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Lead and Copper Smelting at Salt Lake—II

Lead Smelting at the Murray Plant. Copper Smelting at the Garfield Plant. Use of the Pot-roasting Process at Both These Plants

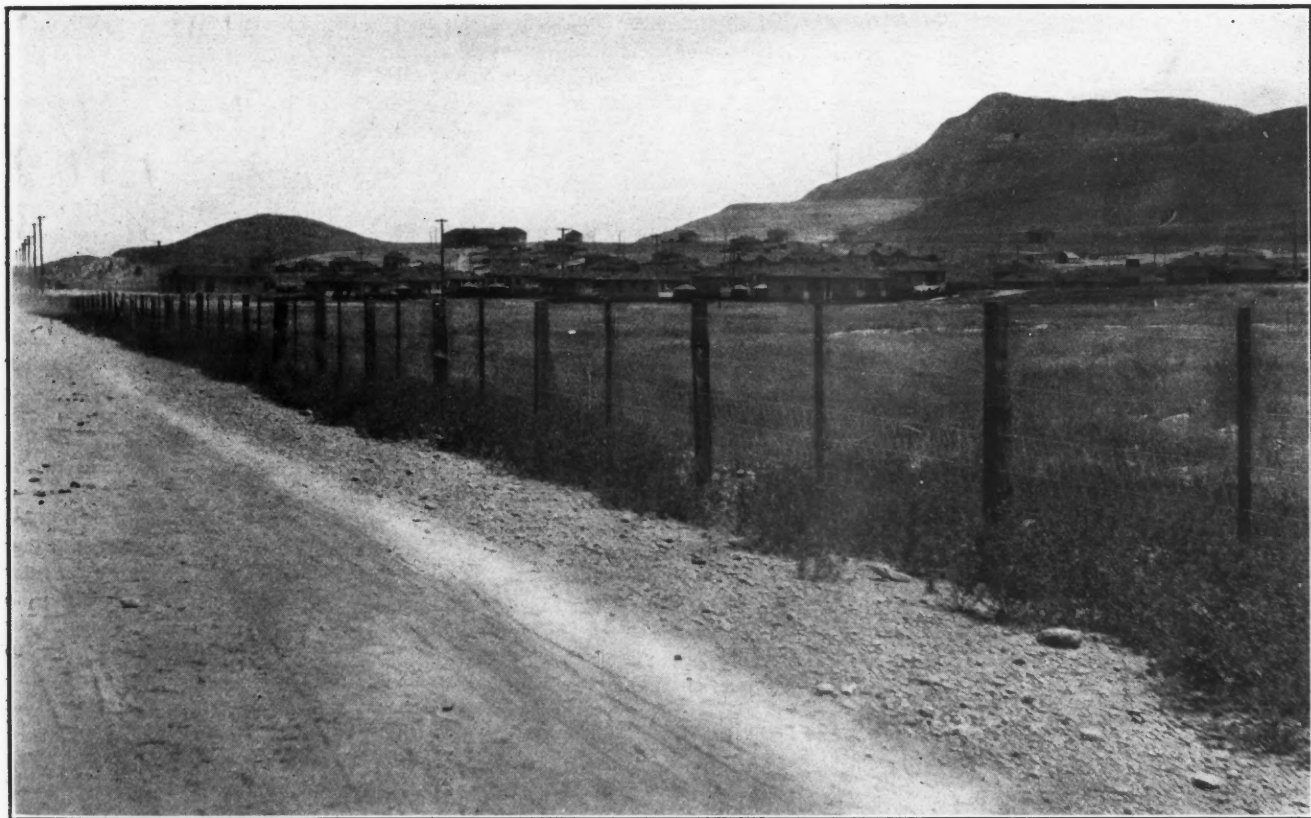
BY WALTER RENTON INGALLS

THE MURRAY SMELTER

The Murray smelter of the American Smelting and Refining Company was built in 1901 and at that time was supposed to exemplify the consensus of expert opinion as to the best practice in lead smelting, the engineers of the then recently organized trust having substantially all of the experience of lead smelting in the United States before them. During the six years of its operation the plant

the most elaborate exemplification in connection with silver-lead smelting in one of the plants of the American Smelting and Refining Company. The failure to have earlier recognized the advantage of the Huntington-Heberlein process is surprising. It is to be remarked, however, that the addition of the bag house has lately been made not as a metallurgical improvement, but rather as a means of ameliorating the smoke trouble.

American process of pot-roasting it appears to be a very subordinate factor, if it be a factor at all. Recent experiment and practice seem to show that the rapidity of the desulphurization in pot-roasting is due simply to the more efficient oxidation by blowing air through the charge and that the condition of successful operation is simply a matter of mixing with the sulphide ore a proper proportion of diluent. Under certain conditions even that may



THE TOWN OF GARFIELD, UTAH

has undergone but little change. On the whole its results have been satisfactory. The most important changes have been the installation of the Huntington-Heberlein process, which was done in 1905; and the installation of a bag house, which has just now (July, 1907) been put into operation. Both of these improvements were dilatory. The Huntington-Heberlein process was in successful operation in Europe before the Murray plant had been begun and the bag house had received

THE HUNTINGTON-HEBERLEIN PROCESS

As installed at Murray, as also, I believe, at the other plants of the American Smelting and Refining Company, the Huntington-Heberlein process presents only a general resemblance to the early application of that process. It is distinctly no longer a process of "lime-roasting," but rather what Prof. L. S. Austin has called "pot roasting." Whatever part lime may play in the Savelsberg and Carmichael-Bradford processes, in the modern

be unnecessary, although in pot-roasting proper it appears to be; indeed a good deal of care seems to be required to compound the charge to the best advantage, and there is considerable variation in the time and degree of desulphurization of different ores.

At the Murray plant there are five Heberlein roasting furnaces and 25 pots, the latter being of the standard size—9 ft. in diameter. On the average a charge of nine tons of ore is desulphur-

ized in 12 hours, and the whole installation is attended by only six men on the pot floor. Considering the relatively small space occupied by this installation the large roasting capacity, and the few men required, and turning to an installation of hand-operated reverberatory furnaces of the same capacity, the advantage of the pot-roasting plant is impressive.

As operated by the American Smelting and Refining Company, the pots are cast with long, heavy trunnions by which they are supported on open bearings, and are not fixed in position as in other installations. The pot sets down in a masonry pit, the rim being a foot or so above the brick working floor of the department. The pots are arranged in two parallel rows and are handled by a traveling crane which spans the working floor and travels lengthwise, just as in a copper smelter. An empty pot being in position, the crane brings down a car full of hot calcines which is dumped into the pot as the "priming" charge and a light blast is turned on. Then the crane brings a pot full of damp semi-roasted ore from the Heberlein furnaces, which is dumped into the pot that is being prepared. It will be observed that the charge is no longer introduced in layers, but is put in at one time. After the surface has been leveled off the full blast, about 12 oz., is turned on (the valve in the air pipe being convenient to the pot), the cover is put on, connection with the smoke pipe is made and the operation proceeds. A heavy smoke of sulphur dioxide comes off immediately. The only attention that is afterward required by the charge is an occasional tamping down of blow holes.

When the charge is finished it glows on the surface like a smoldering fire on a grate with live coals shining amid the ashes. The cover is then lifted off by the crane. Next hooks are caused to catch upon the projecting trunnions of the pot and the latter is lifted clear of its pit and partially tipped above the floor in front of the pit. This is to discharge the portion of the surface which has not been fused and is not completely desulphurized. The proportion of this fine material is very small. It is returned to the next charge, being spread out on top of the priming charge. The pot of finished charge is then restored to normal position and carried by the crane to the breaking floor at the end of the department. There it is inverted, the cake of desulphurized ore dropping out and breaking as it falls upon the floor. At one side of the breaking floor there is a 24x36 in. Blake breaker for the further reduction of the lumps. The lumps that are too big to go into the breaker are lifted by the crane and dropped again. The floor of the breaking floor is laid with steel rails set close together. Four men per shift do the work upon the breaking floor.

This is certainly a very simple and efficient method of handling the large cakes of semi-fused ore, which in some other installations had been found troublesome and expensive. Indeed, whereas in certain plants there has been no economy in the Huntington-Heberlein process as compared with ordinary roasting in so far as direct operating expense is concerned, as practised at Murray the saving is obviously important. As used at Murray the pot-roasting process is not confined to galena ore but is applied to all kinds of sulphide ore, but not to matte. Also charges of all kinds of sulphide ore are worked by direct blowing (without any preliminary roasting) with satisfactory results. The desulphurized ore handled in the way described above naturally contains more fines than where it is screened after breaking and all the fines returned to a subsequent charge.

