is offered for prompt deliveries. An advance of \$2 a ton was ordered by the American Sheet & Tin-Plate Co. on sheets and 10c. a box on tin-plate, and 10c. a square on roofing sheets. The net minimum price of black sheets is now 2.30c. and on galvanized 3.35c. for No. 28 gauge. Roofing, in ordinary carload lots, is now \$1.70 on painted and \$2.95 on galvanized per square. The "official" price of tin-plate established on Dec. 22, 1904, was \$3.55 a box, but sales are not, and have not been made at that price, the market being \$3.25 a box. The leading interest has not put all of its mills in operation as was expected, and is not running more than 70% of its capacity. An advance in prices of plates, merchant steel bars, hoops and bands may be ordered at any time, as the market is very strong. Merchant pipe shows some improvement, as many important orders have been booked, but prices continue very low.

The Ohl syndicate, as it is known, is reported to have secured options on the majority of the stock of the La Belle Iron Works, but there has been no announcement as to what interests are connected with the proposed deal. The latest rumors are that the Jones & Laughlin Steel Co. and the Wheeling Steel & Iron Co. are



**Metal Market.**

New York, Nov. 22

**Gold and Silver Exports and Imports.**

At all United States Ports in Oct. and Year.

Metal.	October.		Year.	
	1904.	1905.	1904	1905.
G <sup>ld</sup> Exp	\$3,855,649	\$305,124	\$86,995,557	\$42,985,045
Imp	8,045,375	10,928,279	76,789,945	41,266,451
Exc	I. \$4 189,626	I. \$10,623,255	E. \$10,155 612	E. \$1,716,564
Silv. Exp	3,485,098	4,508,726	42,615,018	43,931,936
Imp	1,717,114	2,089,358	21,394,345	26,596,856
Exc	E. \$1,767,984	E. \$2,419,368	E. \$21,920,673	\$17,355,580

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 Exports and Imports, N.Y.**

For the week ending November 18, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	1 000	\$31,514	\$619,286	\$69,246
1905.....	34,510,503	10,514,083	30,640,660	3,930,765
1904.....	31,273,487	5,732,788	32,161,854	945,350
1903.....	31,631,185	9,132,655	26,696,983	3,193,069

Exports of silver for the week were chiefly to London. Imports were from the West Indies and Mexico.

Exports of merchandise from the United States in October are valued by the Bureau of Statistics of the Department of Commerce and Labor at \$154,398,871; being \$18,415,055 more than in September, but \$8,129,072 less than in October, 1904. For the ten months ending Oct. 31, the statement is as follows:

Exports.....	\$1,147,996,824	\$1,256,950,246
Imports.....	844,172,259	979,987,820
Excess, exports....	\$303,824,565	\$276,962,426
Add excess of exports, silver.....	17,355,580	
" " gold.....	1,716,564	
Total export balance.....	\$296,034,570	

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending Nov. 18 gives the following totals, comparison being made with the corresponding week of 1904.

	1904.	1905.
Loans and discounts....	\$1,112,710,700	\$1,017,083,600
Deposits.....	1,159,877,600	999,069,999
Circulation.....	42,188,500	54,689,900
Specie.....	223,918,400	179,607,300
Legal tenders.....	75,640,700	73,075,100
Total reserve.....	\$299,559,100	\$252,682,400
Legal requirements....	289,969,400	249,767,250
Balance surplus.....	\$9,589,700	\$2,915,150

The deficiency in reserve has been made good, and this week shows a small surplus. Changes for the week this year were increases of \$690,500 in legal tenders and \$378,200 in circulation; decreases of \$27,204,200 in loans, \$2,659,000 in specie and \$29,249,800 in deposits.

The following table shows the specie holdings of the leading banks of the

world. The amounts are reduced to dollars:

	Gold.	Silver.
New York Associated.....	\$179,607,200	
England.....	162,730,020	
France.....	574,878,385	\$218,264,015
Germany.....	157,025,000	52,340,000
Spain.....	74,920,000	112,145,000
Netherlands.....	33,000,500	29,768,000
Belgium.....	16,443,335	8,226,665
Italy.....	126,160,000	15,797,500
Russia.....	574,625,000	18,820,000
Austria.....	225,570,000	58,520,000

The returns of the Associated Banks of New York are of date Nov. 18, and the others Nov. 17. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York.

The movement of gold in Great Britain for the 10 months ending Oct. 31 was as follows:

	1904.	1905.
Imports.....	£27,958,889	£32,061,624
Exports.....	24 719,722	25,569,643
Excess imports.....	£3,239,167	£6,491,981

Shipments of silver from London to the East for the year up to Nov. 9 are as follows:

	1904.	1905.	Changes.
India.....	£8,564,568	£5,309,621	D. £3,254,947
China.....	372,722	804,246	I. 431,524
Straits.....	58,103	38,299	D. 19,804
Totals.....	£8,995,393	£6,155,166	D. £2,843,227

Receipts for the week were £3,100 from Australia, £7,600 from the West Indies and £201,600 from New York; a total of £212,300. Exports were £400 to Egypt and £183,800 to India; £184,200 in all.

Indian exchange has been firm, and all the Council bills offered in London were taken at an average of 16.03d. per rupee. Buying of silver for India continues fair, and there have been heavy exports to Russia.

Silver for the past week has shown unusual strength. The demand for November delivery has been beyond the supply, and the price has touched the highest figure reached in five years. The market closes slightly easier, but with a good undertone.

**Prices of Foreign Coins**

	Bid.	Asked.
Mexican dollars.....	\$0.49½	\$0.50½
Peruvian soles and Chilean pesos..	.45½	.47
Victoria sovereigns.....	4.86½	4.87½
Twenty francs.....	3.87	3.90
Spanish 25 pesetas.....	4.78	4.82

**SILVER AND STERLING EXCHANGE.**

Nov.	Sterling Exchange.	Silver.		Nov.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
16	4.85½	64	29 27/8	20	4.8630	64½	29½
17	4.86½	64¼	29 11/8	21	4.8620	64½	29 11/8
18	4.86¼	64	29 7/8	22	4.8615	64½	29 11/8

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.**

Nov.	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.
16	16½	16½	75½	83½	5.25	6.05	5.90
17	16½	16½	75½	83½	5.25	6.10	5.95
18	16½	16½	.....	83½	5.25	6.10	5.95
20	16½	16½	75½	83½	5.25	6.15	6.00
21	16½	16½	75½	83½	5.25	6.10	5.95
22	16½	16½	75½	83½	5.25	6.10	5.95

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.