ECONOMIC RESULTS OF THE H-H PROCESS

The use of the Huntington-Heberlein process at the Murray plant has materially reduced the cost of roasting. As to the matter of lead and silver losses there appears to be some uncertainty. Not so, however, with respect to the blast-furnace operations. Although the proportion of H.-H. material used in the charge for the latter is comparatively small, being only 12 to 15 per cent. of the charge, the capacity of a 48x168-in. furnace has been increased from about 175 tons to about 200 tons per day, these being average figures. In a single day as much as 250 tons has been smelted by one furnace. However, the average of 200 tons, day in and day out, with the silicious, rather slow-running slag that is made is certainly a highly satisfactory result. The charge for the furnaces averages about 12 per cent. lead, with an ordinary range of 9 to 14 per cent., and 7 to 16 per cent. as the extremes. The charge contains ordinarily about 80 per cent. of ore, the remainder being fluxes, between-products, etc. As stated above, the Huntington-Heberlein process is used for the desulphurization of all kinds of ore, but not for matte, which still is roasted in the hand-raked reverberatories. The Brückner furnaces of the works, also, are still employed for various purposes.

THE BAG HOUSE

Recently a large bag house has been installed chiefly to ameliorate the smoke nuisance as has been referred to earlier in this article. This is a brick building, 100x216 ft., of the usual construction, the design, arrangement of the bags, etc., being similar to the bag house at the Globe works, Denver, Colo. The Murray installation has 4160 bags, 30 ft. long and 18 in. in diameter, grouped in four sections, any one of which may be isolated for shaking the bags, etc. The gas is taken from the long flue system of the works and delivered to the bag house by an 18x6-ft. fan,

handling 250,000 cu. ft. of gas per min., at a pressure of about 1 in. of water, requiring 125 h.p. The temperature of the gas is low, being only 120 to 160 deg. F., the gas cooling to that point during its passage through the long flue which formerly conveyed it to the chimney. The bag house is surmounted by four steel chimneys, the tops being 175 ft. above the ground, which discharge the filtered gas. Notwithstanding the low temperature of the gas passing through the bags, the latter do not become soggy from the condensation of moisture. The cost of the bag house was approximately \$150,000.

DUST FLUE—BLOWERS

The Murray plant has been described in "Lead Smelting and Refining," pp. 287-293, wherefore no repetition is necessary. Aside from the new features which have been noted above, it is sufficient to call attention to the unsatisfactory result of the concrete dust flues, which crack and disintegrate under the action of the heat and sulphur compounds in the gas; and the addition of a No. 10 rotary blower to the power house, which was provided originally with four piston blowers. The blast furnaces are operated with 36 oz. pressure. The introduction of the rotary blower here, as at other works, indicates that the piston blower has gone quite out of fashion for the production of blast of that moderate pressure, simply for the reason that the rotary blower is more economical. If the piston blower still has its advocates they are few in number.

THE GARFIELD WORKS

The Garfield works, the newest in the Salt Lake district, are owned by the Garfield Smelting Company, which is a subsidiary of the American Smelting and Refining Company. It is situated on the shore of Great Salt Lake, 24 miles west of Salt Lake City. In selecting this location advantage was taken of a point that offered good railway connections together with ability to become forever free from conflict with agricultural interests over any smoke nuisance. The means taken to obviate the latter difficulty are extraordinary and expensive. It seems to me that while the farmers have become hysterical over that question, the smelters have become no less so and have gone, especially in the case of the Garfield plant, to lengths which are unnecessary. This plant is situated so that if the wind is in one direction the smoke will blow over the lake; in the opposite direction it will blow up a ravine in the mountains, at the foot of which the plant is placed. To the right and left, along the lake shore, the company owns the land for miles. It also owns the land for a long distance back into the mountains. All told, the company acquired about 35,000 acres, covering a tract more than seven miles east and west and four miles north and south. In this great domain the smelting company



GARFIELD SMELTER, LOOKING EAST

is supreme. So far did the desire to eliminate all possibility of trouble go, however, that the particular site chosen for the works involved much expense over what there would have been upon a more favorable topography.

As to railway facilities, the Rio Grande Western gives connection with the Gould lines and the Los Angeles, San Pedro & Salt Lake with the Harriman lines. At present there are no other railway systems in Utah.

SMELTING FURNACES

The Garfield is essentially a reverberatory-furnace plant. As originally constructed it comprised three reverberatories and two blast furnaces. In each case the number is now being doubled, it being expected that the new furnaces will be completed by the end of 1907. These were contemplated in the general lay-out of the works, wherefore it is necessary only to construct the furnaces and the house for them and add the corresponding engines and blowers in the power plant.

All of the furnaces at Garfield, together with the converters, are in the same house—an arrangement which does not commend itself. The reverberatories are 112x19 ft., each with two 350-h.p. Sterling boilers, in tandem. These furnaces smelt about 250 tons of ore per day, when in fair operation, with the consumption of about 50 tons of coal on the grate. The coal is burned with an undergrate blast. The arrangement for removing the ash is crude and no provision has yet been made for recovering the unburned coal. The matte product assays about 40 per cent. copper, and the slag about 40 per cent. silica. The operation of these furnaces has not been entirely satisfactory for reasons to which I shall refer later.

There are two blast furnaces, each 20x4 ft. at the tuyeres. They set end to end and it is proposed to close the space between them at some time, making one furnace 70x4 ft. The two new furnaces will be constructed with the same end in view. Both furnaces are operated with a 24-oz. blast pressure and a 10-ft. column of charge. The height from the top of the charge to the feed floor is unusual and perhaps excessive. Also the width of 48 in. at the tuyeres seems to be going to an undesirable extreme in view of the general fineness of the Utah ore, but it may be all right if a considerable proportion of sintered material be used in the charge as indeed will be. One of the blast furnaces is at present operated semipyratically, smelting 350 to 370 tons of ore per day, or about 4.5 tons per square foot of hearth area, with a consumption of 8 per cent. of coke. This produces a matte with 20 to 25 per cent. copper, which is added to the charge for the other furnace. The latter smelts about 500 tons per day, with 8 per cent. of coke, producing a matte with 40 per cent. copper. Both furnaces receive their charges from the

usual cars upon pans hinged lengthwise with the furnace. By tipping the pans the charge slides into the furnace, the pans being designed to return to their original position, which should keep the sides of the furnace closed, but the mechanism does not work well, the pans often remaining down and the furnace open.

Both from blast furnaces and reverberatories the slag is tapped into cars on a lower level, which are drawn by electric locomotives to the dump. The slag assays about 0.35 per cent. copper. The ore charge contains a little upward of 4 per cent. copper on the average.

There are four converters, 8x11½ ft., each stand having three bowls. Six more converters are to be added.

ROASTING FURNACES

There are 16 McDougall furnaces, each of which roasts about 50 tons of ore per day, burning it from 30 per cent. sulphur down to 8 per cent. Eight more of these furnaces are to be added. The charge is made up in the storage beds, wherein it is distributed by four belt conveyers with trippers, running lengthwise of the building. From the beds it is drawn into cars, which are trammed by electric locomotives to hoppers over the furnaces. On the lowest hearth an addition of the fine concentrate from the Utah Copper Company is made by hand, which increases the sulphur content of the charge delivered by the McDougall's, the fine concentrate being little more than dried. The object of charging in this way is to avoid the production of so much dust as would arise if the fine ore came down through the furnace. However, the means for handling this material can be greatly improved, as doubtless they will be. The hot calcines from the McDougalls go directly to the reverberatory furnaces.

In addition to the McDougall plant there are 25 Huntington-Heberlein pots, each of which desulphurizes and sinters three charges of seven tons each per 24 hours, making a product with only 3 to 4 per cent. sulphur. These start with ore burned down to about 12 per cent. sulphur in the McDougall furnaces. The hot semi-calcines from the latter are discharged into bins, from which they can be chuted into water in a pot for moistening. Then they are taken in that pot by a traveling crane and dumped on the priming charge in the pot to be blown. An improvement will be the moistening of the semi-calcines by water sprays into the streams discharged by the chutes of the hopper wherein received from the McDougalls.

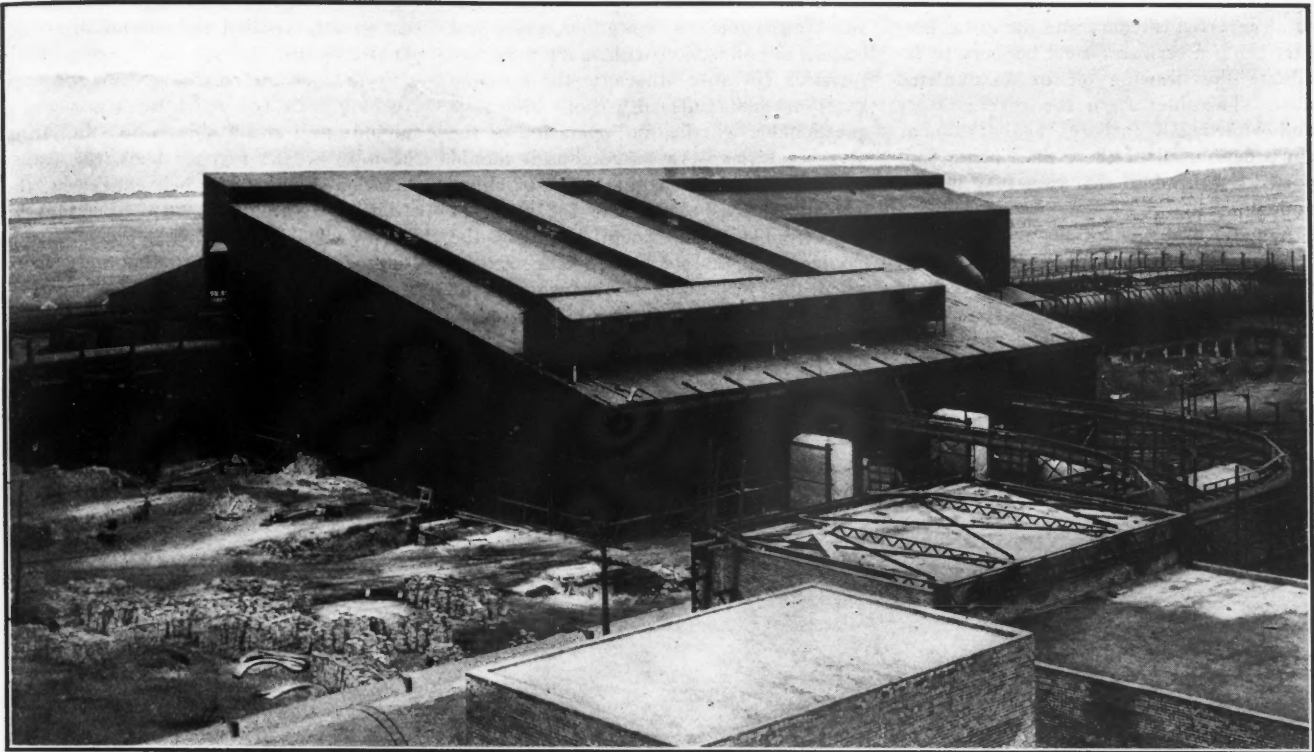
The Huntington-Heberlein pots at Garfield set in a single row commanded by a traveling crane, the method of handling being quite similar to that at Murray, the only differences being of a mechanical character. The arrangement of the pots in a single row facilitates handling and simplifies the removal of the gases, the re-

movable hoods communicating with a flue which runs parallel with the line of pots and close to it, so that connection is effected by a short, horizontal branch pipe from the hood of each pot. This eliminates all telescopic pipes and reduces the iron-work in direct connection with the hood. No special attention is given to making a tight joint between the hood and the main flue.

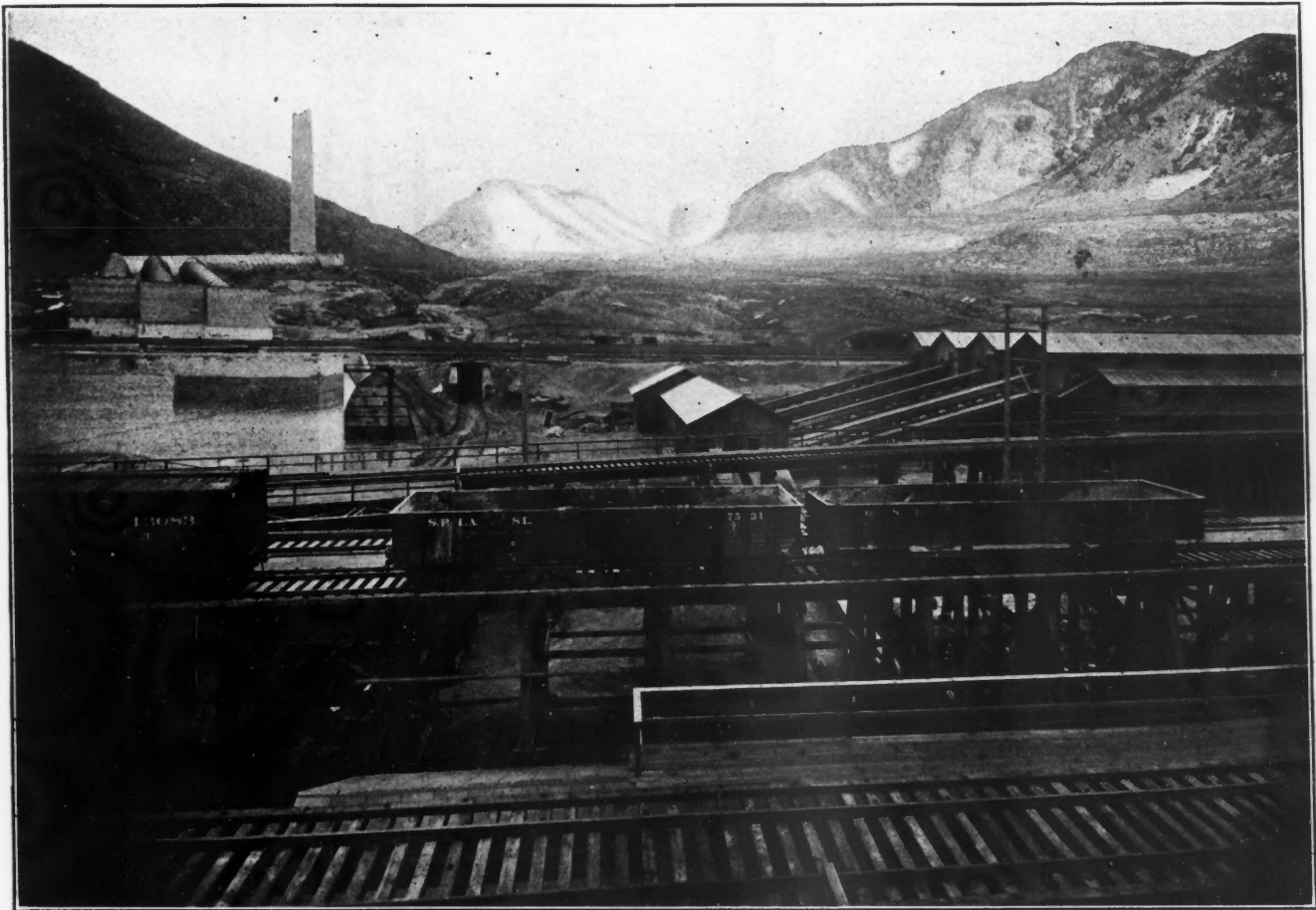
Each of the Huntington-Heberlein pots treats about seven tons of ore in eight hours, reducing the sulphur to 3 or 4 per cent. The sintered cake is dumped on the breaking floor at the end of the line of pots (which by the way stand in the open air, just as at Murray) and with the aid of a crew of four men is broken up sufficiently to pass through a 24x36-in. Blake crusher. The product from the crusher is removed by conveying belt, elevator, etc., to the bins for the blast furnaces. The ore sintered in this way is an excellent material for the blast furnace, but the breaking by means of crusher produces considerable fines, wherefore the full advantage of the coarseness of the material prepared by the Huntington-Heberlein process is not realized in the blast furnace.

THE DRAFT SYSTEM

Except for the boiler-house which contains four 350-h.p. Sterling boilers, each with its own steel chimney, the Garfield plant has only one chimney, that being a Custodis construction, 300 ft. high, 30 ft. in diameter, inside, at the top, and 42 ft. 6 in. in diameter, outside, at the bottom. The flues lead up-hill to the base of the chimney, the rise being such that the top of the chimney is about 500 ft. above the furnaces. The system of flues leading to the chimney is very elaborate. A good idea of its layout may be obtained from the engravings which accompany this article. The blast-furnace, reverberatory-furnace, converter, McDougall-furnace, and Huntington-Heberlein departments, each has its separate flue, the general arrangement of which surrounds the smelter yard in more or less rectangular form. These are combined into three main flues extending up the hill to the chimney. The length of the main flues from the chimney to the point where the branches lead to the various departments is about 3500 ft. The first portion of the flue leading from the blast-furnace department is of steel balloon-construction, as shown in one of the accompanying engravings. This picture was taken before the works were completed, and as finished the tramways to the blast-furnace department extend upon the steel framework above this flue. The flue from the converter department is also of steel and after extending separately for a considerable distance unites with the flue from the blast furnaces. On the third side of the rectangle the blast-furnace flue is changed from sheet-steel construction to a con-



FURNACE HOUSE, GARFIELD SMELTER



GARFIELD SMELTER, LOOKING SOUTH

struction of brick and steel, the upper portion of the flue being of brick in the form of an inverted catenary and the lower portion being a series of steel hoppers to facilitate the drawing off of accumulated dust. The flues from the reverberatory and McDougall furnaces are of similar construction, all of these flues being supported overhead so that cars may be run under them.