**Copper.**—The market is retaining all the characteristics which have distinguished it during the past few weeks. Supplies for near shipment continue to be exceedingly scarce, and there has again been a good business done, both for home trade and export for shipment during the early part of next year. Consumption the world over is unprecedentedly large, and under conditions like the present producers of copper have every reason to look with a great deal of complacency into the future. The market closes again higher at 16½@17c. for Lake; 16¾@16½c. for electrolytic in ingots, cakes and wirebars; 16¼@16½c. for casting copper.

The backwardation between the prompt and future positions of the standard market has been reduced somewhat through a steady advance in the three months' price, while the spot price has remained about stationary. Quotations at the close are £75 12s. 6d. for spot, £73 12s. 6d. for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 400 tons.

Refined and manufactured sorts we quote: English tough, £76 15s.; best selected, £77 10s.; strong sheets, £86; India sheets, £81; yellow metal, 7¾d.

Imports of copper and copper material into Great Britain, with exports—including re-exports of foreign metal—are reported as below for the 10 months ending Oct. 31, in long tons; the totals giving the contents of all material, in fine copper:

	1904.	1905.	Changes.
Copper ore.....	69,816	77,126	I. 7,310
Matte and precipitate.....	55,227	54,702	D. 525
Fine copper.....	76,230	59,429	D. 16,801
Total imports copper.....	110 826	94,492	D. 16,334
Exports.....	41,992	43,059	I. 1,067
Re-exports.....	6,904	11,914	I. 5,010
Total exports.....	48,896	54,973	I. 6,077
Balance.....	61,930	39,519	D. 22,411

Of the imports this year 486 tons of ore, 3,925 tons of matte, and 24,795 tons of fine

copper were from the United States; which compares with 188 tons of ore, 4,091 tons of matte and 40,443 tons of fine copper last year.

Exports of copper from New York for the week were reported at 3,413 long tons. Our special correspondent reports the exports from Baltimore for the week at 861 long tons of fine copper.

**Tin.**—A very good business has been doing in this metal, and the demand is so heavy that quotations have been well maintained; in fact, the opinion prevails that prices will be still higher. We quote at the close 33½@33⅝, depending upon deliveries.

The London market has fluctuated within narrow limits during the early part of the week, but at the close it shows an advance of about £1, the quotations being £153 7s. 6d. for spot, £152 7s. 6d. for three months.

Imports of tin into Great Britain, with re-exports of foreign metal, for the 10 months ending Oct. 31 are reported as follows, in long tons:

	1904.	1905.	Changes.
Straits.....	25,775	26,876	I. 1,101
Australia.....	3,476	3,319	D. 157
Other countries.....	2,075	1,797	D. 278
Total imports.....	31,326	31,992	I. 666
Re-exports.....	22,893	23,561	I. 668
Net imports.....	8,433	8,431	D. 2

The greater part of the re-exports is Straits tin sent to the United States.

**Lead.**—The American Smelting & Refining Co. raised its price during the week to 5.25 New York, 5.17½c. St. Louis. The inquiry continues unabated at the higher quotations, which latter were certainly justified by the market conditions.

The London market is steady and closes at £15 8s. 9d. for Spanish lead, £15 10s. for English lead.

Imports and exports of lead in Great Britain for the 10 months ending Oct. 31 are reported as follows, in long tons:

	1904.	1905.	Changes.
United States.....	31,133	21,490	D. 9,643
Spain.....	91,867	85,100	D. 6,767
Australia.....	59,760	60,246	I. 486
Germany.....	14,064	16,506	I. 2,443
Other countries.....	7,156	2,856	D. 4,300
Total imports.....	203,979	186,198	D. 17,781
Export.....	29,200	35,446	I. 6,246
Balance.....	174,779	150,752	D. 24,027

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

**St. Louis Lead Market.**—The John Wahl Commission Co. telegraphs us as follows: Lead is strong and again higher. Latest sales are on a basis of about 5.40c., East St. Louis.

**Spanish Lead Market.**—Messrs. Barrington & Holt write from Cartagena, Spain, under date of Nov. 4, that silver has been 14.75 reales per quintal. Exchange is 32.34 pesetas to £1. Pig lead has been 79.75 reales per quintal; equal, on current exchange to £13 15s. 11d. per long ton, f. o. b. Cartagena. Shipments were 122 tons argentiferous to Marseilles, and 860 tons desilverized lead to Odessa.

**Spelter.**—So far, this metal has not shared in the general activity, which is somewhat surprising in view of the heavy consumption for galvanizing and brass purposes. During the last few days the inquiry has improved somewhat and the market closes steady at 6.10@6.15 New York, 5.95@6c. St. Louis.

The London market showed some weakness during the week, declining at one time to £28 2s. 6d., but the close is firmer at £28 10s. for good ordinaries, £28 15s. for specials.

Imports and exports of spelter in Great Britain for the 10 months ending Oct. 31 were as follows, in long tons:

	1904.	1905.	Changes.
Spelter.....	72,593	72,012	D. 581
Zinc sheets, etc.....	18,784	16,784	D. 2,000
Total imports.....	91,377	88,796	D. 2,581
Exports.....	6,626	6,633	I. 7
Net imports.....	84,751	82,163	D. 2,588

Imports of zinc ores are not reported separately.

**St. Louis Spelter Market.**—The John Wahl Commission Co. telegraphs us as follows: Spelter is quiet, at about 5.97½@6c., East St. Louis.

**Spanish Zinc Ore Market.**—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Nov. 4, that prices are nominally unchanged at 95 fr. for blende, 35% zinc, and 72 fr. for calamine, 30% zinc. Higher prices are looked for, as the demand is very strong.

**Zinc Sheets.**—Sheet zinc is quoted at \$7.50 per 100 lb. (less discount of 8%), f. o. b. cars Lasalle and Peru, in 600-lb. casks, for gauges 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 January 1, 1905, have been as follows: December 30, 1904, \$7.25; January 7, 1905, \$7.50; May 12, \$7.25; June 1, \$7; July 29, \$7.25; August 10, \$7.50. The demand is reported active.

**Antimony.**—The market for this metal is very much firmer, and a premium is asked for prompt shipments, as supplies on the spot are very much reduced. Quotations are 11½@13c., depending upon brands and deliveries.

**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 48 up to 60c., also according to size of order and deliveries.

**Platinum.**—Quotations are firm at \$20.50 per oz. Gas-engine sparking points vary from 87c. for "A," to \$1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated wire, 90c.; and cones, \$1 per gram.

**Quicksilver.**—The market is quiet. The New York quotation is \$40 per flask of 75 lb. for large orders, and \$40.50@41 for small lots. San Francisco prices hold steady at \$39 for domestic orders, and \$37.50@38 for export business. The London market is unchanged, £7 2s. 6d. being quoted both for first hands and jobbers.

Imports of quicksilver into Great Britain, with re-exports of foreign metal, for the 10 months ending Oct. 31, were as follows, in pounds:

	1904.	1905.	Changes.
Imports.....	2,475,206	2,534,506	I. 59,200
Re-export.....	1,673,648	1,402,737	D. 270,911
Net imports.....	801,558	1,131,769	I. 330,111

The greater part of the imports were from Spain, but some metal was also received from Austria.

**Manganese Alloys.**—Prices for these alloys in Germany are given by Paul Speier as below. The prices are for orders of not less than 500 kg., delivered in Bremen, and are as follows, per 100 kilograms:

	Marks.
Manganese copper, No. 1, 30% Mn.....	275
No. 2, 28% Mn.....	180
No. 3, 20 to 25%, with 2 to 4% iron.....	165
Manganese tin, No. 1, 55% Mn., no iron.....	400
No. 2, 56% Mn., some iron.....	280
Manganese nickel, No. 1, free from iron.....	450
No. 2, traces of iron.....	270

Manganese metal is quoted at 3.60 marks per kg.—38.8c. per lb.—delivered in Bremen.

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

	Per lb.
Aluminum.....	33@37c
No. 1, 90% ingots.....	31@34c.
No. 2, 99% ingots.....	4c. up
Rolled Sheets.....	20@23c.
Aluminum-Bronze.....	33@39c.
Nickel-alum.....	\$2.10
Bismuth.....	77c.
Cadmium, f. o. b. Hamburg.....	80c.
Chromium, pure (N. Y.).....	50c.
Copper, red oxide.....	95c.
Ferro-Molybdenum (50%).....	75c.
Ferro-Titanium (20@25% N. Y.).....	12½c.
Ferro-Chrom. (74%).....	29c.
Ferro-Tungsten (37%).....	\$1.60
Magnesium, pure (N. Y.).....	75c.
Manganese (98@99% N. Y.).....	40c.
Manganese Cu. (30@70% N. Y.).....	\$1.75
Molybdenum (98@99% N. Y.).....	40c.
Tantalum acid (N. Y.).....	65@70c.
Thallium, f. o. b. Breslau, Germany.....	45c.
Phosphorus, foreign.....	70c.
Phosphorus, American.....	90c.
Tungsten (best), pound lots.....	

Variations in prices depend chiefly upon the size and condition of orders.

**Missouri Ore Market.**

JOPLIN, Nov. 18.

The highest price reported paid for zinc ore was \$55 per ton for three bins in Joplin, one in Carterville and one in Duenweg. The assay basis price ranged downward a little, ore selling from \$48 to \$52 per ton of 60% zinc. Prices on all grades averaged \$46.96. The shipment was 980 tons less than the previous week, and a large part of this represented purchases of the previous week. Offerings on the part of the buyers were not numerous, aside from the bins of choicest ore, and as a consequence sellers were offer-

ing ore with no takers. The weather during the entire week was exceptionally good for mining operations and the outputting was heavy, the stock on hand being augmented by approximately 640 tons.

The high price of lead has reached \$71.50 per ton, and 80% grades command \$70 per ton. The average price of all grades was \$69.72 per ton. This was an advance of \$1.50 for the choicest ore and \$2 per ton for the 80% grades.

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

	Zinc, lb.	Lead, lb.	Value.
Carterville-Webb City..	2,189,270	639,690	73.83
Joplin.....	2,315,910	224,070	65,750
Galena-Empire.....	857,260	176,050	26,300
Duenweg.....	623,520	93,890	17,930
Aurora.....	988,020	.....	17,670
Badger.....	548,730	3,060	13,820
Neck City.....	477,600	.....	12,410
Granby.....	606,000	18,000	10,050
Oronogo.....	263,390	15,900	7,115
Baxter.....	191,810	53,230	6,080
Carthage.....	195,470	.....	5,080
Alba.....	169,580	.....	4,410
Stott City.....	95,100	.....	2,280
Central City.....	80,900	4,470	1,950
Spurgeon.....	58,960	10,240	1,480
Sherwood.....	65,540	.....	1,370
Beef Branch.....	72,020	12,190	1,360
Prosperity.....	24,590	6,220	790
<b>Totals.....</b>	<b>9,622,670</b>	<b>1,257,010</b>	<b>\$69,675</b>

46 weeks.....449,069,440 55,523,890 \$11,756,445  
 46 weeks last year..459,100,090 58,163,840 9,514,575  
 Zinc value, the week, \$225,915; 46 weeks, \$10,083,875  
 Lead value, the week, 43,760; 46 weeks, 1,672,570

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1904.	1905.	Month.	1904.	1905.
Jan.....	33.33	52.00	Jan.....	55.55	61.50
Feb.....	33.63	52.77	Feb.....	56.37	57.62
March.....	35.40	47.40	March.....	57.20	57.20
April.....	35.75	42.88	April.....	58.00	58.00
May.....	34.87	43.31	May.....	57.77	58.27
June.....	32.93	40.75	June.....	56.60	57.80
July.....	33.37	43.00	July.....	53.00	58.00
August.....	37.55	48.83	August.....	53.00	58.00
September.....	40.18	46.75	September.....	53.50	63.50
October.....	43.65	47.60	October.....	53.50	63.86

**Wisconsin Ore Market.**

PLATTEVILLE, Nov. 17.

There has been an increased amount of ore produced this week, and all sold, but not all loaded; 60% zinc ore sold at \$54.50. Some fancy lots brought as high as \$56. The competition between the Picher Lead Co. and the new concern at Joplin is making itself felt in the lead market in the Platteville district. Prices jumped up to \$33.50@34 per 1,000 pounds.