A mere inspection of the accompanying engravings will show that in these works the dust and fume are given an excellent opportunity to settle. Frequent tests are carefully made of the smoke discharged through the chimney. These are said to show that the loss of metals in the smoke is practically zero; substantially the only

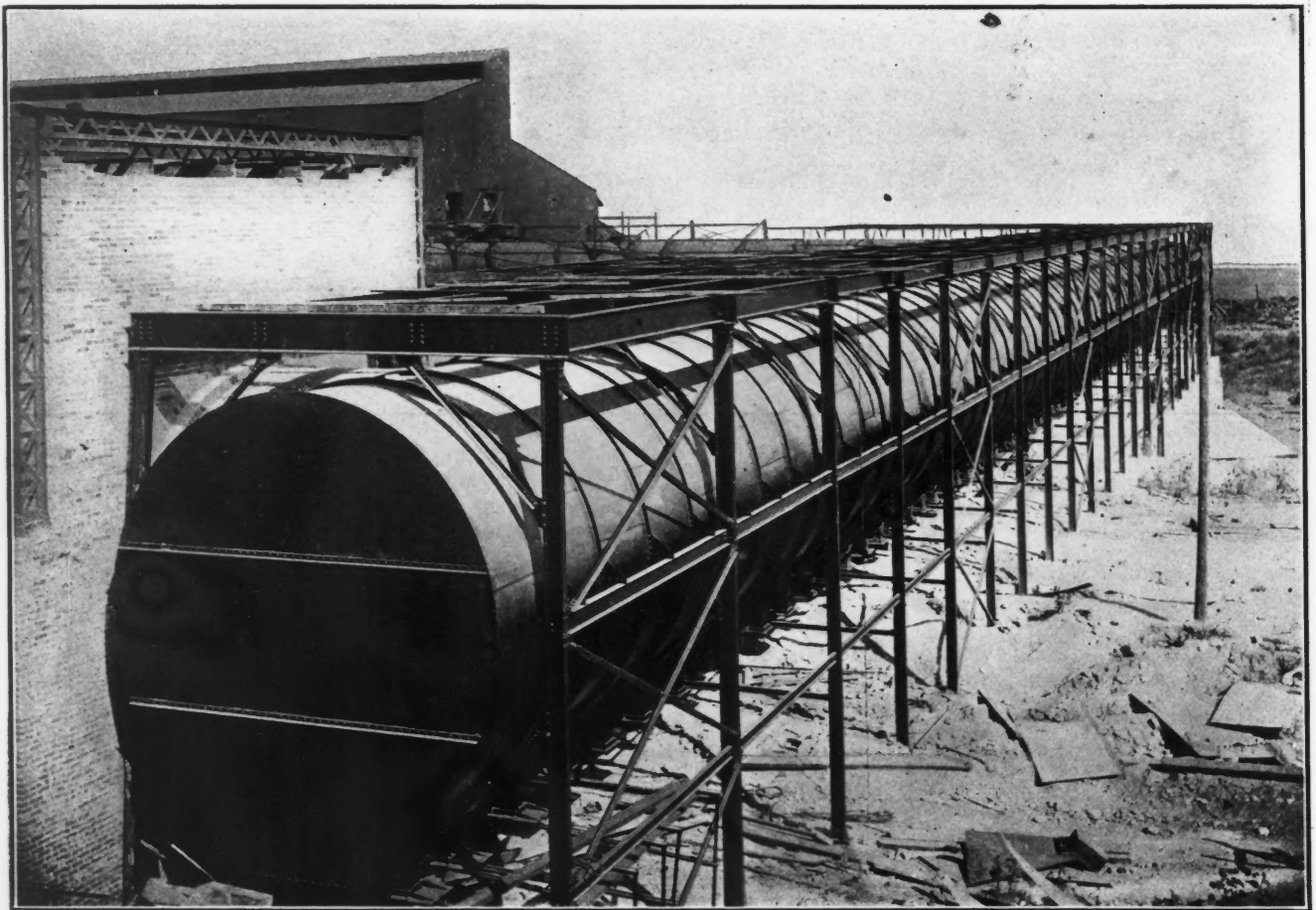
some extent by the application of an under-grate blast from a blower, but it is still impossible to run the waste-heat boilers in connection with more than two furnaces (because otherwise the escaping gases are not sufficiently hot) and it is questionable whether the operation of the reverberatories is yet as good as it should be. Doubtless, the arrangement of chimney and flue is responsible for much of this trouble, and doubtless also the troubles will disappear to a large extent when the full number of furnaces for which the plant is designed is in operation.

HANDLING MATERIAL

The handling of material throughout

which must be seen to appreciate its amazing magnitude. Here is one of the items that greatly swelled the cost of these expensive works.

From the ore-receiving bins to the crushing mills (of which there are two, a sulphide mill and a silica mill) and from the mills to the furnace beds, the transportation is chiefly by belt conveyers, the ore being distributed upon the beds by the conveyers. The system has given considerable trouble, owing to the multiplicity of its parts and its general complication, while the ore bins do not in all cases appear to be of the happiest design. In carrying out the idea of making the handling of all material in these works mechanical, it is questionable if that has not



BLAST-FURNACE FLUE, GARFIELD SMELTER

loss which is experienced in this plant is what is carried away in the slag.

It will be observed that the system of flues and chimneys at Garfield follows closely that of the Washoe smelter at Anaconda, Mont. The subject of chimneys, flues and draft in general is a fruitful one for discussion, which may be deferred until another time. The question as to whether it was sufficiently considered in the design of the Garfield plant, however, immediately presents itself. There has been more or less trouble in the operation of the reverberatory furnaces, the irregularities of which have been corrected to

the works is by tramway and by belt conveyers. The tramways are operated by electric motors. The ores, fluxes and fuel are brought in upon trestles and the tramways throughout the works extend largely upon trestles. I do not know of any other copper-smelting works in the United States which has so much trestle. To all intents and purposes the works have been built on a level site with several floors extending over the whole works, while the amount of trestle work was increased by certain unfortunate configurations of the ground. The engravings give only an imperfect idea of the extent of this system,

been overdone; at least, if it has been done in the simplest, most economical and most efficient manner.

ACCESSORY DEPARTMENTS

The Garfield plant is well provided with the usual accessory departments that are necessary in the operation of a large modern smelting works. There is a large and exceptionally well-equipped machine shop, a large carpenter shop and an excellent foundry. The power house comprises at present two cross-compound blowing engines for the converters and two No. 10 rotary blowers for the blast furnaces, each

blast furnace having its own blower with an independent air line from the latter to the furnace. The location of the blast furnaces at the eastern end of the main furnace building necessitated a rather long pipe for the air; but on the other hand the length of the steam pipes from the waste-heat boilers to the power house is reduced in comparison to what it would be by the reverse arrangement. The arrangement of the furnace building is such that additional blast furnaces can be provided for by extending the building to the east, while additional reverberatory furnaces will be put in an extension of the building to the west. It will be observed that the blast furnaces, reverberatory furnaces and converters are all contained in the same building, an arrangement which is open to criticism in comparison with the placing of these departments in separate buildings as they are at the Washoe smelter and will be at the Steptoe smelter.

RESULTS, CAPACITIES AND COST

It has been several times reported in the daily papers that the Garfield smelter is a failure. It has been said that even the big chimney shows structural defects. Of

high. It is said to have been \$5,000,000, or will be that much when the additional furnaces that are now being installed have been completed, which will be about the end of this year. Its capacity may be estimated at 900,000 tons of charge per year, which would make its cost upward of \$5 per ton of annual capacity. It is only a little while ago that \$3 was considered a figure that would supply all that is needed for the most economical operation. Is the extra \$2 worth while?

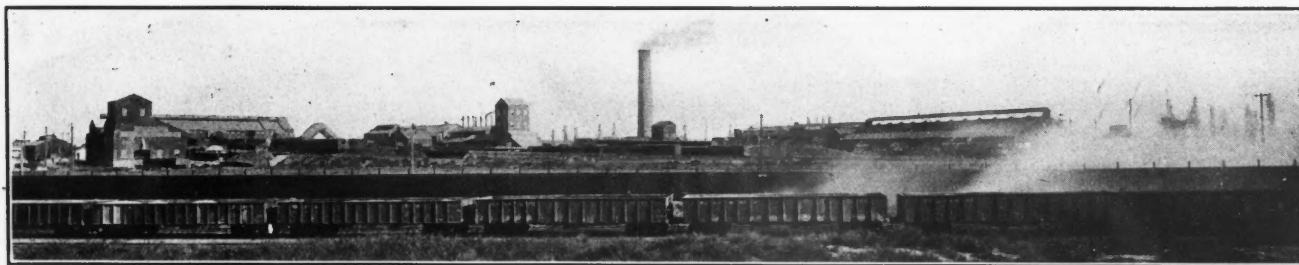
Magnetic Separating Plant of Delaware & Hudson Company

The new plant of the Delaware & Hudson Company, of Albany, which operates magnetite mines in Lyon Mountain, N. Y., is arranged for dry magnetic separation. The ore is brought to the plant without sorting. The crushing capacity of the mill is from 1000 to 1200 tons of crude ore in 24 hours; 375 h. p. is required and ore is crushed to $\frac{1}{4}$ in. to obtain the best results in separation. Nearly all of the machinery used was supplied

The capacity of each separator is 15 to 20 tons of crude ore. The middlings and tailings from the four primary separations are recrushed on four sets of rolls and again treated on a second set of separators.