The various camps report shipments of zinc and lead as follows:

	Zinc, Lbs.	Lead, Lbs.
Rewey.....	63,960	.....
Cuba City.....	66,000	.....
Benton.....	130,000	.....
Buncombe.....	535,600	.....
Platteville.....	406,500	.....
Galena.....	.....	80,000
<b>Total.....</b>	<b>1,202,060</b>	<b>80,000</b>

There is considerable ore on hand still, owing to scarcity of cars on hand

**Mining Stocks.**

**New York.** Nov. 22.

Notwithstanding the continued unsettled state of the money market, speculation has been strong and prices rather better. Amalgamated Copper closes at \$85½; American Smelting & Refining, \$157¾ for the common and \$130½ for the preferred; United States Steel, \$37¾ for the common and \$103½ for the preferred.

In the outside market copper stocks were popular. Boston Consolidated sold up to \$19¼; Greene Copper to \$26½; Nevada Copper to \$9; Utah Copper to \$23½; all showing some gain.

Standard Oil did not increase its dividend as expected. The amount declared for the quarter is \$10, making a total of \$40 for the year.

**Boston.** Nov. 21.

There has been a gradual broadening of the copper share market, and after a short period of depression this class of stocks has again become buoyant and active. Again North Butte has been the most conspicuous stock, and is to be credited with another phenomenal rise of over \$16 this week, touching \$76 today. When it is considered that this stock came on the market at \$15 per share less than six months ago, it can be seen that the record it has made is marvelous. The company declared its second dividend this week, the rate being 75c. per share, against 50c., its initial dividend three months ago. The company has been acquiring new properties out of earnings, and is negotiating for additional ones. Utah showed a burst of speed by advancing \$3.50 to \$50.25. It is now declared that the company will either announce an increase in its dividends next month or a purpose to enlarge its smelting plant. The company is said to be earning better than \$7 per share.

Mohawk has advanced \$2.50 to \$59.50, and it is again reported that an initial dividend of \$2 will be declared in January. Osceola has recovered \$6 to \$110.50, and Tamarack is up \$9 to \$130. Quincy is up \$4 to \$107, and Calumet & Hecla \$21 to \$691. The latter increased its dividend by declaring \$15, which will make an even \$50 paid for the current calendar year. Wolverine is up \$2.50 to \$126.50. Allouez has recovered \$3, touching \$43. This company is said to be earning about \$22,000 net per month, after paying the expenses of opening a new shaft. It is asserted that the directors own about 40% of the stock. Parrot rose \$4 to \$29.75 on limited buying, benefiting by the declaration of another 50c. dividend, making \$2 for the year. Atlantic is up \$3.25 to \$25.25, Bingham, \$2.75 to \$35.75; Centennial, \$2 to \$29.37½; Copper Range, \$4 to \$74.50; Franklin, \$2.25 to \$18.50; Greene, \$1.37½ to \$26.75; Isle Royale, \$3.25 to \$24.75;

Old Dominion, \$2.75 to \$30.50; Rhode Island, \$1.25 to \$7.50; Tecumseh, \$1.12½ to \$13.75; and Trinity rose \$2.25 to \$11.25. United States boomed \$4.50 to \$39, and United has been steady around \$34. Amalgamated is up \$5.75 to \$86.50, and Daly-West stiffened \$1.75 to \$16.50. The United States properties acquired recently in Eureka, Nev., cost less than \$250,000.

J. A. Coram, who owns control of the Balakala, in Shasta county, Cal., is organizing a \$60,000,000 holding company to take over this property, mines in Butte and the Montana Coal & Coke Co.

The curb stocks have been active, but weak on realizing sales. Nevada Consolidated, Utah Apex and Junction Development have been the most conspicuous, although the latter is up \$3.75 to \$29.75. Arizona Commercial touched \$21.25 today.

**Colorado Springs.** Nov. 17.

The past week on the local exchange has witnessed a decline in quite a number of Cripple Creek stocks, but the volume of trading remained about normal, with few exceptions. El Paso has taken one of its periodical declines and sold down during the week to 58½c., but closed on today's market at 60½c. Elkton has declined 2c., selling today for 48c. Findley sold one week ago for 83 and took a slide to 70c., but recovered to 76½c. This is owing to a threatened suit by the Independence for alleged extraction of ore from its territory. Isabella has also shaded off to 23½c. Gold Sovereign sold one week ago for 10¾, and in the face of good reports has declined to a quotation today of 9½@10¼c. Portland sold during the week for \$2.10 per share.

**San Francisco.** Nov. 16.

Early in the week there was a decline in the Comstocks, but it was on moderate dealings, and prices recovered later. It was not a large movement—rather a chip-pers' market. Ophir closed at \$6; Consolidated California & Virginia, \$1.65; Mexican, \$1.45; Sierra Nevada, 43c. per share.

Dealings in the Tonopahs were good, Tonopah sold at \$2.50; Jim Butler, 70c. per share.

Oil shares were rather dull. Claremont sold for \$1.10; Monte Cristo, 25c., on light dealings.

The sworn returns of the mining companies, as filed in their offices this week, show cash on hand Nov. 1 as given, with all expenses paid, unless otherwise noted: Alpha Consolidated, \$1,355; Andes, \$4,273; Alta, \$705, with liabilities of \$3,658; Belcher, \$4,051, with October expenses partly unpaid; Best & Belcher, \$577; Bullion, \$1,606; Caledonia, \$1,632, with October expenses unpaid; Confidence, \$734, with October expenses unpaid; Crown Point,

\$59; Challenge Consolidated, \$101; Consolidated Imperial, \$2,547; Consolidated New York, \$181; Consolidated California & Virginia, \$17,197; Chollar, \$404, with bills payable of \$500; Exchequer, \$3,007; Gould & Curry, \$1,623, with bills receivable of \$300; Julia Consolidated, \$526; Justice, \$702, with bills payable of \$708; Mexican, \$9,982; Ophir, \$6,564, with 38 tons of concentrates in transit; Overman, \$2,731, with October expenses unpaid; Potosi, \$3,305; Savage, \$7,928; Segregated Belcher, \$379; Scorpion, \$1,134; Silver Hill, \$20,072; Sierra Nevada, \$2,370; Standard Consolidated, \$31,731; Union Consolidated, \$1,386; Utah Consolidated, \$1,542, with indebtedness of \$3,000.

Hale & Norcross reports indebtedness of \$1,492, with no cash on hand.

Assessments.

Company.	Delinq.	Sale.	Amt.
Caledonia.....	Nov. 17	Dec. 8	\$0.10
Brunswick-Potosi.....	Dec. 13	Jan. 2	0.03
Brunswick-Savage.....	Dec. 12	Dec. 29	0.03
Challenge Con.....	Nov. 22	Dec. 13	0.10
Champion.....	Dec. 11	.....	0.50
Chollar.....	Dec. 18	Jan. 8	0.10
Con. New York.....	Dec. 15	Jan. 2	0.03
Confidence.....	Nov. 12	Dec. 4	0.20
Crown Point.....	Nov. 14	Dec. 5	0.10
Hale & Norcross.....	Nov. 2	Nov. 28	0.10
Justice.....	Nov. 16	Dec. 9	0.05
Rose Kimberly.....	Nov. 30	.....	0.02
Savage.....	Nov. 8	Nov. 29	0.10
Segregated Belcher.....	Dec. 8	Dec. 28	0.05
Sierra Nevada.....	Nov. 3	Nov. 23	0.10
Union Con.....	Nov. 13	Dec. 4	0.10

Dividends.

Company.	Payable.	Rate.	Amt.
Amalgamated Copper.....	Nov. 27	\$1.25	\$1,937,500
B. & H.....	Oct. 31	0.01	4,000
Calumet & Hecla.....	Dec. 20	15.00	1,500,000
Gen. Chemical, pfd.....	Jan. 2	1.50	150,000
Iron Silver.....	Nov. 30	1.00	50,000
International Salt.....	Dec. 1	1.00	187,500
Lehigh Coal & Nav.....	Nov. 27	2.00	693,794
Mexican Coal and Coke.....	Dec. 5	3.00	150,000
National Lead, pfd.....	Dec. 15	1.75	260,820
N. Y. & Honduras Rosario.....	Nov. 25	0.10	15,000
Old Dominion.....	Dec. 15	0.50	144,000
Rocco-Homestake.....	Nov. 25	0.02	6,000
Silver Hill.....	Nov. 21	0.05	9,000
Standard Oil.....	Dec. 1	10.00	9,750,000
U. S. Cast Iron Pipe & Fdy.....	Dec. 1	1.00	125,000
U. S. Steel, pf.....	Nov. 30	1.75	6,305,497

\*Monthly. †Bi-monthly. ‡Quarterly. §Semi-Annually.

St. Louis.

	High.	Low.
Adams.....	\$ .40	\$.25
American Nettle.....	.15	.06
Center Creek.....	2.00	1.50
Central Coal & Coke.....	63.25	62.50
"    "    pfd.....	80.50	79.50
Columbia.....	1.00	.25
Con. Coal.....	32.00	31.00
Doe Run.....	152.00	140.00
Granite Bimetallic.....	.20	.16
St. Joe.....	18.00	16.50

LONDON. (By Cable.) Nov. 15.

	£	s.	d.
Camp Bird.....	1	14	3
Consolidated Gold Fields.....	6	4	4 1/2
De Beers.....	17	17	6
Dolores.....	1	15	0
East Rand.....	6	18	3
El Oro.....	1	14	0
Esperanza.....	5	11	3
Modderfontein.....	7	16	3
Rand Mines.....	8	0	0
Rio Tinto.....	65	10	0
Simmer and Jack.....	1	10	3
Stratton's Independence.....	0	8	3
Tomboy.....	1	7	6

\*Furnished by Wm. P. Bonbright & Co., New York.

STOCK QUOTATIONS.

NEW YORK.		Week Nov. 22.		
Name of Company.	High	Low	Clg.	Sales
*Amalgamated.....	86 1/2	81	80 1/2	427,960
Anaconda.....	148	118 1/2	143	136,300
British Col. Copper.....	77 1/2	7 1/2	7 1/2	3,700
Federal.....	145	115	138	8,700
Federal, Pf.....	110 1/2	98	109 1/2	48,550
Greene Copper.....	26 1/2	25 1/2	26 1/2	15,400
Greene Gold.....	4 1/2	4 1/2	4 1/2	1,700
Mitchell.....	9	8 1/2	8 1/2	6,576
Tennessee Copper.....	35	33 1/2	33 1/2	1,200
Union Copper.....	1 1/2	1 1/2	1 1/2	16,300
United Copper.....	34 1/2	32 1/2	33 1/2	2,622
United Copper, Pref.....	79	73	78 1/2	2,622
Utah Apex.....	7	6 1/2	6 1/2	21,500

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.....	156 1/2	140 1/2	156	388,050
Am. Smelting & Ref., Pf.....	136	124	135	95,320
Colorado Fuel & Iron.....	46 1/2	43	45 1/2	26,600
National Lead.....	54 1/2	48 1/2	54 1/2	86,500
Pittsburg Coal.....	13 1/2	13 1/2	13 1/2	2,400
Pittsburg Coal, pf.....	54	52 1/2	54	300
Republic I. & S.....	27	24 1/2	27	39,000
Republic I. & S., Pf.....	99 1/2	94 1/2	99 1/2	35,000
Tenn. C. & I.....	106 1/2	95 1/2	104 1/2	211,270
U. S. Red. & Ref.....	30 1/2	28 1/2	30	4,100
U. S. Red. & Ref., Pf.....	73	66	71	9,000
U. S. Steel.....	38 1/2	36 1/2	38	252,650
U. S. Steel, Pf.....	103 1/2	101 1/2	103 1/2	103,450
Standard Oil.....	69 1/2	67 1/2	69 1/2	197

BOSTON.