The final product, concentrates and tailings, is carried out of the mill on two belt conveyers to the loading pockets. The concentrate pocket has a capacity of about 600 tons. The tailings pass over revolving screens with $\frac{1}{8}$ -in. apertures, which deliver each product into a bin of 200 tons capacity. The fine tailings have found good use as locomotive sand, being dry, sharp and clean. The coarse material makes good railroad ballast, and is also used for concrete sand.

An interesting use to which gypsum is put, especially in England, is the Burtonization of beer. The reputed excellence of certain British beers, notably those of Burton and Newark, is attributed to the presence of calcium sulphate in the natural water used in their preparation. It has been calculated that 350,000 lb. of gypsum are annually imbibed in



GENERAL VIEW OF MURRAY SMELTER

course, these reports are utterly incorrect, and if they had any basis, the latter could be nothing more than the infantile troubles from which any new plant suffers. The Garfield plant was constructed upon general lines that have been well approved by the practice of metallurgical engineers, and the engineers in charge of this particular construction had ample experience in the design and execution of such a works, together with the advantage of the great fund of technical knowledge that the American Smelting and Refining Company has accumulated. The works are open to more or less criticism as to technical matters which affect their degree of efficiency, but certainly such defects are not of a character to prevent the plant from running right along as a successful concern from the commercial standpoint. Such defects as there may be are perhaps due to the fact that the American Smelting and Refining Company has too many engineers, and does not trust its work of this kind sufficiently to a single one, upon whom responsibility may be placed. In other words, it is a case of too many cooks.

The first cost of this plant was very

by Allis-Chalmers Company, of Milwaukee.

The mill is divided into three sections, each of which can be separately operated. The crude ore, after weighing is dumped into a bin of 700 tons capacity, from which it passes over a grizzly of manganese steel bars to a 24x30-in. Blake crusher and is reduced to about 5 in. Then the ore passes over a second grizzly to a No. 6 K Gates gyratory crusher, which reduces it to $2\frac{1}{2}$ in.; the ore is then delivered to a belt conveyer which also receives the fine material from the grizzlies and carries the product to a set of 40x30-in. rolls, reducing the ore to 1 in.; it is then elevated to the top of a vertical dryer. After drying, the product is delivered by a bucket elevator to a second storage bin.

Sizing screens are fed from the bins by means of feed rolls, the oversize and the $\frac{3}{4}$ -in. material being delivered to 40x15-in. rolls of the same type as the coarse rolls. Then the material is passed over revolving screens with $\frac{1}{4}$ -in. apertures. The oversize is returned to the rolls, while the $\frac{1}{4}$ -in. material is elevated to bins over the separator section.

potations of Burton beer, and since gypsum is soluble to a certain extent, attempts have been made with varied success to add similar artificial salts to water not derived from gypsum-bearing beds, and large quantities of gypsum are purchased by brewers in England for this purpose. This addition, although advantageous, does not produce so perfect a combination of salts as that existing in the natural waters of Burton-upon-Trent

The production of the Vieille Montagne company in 1906 was 86,880 metric tons of crude spelter, 6160 tons of special spelter and 3649 tons of manufactured zinc, a total of 96,689 tons. The rolling mills of the company made 67,253 tons of sheet zinc, while the oxide works made 4422 tons of zinc oxide. The work of the company at Baelen and Viviez produced 71,525 tons of sulphuric acid. These figures illustrate the magnitude of the business of this company, which is the largest zinc-smelting concern of the world. In its last annual report there is further complaint of the continued increase in the cost of coal in Belgium, France and Germany.

Nickel Mining in New Caledonia

Nickel Ore Is Mined from Large and Small Open Workings or Quarries on the Sides of the Mountain Spurs. Methods of Handling

BY G. M. COLVOCORESSES*

In a previous article a general account was given of the geography and geology of New Caledonia; with some discussion of the nature of the orebodies and their probable origin. The most important of the mineral products of the island is the nickel ore, by which it is best known abroad.

NICKEL ORES OF THE ISLAND

By far the most important New Caledonian industry is the production of nickel

SiO₂, 41.8; NiO₂, 22.2; Mg, 19.8; H₂O, 16.2; total, 100, and (the hydrated sesquioxide of nickel itself having the formula 7NiO, 6SiO₂ + H₂O) may contain, when absolutely pure, 48.6 per cent. of nickel. It is common enough in any mine to find hand specimens and even veins of ore carrying up to 30 or even 35 per cent. nickel, but no large quantity can be mined.

This ore has a hardness of from 2 to 3 and a specific gravity of from 2.2 to 2.8. Its color is naturally dark green, but ex-

between 400 and 700 m., and in a very few cases higher or lower. Usually a mine does not consist of one large deposit, but rather of a group of small deposits with barren ground between. Thus one plateau contained eight large producing quarries within a radius of 2000 m. At another mine there is a single large deposit estimated to contain 250,000 tons of ore, and on an adjacent spur, 1000 m. away, is another deposit on which about 60,000 tons have been developed. Another large mine has three



NICKEL MINE AT AN ALTITUDE OF 1500 FEET

ore, although the greatly increased chrome industry may rival it before long; but that is another story, and will not be treated in this article. Again, this ore is a product of decomposition of the peridotite and in this case the result is the hydrous silicate of nickel and magnesia, known as garnierite or noumeaite. For this various formulas are given: H₁₀(NiMg)₈Si₇O₂₁; or, H₂(NiMg)SiO₄ + H₂O; or, 2(NiMg)₈Si₇O₂₁ 3H₂O, with approximately the following composition:

*Mining engineer, Noumea, New Caledonia.

cess of magnesia may render it pale green, and the presence of iron gives it a chocolate or brownish yellow tinge. As taken from the mine, the great bulk of the impure ore resembles hard yellow clay, or decomposing rock, and it always carries from 10 to 25 per cent. of uncombined water. The nickel is always found in surface deposits. These are situated on spurs on the sides of plateaus more generally on those forming outposts of the Chaîne Centrale. The height of these deposits varies, but may be said in general to be

distinct sets of quarries, one at either end, one in the center of the flat-topped spur on which it is located, the distance between the extremities of the quarries being 1400 m. Yet other mines consist of six, or even more, small quarries, each one of which may yield 5000 to 10,000 tons, located with no apparent regularity or order on the main spur and its branches. But practically all these deposits have one physical feature in common—they overlook a river or stream valley, whose sides rise at a very sharp angle. This is a feat-

ure in New Caledonian mining—that in all mines (nickel, chrome and cobalt) the ore is not raised, but is mined from quarries or adits (excepting a few cobalt shafts) and is then lowered into the valleys, up which railway or road may run. The problem of hoisting does not exist here, but is converted into a study of the most economic means of hauling ore from the different quarries to one or more central points and then descending it into the valley below.

METHODS OF MINING

Every nickel mine on the island presents different features, but the best general idea of their working can perhaps be gained by following a typical ton of ore from its extraction to its shipment, for it must be remembered that neither concentration nor smelting is done on the island.

Let us suppose that at 10 or 15 km. from the coast—generally nearer—are located the quarries from which the ore is to be taken out, situated at an altitude of 500 m., usually on the saddle of a spur from one of the big 1200-m. high mountains. These quarries have been opened along the face of the spur, cut out like a flight of steps, each level about 8 m. in height, with a length that may vary from 20 to 200 m.; 3 to 12 levels altogether, and men working on several or all of them simultaneously. Owing to the boulders and cliffs of rock and the horses of barren earth which separate the stringers, veins and pockets of rich ore, it would not be economical to use steam shovels or excavators, and almost all the work must be done with pick and shovel, blasting being used only occasionally to break up the rock or some unusually tough mass of ore. Sometimes the ore not only occurs in veins or pockets, but from these has become impregnated into the serpentine rock itself. Often, indeed, there will be kernels of solid rock surrounded by several crusts of decomposing rock impregnated with nickel, each successive shell growing softer and richer in the metal. When the face of a quarry is attacked, the overburden and pockets of red ferruginous earth are first stripped out for about 5 m. and removed from the platform, which is carefully swept. This leaves only ore and rock to be broken down from this block of ground. The ore proper and the pay rock are next broken and picked over, which operation is most important. Experienced men can generally tell by the look and hardness what ore will pay and what will not, but to aid them, all the material is usually broken to a certain degree of fineness with hand hammers, after which the ore pulverizes easily and separates away from the harder pieces of rock, which can be picked out and thrown away. In some mines this operation is carried even further, by passing all the stuff through grizzlies and shaking sieves and rejecting

the larger grades, and sometimes also the extreme fines, which are apt to be very poor if the ore is earthy in character. It is also usual to make several piles of doubtful material, which are kept at one side to be sampled and analyzed before being kept as pay ore (carrying, say, 6 per cent. nickel) or rejected as waste. All the ore is also sampled, being placed in piles of about 10 tons each, ticketed with the approximate quantity and the result of the assay, so that the platform of a level resembles a series of large Australian ant-hills. It may seem curious that so much sampling should be necessary, but the nickel content of the ore is far from uniform, the same quarry, even the same broken face, often producing small piles of 15 per cent. ore (which is very rich), larger ones of 10 per cent. and the bulk of 7 per cent., with several doubtful piles running 5 or 4 per cent. The ore contracts call for a certain minimum grade and a higher price per kilogram of metal contained is paid on a sliding scale for higher grades of ore, so that it is necessary to calculate just what grade of ore each mine and each quarry can furnish with the greatest economic advantage, and to mix the ore accordingly, often rejecting all the lower grades where they cannot be advantageously sweetened up to the required tenor.