Allouez.....	43 1/2	41	42 1/2	6,581
*Amalgamated.....	86 1/2	80 1/2	85 1/2	41,895
Atlantic.....	25 1/2	23	24 1/2	2,545
Bingham.....	36 1/2	33	35 1/2	18,764
Boston Consolidated.....	20 1/2	18 1/2	18 1/2	35,545
Calumet & Hecla.....	69 1/2	67 1/2	68 1/2	149
Centennial.....	29 1/2	27 1/2	28 1/2	3,447
Mercur.....	.62	.60	.62	650
Copper Range.....	74 1/2	71	74	10,832
Daly-West.....	16 1/2	14	16 1/2	3,008
Franklin.....	19	17	18	7,860
Granby.....	9 1/2	9 1/2	9 1/2	4,892
*Green Con. Copper.....	26 1/2	25 1/2	26 1/2	8,703
Isle Royale.....	24 1/2	23	24	2,261
Mass.....	10 1/2	10	10	1,245
Michigan.....	16 1/2	16	16 1/2	5,440
Mohawk.....	59 1/2	58	59	1,930
North Butte.....	76	60	75 1/2	82,097
Old Dominion.....	30 1/2	28	30 1/2	4,280
Osceola.....	111	105	110	2,628
Parrot.....	29 1/2	26	28 1/2	3,022
Phoenix.....	1 1/2	1 1/2	1 1/2	550
Rhode Island.....	7 1/2	6 1/2	7 1/2	2,168
Shannon.....	8 1/2	7 1/2	8	4,195
Tamarack.....	130	123	128 1/2	194
Tecumseh.....	14 1/2	12 1/2	13 1/2	4,113
United Copper, com.....	34 1/2	32 1/2	34	6,700
United States.....	39	35	38 1/2	24,338
Utah.....	50 1/2	47	49 1/2	14,721
Wolverine.....	127	125	126 1/2	87

PHILADELPHIA.

Cambria Steel.....	28 1/2	27 1/2	28	5,466
Philadelphia Co.....	53 1/2	51 1/2	51 1/2	16,802
Tonopah.....	13 1/2	12 1/2	13 1/2	1,400

PITTSBURG.

Crucible Steel.....	13	12 1/2	13	668
Crucible Steel, Pref.....	67 1/2	66	67 1/2	825
Tonopah Ext.....	5.60	5.50	5.60	4,210

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg.
Elkton.....	48 1/2	50	46	46
El Paso.....	58 1/2	61	59 1/2	60
Isabella.....	23	26 1/2	22 1/2	26 1/2
Portland.....	210	210	210	210
Vindicator.....	75	75	70	70

SAN FRANCISCO.

Best & Belcher.....	1.40	1.40	1.30	1.35
Bullion.....	.34	.34	.32	.32
Caledonia.....	.45	.50	.45	.50
Confidence.....	.80	.85	.80	.85
Con. Cal. & Va.....	1.55	1.60	1.55	1.55
Gould & Curry.....	.17	.17	.12	.13
Hale & Norcross.....	1.05	1.10	1.00	1.00
Mexican.....	1.40	1.40	1.35	1.35
Occidental Con.....	.87	.87	.86	.86
Ophir.....	5.87 1/2	5.87 1/2	5.62 1/2	5.62 1/2
Savage.....	.53	.54	.50	.50

\* Ex-dividend. † 1st Installment Paid. ‡ Assessment Paid. § 2d Installment Paid.

Monthly Average Prices of Metals.

Month.	SILVER.			
	New York.		London.	
	1904.	1905.	1904.	1905.
January.....	57.005	60.690	26.423	27.930
February.....	57.592	61.023	26.665	28.047
March.....	56.741	58.046	26.164	26.794
April.....	54.202	56.600	24.974	26.108
May.....	55.430	57.832	25.878	26.664
June.....	55.673	58.428	26.591	27.163
July.....	58.095	58.915	26.760	27.822
August.....	57.906	60.259	26.549	28.528
September.....	57.120	61.695	26.349	28.528
October.....	57.923	62.034	26.760	28.637
November.....	58.453	.....	26.952	.....
December.....	60.563	.....	27.930	.....
Year.....	57.221	.....	26.399	.....

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.		1904.	1905.
	1904.	1905.	1904.	1905.		
Jan.....	12.410	15.008	12.553	15.128	57.500	68.262
Feb.....	12.063	15.011	12.245	15.136	56.500	67.963
March.....	12.299	15.125	12.551	15.250	57.321	68.174
April.....	12.923	14.920	13.120	15.045	58.247	67.017
May.....	12.758	14.627	13.000	14.820	57.321	64.875
June.....	12.269	14.673	12.399	14.813	56.398	65.881
July.....	12.380	14.888	12.505	15.005	57.256	66.887
Aug.....	12.343	15.664	12.468	15.725	56.952	69.830
Sept.....	12.495	15.965	12.620	15.978	57.645	69.667
Oct.....	12.993	16.279	13.118	16.332	60.012	71.406
Nov.....	14.284	.....	14.456	.....	65.085	.....
Dec.....	14.661	.....	14.849	.....	66.384	.....
Year.....	12.823	.....	12.990	.....	58.587	.....

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.	1904.	1905.	Month.	1904.	1905.
Jan.....	28.845	29.325	July.....	26.573	31.769
Feb.....	28.087	29.262	August.....	27.012	32.806
Mar.....	28.317	29.523	Sept.....	27.780	32.095
April.....	28.132	30.525	Oct.....	28.596	32.481
May.....	27.718	30.049	Nov.....	29.185	.....
June.....	26.325	30.329	Dec.....	29.286	.....
			Av., year.	27.986	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.....	4.347	4.552	July.....	4.192	4.524
Feb.....	4.375	4.450	Aug.....	4.111	4.665
Mar.....	4.475	4.470	Sept.....	4.200	4.850
April.....	4.475	4.500	Oct.....	4.200	4.850
May.....	4.423	4.500	Nov.....	4.200	.....
June.....	4.496	4.500	Dec.....	4.600	.....
			Av., year.	4.309	.....

Prices are in cents per pound.

SPELTER.

Month.	New York.		St. Louis.		L'nd'm
	1904.	1905.	1904.	1905.	
January.....	4.863	6.190	4.673	6.032	25.068
February.....	4.916	6.139	4.717	5.989	24.594
March.....	5.057	6.067	4.841	5.917	23.825
April.....	5.219	5.817	5.038	5.667	23.813
May.....	5.031	5.434	4.853	5.284	23.594
June.....	4.760	5.190	4.596	5.040	23.875
July.....	4.873	5.396	4.723	5.247	23.938
August.....	4.866	5.706			

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

(See also Market Reviews.)

<b>ABRASIVES—</b>		<b>CRYOLITE</b> ..... lb. .06½	<b>POTASSIUM—</b>
Bort as to size..... carat,\$10.00@18.00		<b>EXPLOSIVES—</b>	Bicarbonate crystal..... lb. \$0 08½
Carborundum, f.o.b. Niagara		Blasting powder, A..... 25-lb. keg .65	Powdered or granulated.. " .14
Falls, powd..... lb. .08		Blasting powder, B..... " 1.40	Bichromate, Am..... " .08½@.084
Grains..... " .10		" "Rackarock" A..... lb. .25	Scotch..... " .08½@.08
Corundum, N. C..... " .07@.10		" "Rackarock" B..... " .18	Bromide..... " .15
Chester, Mass..... " .04½@.05		Judson R.R. powder..... " .10	Carbonate (80@85%)..... " 3.50@4.00
Craigmont, Ont..... " .05½@.06½		Dynamite (20% nitro-glycerine)..... " .13	Caustic, ordinary..... " .04½
Mont. f.o.b. Chicago..... " .07@.07½		(30% nitro-glycerine)..... " .14	Elect. (90%)..... " .06½
Crushed Steel, f.o.b. Pittsburg..... " .05½		(40% nitro-glycerine)..... " .15	Chlorate, powder-d..... " .08½@.08
Emery, in kegs: Turkish flour..... " .03½		(50% nitro-glycerine)..... " .16½	Crystals..... " .06½@.08
Grains..... " .05@.05½		(60% nitro-glycerine)..... " .18	Cyanide (98@99%)..... " .18½@.19
Naxos flour..... " .03½		(75% nitro-glycerine)..... " .21	Kainit (bulk)..... 'g. ton. 8.50
Grains..... " .05@.05½		Glycerine for nitro..... " .11@.11½	Manure salt 20%..... " 14.75@15.75
Chester flour..... " .03½		<b>FELDSPAR—Ground</b> ..... sh. ton. 9.75@10.00	Double Manure Salt, 48@53%..... 100 lb. 1.16½@1.19½
Grains..... " .05@.05½		<b>FIRE BRICK.</b>	Muriate..... " " 1.90@1.95
Peekskill, f.o.b. Easton, Pa., flour..... " .01½		American..... per M. 20.00@30.00	Permanganate..... lb. .09½@.09
Grains, in kegs..... " .02½		Imported..... " 30.00@45.00	Prussiate, yellow..... " .13½@.13
Garnet, per quality, sh ton 25.00@35.00		St. Louis No. 1..... " 16.00	Red..... " .35
Pumice Stone, Am. Powd.. lb. .01 3-5@.02		No. 2..... " 14.00	Sulphate..... 100 lb. 2.18½@2.21½
Italian, powdered..... " .01½@.01½		Extra..... " 20.00@23.00	<b>SALT—N. Y. com. fine 280 lb. bbl. N. Y. agricultural</b> ..... sb. ton. 4.40
Lump, per quality..... " .04		<b>FIRE CLAY.</b>	<b>SALTPETER—Crude</b> ..... 100 lb. 4.00@4.25
Rottenstone, ground..... " .02½@.04½		St. Louis mill,..... per ton 2.50	Refined..... " 4.25@4.75
Lump, per quality..... " .06@.20		<b>FLUORSPAR—</b>	<b>SILICA—</b>
Rouge, per quality..... " .10@.30		Domestic f.o.b. shipping port:	Ground quartz, ord'ry...sh. ton 9.00@10.00
Steel Emery, f.o.b. Pittsburg..... " .07		Lump..... sh. ton. 8.00@10.00	Best..... " 12.00@13.00
<b>ALCOHOL—Grain</b> ..... gal. 2.38		Ground..... " 11.50@13.50	Lump Quartz..... " 2.50@4.00
Refined w.od, 95@97%..... " .70@.75		Gravel..... " 4.25@4.50	Glass sand..... " 2.75
Purified..... " 1.25@1.30		<b>FULLER'S EARTH—Lump</b> .. 100 lb. .80	Infusorial earth, crude..... 25.00
<b>ALUM—Lump</b> ..... 100 lb. 1.75		Powdered..... " .85	Calcined and floated..... 32.00
Ground..... " 1.85		<b>GRAPHITE—</b>	<b>SILVER—Nitrate, crystals</b> ..... oz. .36½
Chrome Alum..... lb. 0.05		American ore, common... lb. .01@.10	<b>SODIUM—</b>
<b>ALUMINUM—Sulphate, com'l.</b> " 75@1.25		Artificial..... " .06	Acetate..... lb. 0.04½
<b>AMMONIUM—</b>		Ceylon, common pulv..... " .02½@.03½	Bicarb, ord., bulk, f.o.b. works..... 100 lb. 3.50
Bromide..... lb. .22		Best, pulverized..... " .04@.08	Extra domes, f.o.b. works " .06½
Carbonate..... " .08		German, c-m. pulv..... " .01½@.01½	Bichromate..... lb. .20
Muriate grain..... " .05½@.05½		Best, pulverized..... " .01½@.02	Bromide..... " .20
Lump..... " .09½		Italian, pulverized..... " .01@.02	Carbonated ash, high test, in bags, f.o.b. works, 100 lb. .75@.77½
Sulphocyanide com..... " .25		<b>GYPSUM—Ground</b> ..... sh. ton. 8.00@8.50	Foreign, f.o.b. N. Y..... " .85@.87½
chem. pure..... " .35		Fertilizer..... " 7.00	Caustic, 60@78%, f.o.b., works..... " 1.75@1.85
<b>ARSENIC—White</b> ..... " 2.95@.04		Rock..... " 4.00	Foreign, f.o.b. N. Y..... " 1.90@1.95
Red Silesian..... " .07½		English and French..... " 14.00@16.00	Chlorate, com'l..... " .08½@.08
<b>ASPHALTUM—</b>		<b>INFUSORIAL EARTH—</b>	Cyanide, ("100% KCN")..... " .18½@.19
Barbadoes..... " .02½@.03		Ground Am. best..... " 20.00	Hyposulphite, Am..... " 1.50@1.60
Cuban..... " .01½@.03½		French..... " 37.50	German..... " 1.75@2.00
Egyptian, crude..... " .06@.07		German..... " 40.00	Phosphate..... lb. .02½@.02½