For many years no ore could be profitably shipped which did not contain 7 per cent. nickel on the dry assay, but the crude ore invariably contains from 15 to 28 per cent. of uncombined moisture (average 20 per cent.), so that a shipment of ore spoken of as 7 per cent. stuff really contains only about 5.6 per cent. nickel, or 56 kg. of nickel to the metric ton. This limitation of grade arises partly from the fact that it is, of course, more expensive to smelt a low-grade ore, and partly from the fact that the ocean freight and insurance to Europe—\$7 per ton on the average—must be borne by the small proportion of weight represented by the nickel contained.

As a natural result of its formation, the ore, except where mixed with overburden, is richer near the surface of the deposits, and after the levels have advanced four or five meters the average tenor gradually decreases and at 10 or 12 m. advancement it generally grows too poor and rocky to pay to follow farther; though some of the richer veins or pockets have occasionally been followed 30 m. or even more. Thus for a time a quarry will yield 8 per cent. ore, then 7 per cent., and later 6 per cent., after which it must be abandoned, unless the product can be sweetened up from fresher quarries. Needless to say, this condition causes an immense waste in working the deposits, from which, so to speak, only the cream can be skimmed, and when the fully equipped mines must be abandoned as unprofitable there are often thousands of tons of 4 and 5 per

cent. ore standing developed in the quarries ready to be broken down and shipped; to say nothing of what has been thrown over the dump mixed with the worthless gangue at the time when the mine flourished and only 8 per cent. product was preserved.

HANDLING THE ORE

On the smaller mines of the island the crude ore is packed in bags and in this shape transported to the sea. On a very small mine the reason for this is that the first cost of equipment to handle ore in bulk is not warranted, but it is regrettable that this ancient and uneconomical system of packing and handling has often been adhered to in many larger mines, where no adequate reason can be given for it.

Where the mines are equipped to handle material in bulk the ore is shoveled from the quarry platforms into iron dumping cars running on a 50-cm. track; these cars are pushed by hand or drawn by mules to a chute down which the ore slides at an angle of about 60 deg. and into a hopper placed at the head of the main gravity cables or "va-et-vients." These cables are firmly anchored at the top and at the bottom are drawn taut by Spanish windlass or multiple tackle. If possible they are unsupported between, and the length of one span may be up to 1600 m., though it is preferable not to exceed 1000 m. The angle of descent is 10 deg. or over, and for long spans cables of 20 or 22 mm. dia. are used. On these cables runs a hanging bucket or skip, suspended from steel pulley wheels, to which is fastened a steel draw-rope of about 8 mm. diameter. This draw-rope passes over a large pulley at the top, on which a ribbon brake regulates the speed of the voyage. A large bucket will carry about 500 kg. of ore, and the run of 1000 m. should be made in one minute, the empty skip coming up into place under the charging hopper and when desired bringing up tools, provisions, water, etc. At the foot of the cables the full skip comes to rest over another hopper with a capacity of 50 to 100 tons, into which the ore is tipped and from which the ore cars on the railway are filled. From the formation it will be remembered that the cables invariably run down into a river valley along which the railway is built from the shipping port.

Many deposits in the interior of the island can never be so served by railways, and would require many kilometers of aerial tramway to bring the ore to a railway terminus, but so far none of these has been worked. On the east coast two large mines are served by these tramways, one a Bleichert 3 km. long operated by gravity, the other an Otto 6 km. long, the last 4 km. requiring power. It is said that the cost of constructing these tramways was about \$15,000 per kilometer, or \$25,000 per mile.

As is natural the mines nearest the coast and hence requiring the least in-

stallation have been the first worked, and it is always a question how much equipment and traffic cost a deposit will stand. Where railways can be run up from a shipping port to the foot of a mine this furnishes the natural means of transport, and the gravity cable of one span gives an ideal way of carrying down the ore and loading the cars with the minimum of material, labor and expense.

RAILWAYS ON THE ISLAND

In speaking of railways I am particular rather than general, for at present only four nickel-mining centers are equipped with steam railway. These vary in length from 10 to 27 km., and in gage are 50, 60 or 75 cm. There are, however, several smaller lines of track up to 6 km. in length, and usually 50-cm. gage, down which ore trains run by gravity to the loading point (which is frequently the head of punt navigation in a small river),

and rowed or towed to the vessel by a steam launch, for in only one case was a wharf built long enough for a ship to lie alongside, and there the latter part of the cargo had to be punted out to the anchorage. Until recently practically all nickel ore has been loaded from punts, but at Thio a marine terminal there has now been constructed a Bleichert aerial ropeway 1 km. long connecting it with the shore. This is designed to load two ships at once, giving each 500 tons per day or one ship 1000 tons. It began operations in 1906.

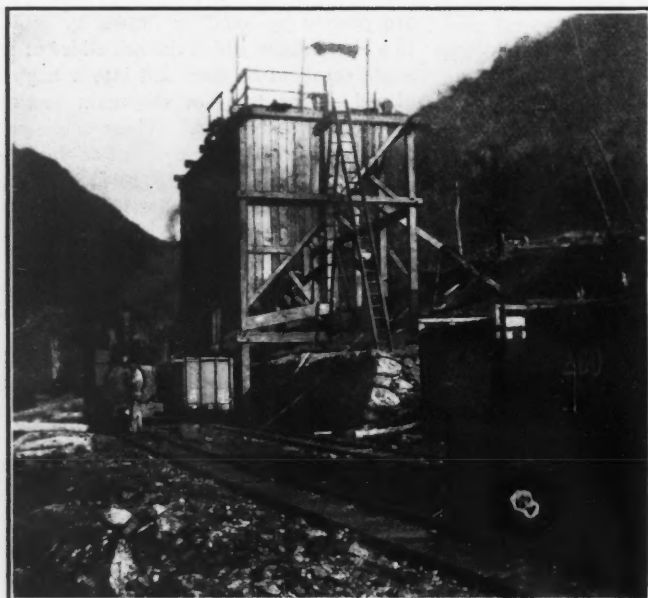
Such in brief is the general history of a ton of nickel ore which leaves New Caledonia for the nickel smelters of Great Britain or Europe.

LABOR AND GENERAL CONDITIONS

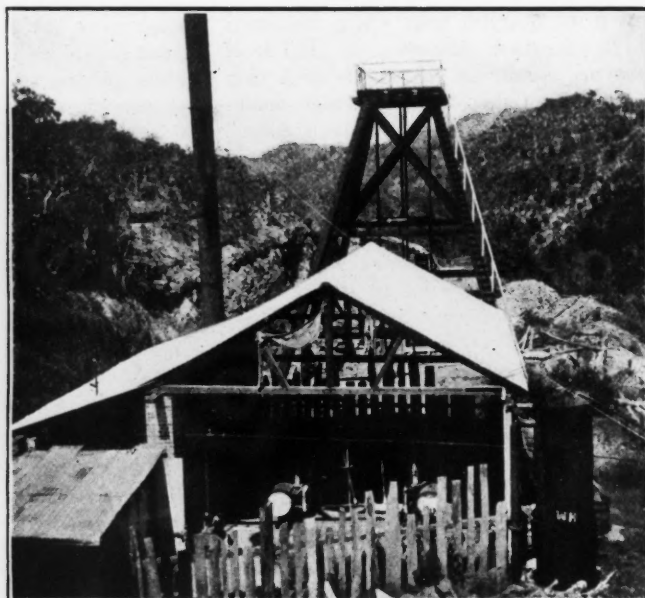
Labor conditions are very peculiar. Being open quarries, very little skilled mine labor is required, and until 1901 French

to the Chinamen but more expensive, while, attracted by the temporary dearth of labor, many Dalmatians and Croats were induced to come from Australia and New Zealand, where they were then working, and for about three years they obtained plenty of work at wages which started at \$1.50 for an eight-hour day and laterly became \$1.20 for a nine-hour day. After that, they found it more remunerative to return to Australia. Lately also many Javanese have been imported, but they are more particularly suited to the coffee plantations, though in some cases they gave good satisfaction on the mines.