Gilsonite, Utah ordinary..... " .03½@.03½		<b>LEAD—Acetate, white</b> ..... lb. .09@.09½	Prussiate..... " .09½@.09½
Trinidad..... " 35.00		Brown..... " .07@.07½	Sal soda, f.o.b. works... 100 lb. .60
<b>BARIUM—</b>		Nitrate, com'l..... " .06½	Foreign, f.o.b. N. Y..... " .85
Carb. Lump, 80@90%..... sh. ton. 25.00@27.00		granular..... " .08½	Silicate, concentrated..... lb. .01
92@98%..... " 28.00@29.00		<b>MAGNESITE—Greece.</b>	Sulphate, com'l..... 100 lb. .65
Powdered 80@90%..... lb. .01½@.02		Crude (95%)..... lg. ton. 6.50@7.00	<b>SULPHUR—Best seconds, per ton.</b> 21.00
Chloride com'l..... ton. 34.00@36.00		Calcined..... sb. ton. 16.50@17.00	Roll..... 100 lb. 1.85
Chem. pure cryst..... lb. .05		Bricks, domes, per qual. f.o.b. Pittsburg..... M. 160@200	Flour..... " 1.90
Nitrate, powdered, in casks..... " .06		<b>MAGNESIUM—</b>	Flowers, sublimed..... " 2.20
Sulphate (Blanc Fixe)..... " .02		Chloride, com'l..... lb. .01½	<b>TALC—North Carolina</b> ..... sb. ton. 15.50@23.50
<b>BARYTES—</b>		Sulphate..... 100 lb. .50@1.25	N. Y. Fibrous best..... " 10.25
Am. Crude No 1..... sh. ton. 9.75		<b>MANGANESE—</b>	French, best..... " 20.00
Crude No. 2..... " 8.00		Crude powdered:	Italian, best..... " 30.00
Crude No. 3..... " 7.00		70@75% binoxide..... lb. .01½@.01½	<b>TAR—Oil bbl. (50 gal.)</b> ..... bbl. 5.40
Floated..... " 16.75@18.00		75@85% binoxide..... " .01½@.02	<b>TIN—Bi-chloride, 45%</b> ..... lb. .09½
Foreign floated..... " 20.00		85@90% binoxide..... " .02½@.03	Crystals..... " .22
Snow-white..... " 17.25@18.75		90@95% binoxide..... " .03½@.05	<b>URANIUM—Oxide</b> ..... " 2.25@3.00
<b>BAUXITE—Ga. or Ala. Mines:</b>		Or..... unit. .18@.20	<b>ZINC—Metallic ch. pure</b> ..... " .07@.09½
First grade..... lg. ton. 5.25@5.50		<b>MARBLE—Flour</b> ..... sh. ton. 6.00@7.00	Chloride solution, com'l..... " .02½
Second grade..... " 4.50@4.75		<b>MINERAL WOOL—</b>	Chloride, granular..... " .04½@.04½
Arkansas, first grade..... lg. " 5.00@5.50		Slag, ordinary..... " 19.00	Dust..... " .05½@.05½
Second grade..... " 4.50@4.75		Selected..... " 25.00	Sulphate..... " .02@.02½
Washed ore..... " 6.00@7.00		Rock, ordinary..... " 32.00	<b>THE RARE EARTHS.</b>
<b>BONE ASH</b> ..... lb. .02½@.02½		Selected..... " 40.00	<b>BORON—Nitrate</b> ..... lb. \$1.50
<b>BORAX</b> ..... " .07½@.07½		<b>MONAZITE SAND—</b>	<b>CERIUM—Oxalate</b> ..... oz. .35
<b>CALCIUM—Acetate, gray</b> ..... " 2.30		Guar. 97%, with 5% Thorium oxide..... lb. .10	<b>LITHIUM—Carbonate</b> ..... " 1.50
Acetate, brown..... " 1.55		<b>NICKEL—</b>	<b>LITHIUM—Nitrate</b> ..... oz. .60
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J..... sh. ton. 65.00		Oxide, crude, 100 lb. (at 55 for fine metal contained).. 35@.40	<b>STRONTIUM—Nitrate</b> ..... lb. .07@.07½
Chloride, f.o.b. works..... " 9.00@10.00		Sulphate, single..... 100 lb. 22@.25	<b>TANTALUM—Acid</b> ..... oz. .40
<b>CEMENT—</b>		double..... " 13@.15	Ore, 20% acid..... lb. .20
Portland, Am. 500 lb..... bbl. 1.55@1.60		<b>OZOKERITE</b> ..... lb. 11½	" 70% "..... " 3.50
Foreign..... " 1.25@1.75		<b>PAINTS AND COLORS—</b>	<b>THORIUM—Nit. 49@50%</b> ..... " 8.00@10.00
" Rosendale " 300 lb..... " .85		Litbarge, Am. powdered..... " .05½@.06½	<b>URANIUM—Nitrate</b> ..... oz. .25
(in sacks)..... " .65		English glassmakers..... " .08½@.08½	<b>ZIRCONIUM—Nitrate</b> ..... lb. 10.00
Slag cement..... " .75@1.25		Lithophone..... " .03½@.06	
<b>CHLORINE—Liquid</b> ..... .30		Metallic, brown..... sb. ton. 19.00	
Water..... " .10		Red..... " 16.00	
<b>CHROME ORE—</b>		Ocher, Am. common..... " 8.50@9.00	
(50% ex-ship N. Y.)..... lg. ton. 18.50@19.00		Best..... " 16.00	
Bricks, f.o.b. Pittsburg, M..... " 175.00		Dutch, wash-d..... lb. .02½	
<b>CLAY, CHINA—Am. common</b>		French, washed..... " .01½@.01½	
ex-dock, N. Y..... " 7.75@8.00		Paris green, pure, bulk..... " .12	
Am. best ex-dock, N. Y..... " 9.00@9.25		Red lead, American..... " .06½@.06½	
Englab, common..... " 11.00@11.25		Foreign..... " .07@.08½	
Best..... " 16.75		Turpentine, spirits..... gal. .64	
<b>COBALT—Oxide</b> ..... lb. 2.60		White lead, Am., dry..... lb. .05½@.05½	
<b>COPPERAS—Bulk</b> ..... 100 lb. \$0.47½		American, in oil..... " .06½@.06½	
In bbls..... " .52½		Foreign, in oil..... " .09@.09	
		Zinc white, Am. extra dry..... " .04½@.04½	
		Foreign, red seal, dry..... " .06@.08	
		Green seal, dry..... " .06½@.09½	

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