A Chinaman costs \$0.50 per day; including purchase price, transportation, food, clothes and cash pay (which is usually \$4 per month). A Javanese costs about \$0.65, and a Japanese about \$0.80. Then as day laborers the "libérés," or ticket-of-leave men, may be engaged without contract for \$1 per day, and French



LOADING AN ORE TRAIN



COPPER MINE IN NEW CALEDONIA

the returning empties being hauled back to the mines by horses. There are some few mines which are so favorably situated as to require no railway at all, the cables landing directly at the punt wharf on a river, or directly on the seashore itself. The importance of cheap transportation is all the greater because, outside of the main production which comes from the few centers operated by large companies, the greater number of working mines are owned or leased by persons who have no stable ore contracts, nor any large capital to place in equipment.

So the ore is finally brought to its shipping point, where a large stock is invariably accumulated, the exact weight and grade of which is known, since it has been weighed and re-sampled on the trucks. Here the ore may be kept for several months awaiting the arrival of a vessel, unless one happens to be loading at the time. Then it will be loaded into punts

and Algerian-Arab convicts formed the bulk of the nickel-mine laborers, though occasionally English, French and Australian miners had been brought for the more difficult work and especially for the chrome mines. The convicts were farmed out by the Government and cost the mining companies from \$0.20 to \$0.50 per day. When convicts were not used gangs of Chinese coolies (from Annam and Tonquin) were imported, and cost but little more. This excessively cheap labor induced the continuation of very primitive methods and few labor-saving devices were thought worthy of consideration. In 1901 all the convicts, of whom about 2000 were then employed, were recalled to the public works undertaken by the Government, as no further deportations were made from France, and convict labor became a thing of the past. More Chinamen were then imported, as well as about 1000 Japanese, who were considered superior

or Austrian free laborers for \$1.20; but very few of these last two classes now remain.

New Caledonian natives and those from the near-by Loyalty and New Hebrides islands formerly formed a considerable proportion of the mine laborers, being especially useful for the traffic and punting. But latterly they have become so lazy and so hard to recruit, that they form an almost negligible quantity at present. When engaged their contract is for a year, and their cost to the operator about \$0.75 per day.

It is very difficult to make comparisons between all these different kinds of labor, but some observations concerning the Japanese and Chinese may be of interest, as so much of this labor is in use in various mining regions of the world.

At equal cost the Japanese seem preferable, for they are more intelligent, more easily taught, also quicker and more reli-

able in their work, provided this requires any skill. But the Chinese generally have greater physical strength and are tougher, so that for pick and shovel work and hand drilling there is not much difference. Both can be very patient and painstaking and for cobbing and hand picking ore they are really superior to most whites.

In handling Eastern labor I believe the real essential is to have a good morale among the men, and this can only be cultivated after a year or more of work, unless the new recruits are mixed on arrival with a large proportion of old hands, who know their work and know that it must be done in order to secure the pay for which they have come out.

The first thing a convoy of coolies does is to see how much of their work can be shirked without resulting in fines and punishments. They set themselves a standard, and it is sure to be a pretty low one at the start, despite all the superintendent

CONDITIONS OF COOLIE LABOR

The worst feature of all this coolie labor is that batches of several hundred unknown men must be recruited at once, and in each lot there are sure to be, say 10 per cent. of really undesirables. Opium fiends, professional gamblers, self-appointed walking delegates and incorrigible loafers are the curse of every camp, and must be gotten rid of or the difficulty will never cease. It is much cheaper to send these men home at the company's expense than to continue to suffer with them, for their comrades will be easily led and general discontent will prevail as long as they stay in camp. If, by some lucky chance, such men should desert, thus breaking their contract and so relieving the company of the necessity of repatriating them or taking them back to their employ, it is the best thing that can happen. Once these men are out of the way, the rest become much more docile, do better

to feed, clothe and house them in a prescribed and very liberal manner. The actual wage paid in money in New Caledonia was about \$4 to a Chinaman and \$8 per month to a Japanese. From this it was possible for an economical Chinaman to save \$200 during his five years, or if he earned bonuses he might save \$300 or more. The best proof that they were well satisfied was the frequency with which they voluntarily re-engaged for another term of five years, usually at a small advance in pay. Indeed, I have seen men returning to China after 15 years' work in New Caledonia with fully \$1000. For the rest of their lives they would be comfortable, even wealthy. Of course, the system, like anything else, may be and sometimes is abused, but if the men do not receive justice they have always recourse to the inspection or immigration officer, who is bound to investigate. Moreover, a company which abuses its men will have



BREAKING DOWN ORE IN A NICKEL MINE



PILOU COPPER MINE

and his foreman can do to the contrary. Their task remains in gradually increasing this standard and raising the efficiency of the men, by showing them that it is to their interest to do better. In other words, their minimum wage and amount of work being fixed, it remains to bring them up to the maximum efficiency, and there are various ways of doing this. Many opinions to the contrary notwithstanding, I believe that in the end the cheapest way is by increasing their wages in proportion as they merit it. A very slight increase will do, for with \$1 extra per month a Chinaman will often do about half more work than formerly, and for a bonus of \$2 per month he does wonders. When a Japanese or a Chinaman really sets out to work very few white men will beat him, along certain lines; taking both wage and bonus into consideration good coolies are about the cheapest labor to be obtained anywhere. Piece work, when possible, is often done to the greatest advantage.

work and are better off in every way. The contracts passed are usually for five years, and the training of the men, developing a morale and weeding out the undesirables is apt to take up the better part of the first year, during which little or no profit is likely to be made; but if they have been well handled the true profit comes in during the years that follow, and all the trouble is well repaid.

Several thousand Japanese and Chinese have been employed in New Caledonia under contracts which were not as liberal to them as those which exist in South Africa, and from all that I have seen of this contract labor I believe that the political talk about "slavery," etc., is the worst kind of "tommyrot" (that word seems to fit exactly). The Chinese or Japanese peasants go of their own free will, because they know that five or ten years' work will make them comfortable for life, according to their standards. The company engaging them is bound by legal contract

great difficulty in securing fresh recruits, so that self-interest, if no higher motive, should lead them to play fair.

The bulk of the gypsum produced in the United States as well as in foreign countries is manufactured into various plasters—such as plaster of paris, stucco, cement plaster, flooring plaster, hard-finish plaster—and a steadily increasing quantity is being used as a retarder in portland cement. Refined grades of plaster are used in dental work and also as cement for plate glass during grinding and as an ingredient in various patent cements. Considerable quantities are ground without burning and are then used as land plaster or low-grade fertilizer, while smaller quantities are used in the manufacture of paint and paper, imitation meerschaum and ivory, and as an adulterant. The pure white, massive form, known as alabaster, is much used by sculptors for interior ornamentation.

Improvements in the Vertical-plunger Sinking Pump *

By A. H. HALE†

The vertical-plunger sinking pump suspended in a shaft by means of a wire cable and hangers that hook to the shaft timbers is in almost universal use. It is undoubtedly true that this type of pump is very wasteful of steam, due in a certain extent to the simple valve motion, which

ful of steam, yet it possesses the great merit of operating under 50 ft. of water as well as though the pump were just above the surface. It is not unusual, when sinking a shaft, for the water to rush in and submerge the pump, or "drown it."

Frequently, also, sinking pumps have to work 2000 ft. away from the boilers that supply them with steam. A large percentage of the waste of steam the pump is blamed for could be avoided by the use of a separator in the steam line near the

pieces to handle in a wet shaft. alone to blame for, is the design of the water-valve chest. As shown in my design, Fig. 1, there is no reason why hinged bolts should not be used about the chest, nor why the bonnet or cover should not be hinged also. In this way the time required to examine the valves—something which has to be done often—is greatly reduced. The bonnets on some makes of 14 and 7 by 13-in. sinking pumps weigh about 75 lb., and on the larger sizes upward of 150 lb.—rather awkward

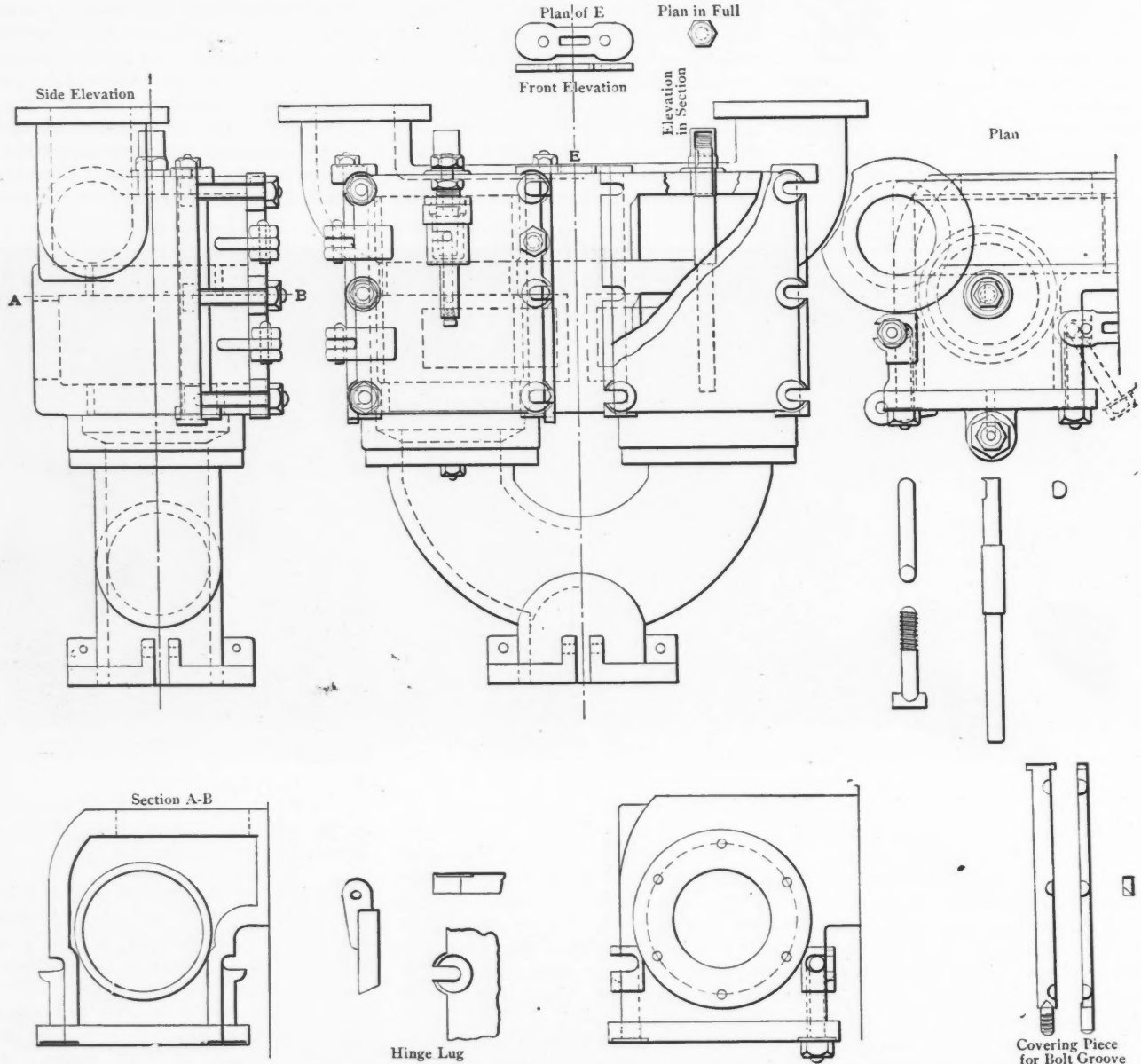


FIG. 1. ILLUSTRATING DETAILS OF WATER-VALVE CHEST FOR SINKING PUMP

is considered best for the conditions under which such a pump is compelled to work. It has been learned from experience that so far as a sinking pump is concerned it is best to sacrifice economy to simplicity. The simple valve-gear, consisting of only four moving parts, all within the steam chest and steam cylinder, may be waste-

pump, and by insulating the steam line so as to prevent condensation. Likewise, a steam separator at the boiler is of value, as much of the water supposed to come from condensation in the steam line is water carried over by the steam.

DEFECTS OF WATER-VALVE CHEST

One serious defect in the design of sinking pumps, which the builders are

Another great annoyance where stationary bolts are used is caused by the nuts becoming changed about and requiring to be turned up with a wrench the entire length of the thread. I notice that one builder of sinking pumps has finally decided to have part of the chest bolts hinged, the remainder being stud-bolts. This combination makes anything but a great design, but it goes to prove that the

*An article in POWER, September, 1907.
 †With Jones & Jones, Denver, Colo.

builders consider hinged bolts better, or they would not have substituted them for stud-bolts.

Another advisable change is in the cap-nut that keeps the water-valve stem in place. As now made it consists of a cap-nut with a set-screw in the top. The squares on the cap-nut are of no particular size as compared to the other nuts on the bolts of the water chest, and the small set-screw in the cap-nut is very often bent or broken. In fact, it is rarely otherwise after the pump has been in service a short time. With the design shown in Fig. 2, the valve-stem and cap are practically one, the use of the set-screw is

sinking pumps claims to hold a patent on the device. For a stop-valve between the two chests, the builder referred to uses an angle-valve. A valve of that kind is utterly worthless for the purpose. They are of such light design that they are soon put out of service by the rocks thrown by the blasts. And as the men in charge of the pumps are usually unskilled and are not familiar with their construction or operation, a plug-cock is much more easily understood by them. They can always tell by the mark on the end of the plug when the valve is open or closed, and there is no chance of their twisting the stem off, as is often done when attempting

chest bonnet for the connection, as in the event of the nipple breaking off it requires some little time to cut out the piece in the hole. I believe that making the connection to the bonnet by means of a running sleeve and back-nuts is the best method. A running sleeve between the cock and the elbow, as shown, will save quite a little trouble in getting the exact length so that the ends will enter the holes in the bonnet.

AIR CHAMBER.

The same builders who claim a patent on the 20- or 30-year-old priming device also claim to hold a patent on an air chamber, in which the discharge pipe connects at the top of and passes down into

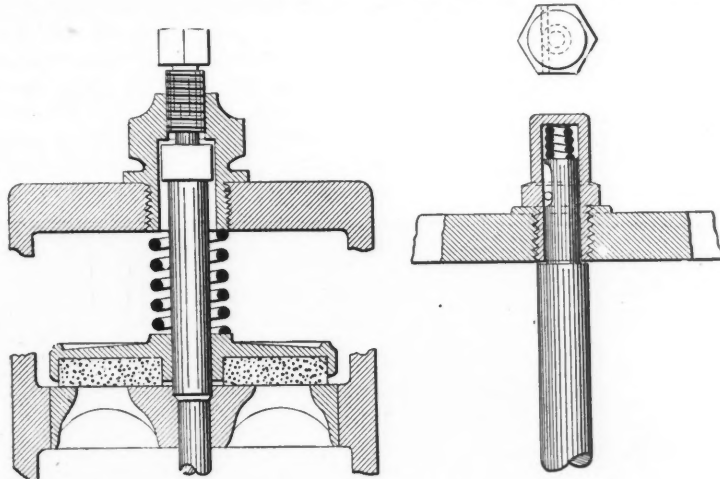


FIG. 2. SHOWING CAP-NUT TO KEEP WATER VALVE IN PLACE

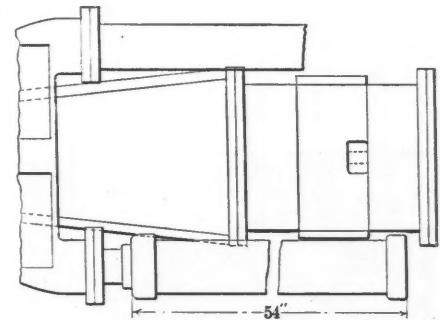


FIG. 4. AIR CHAMBER

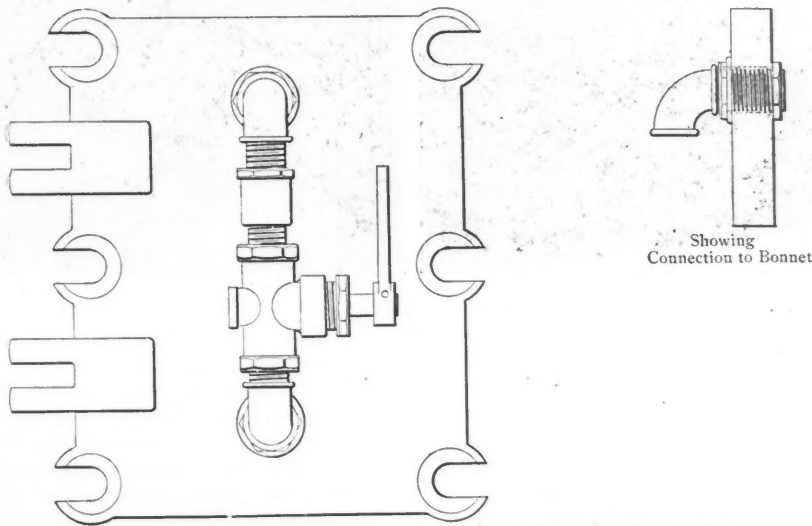


FIG. 3. PRIMING VALVE FOR VERTICAL-PLUNGER SINKING PUMP

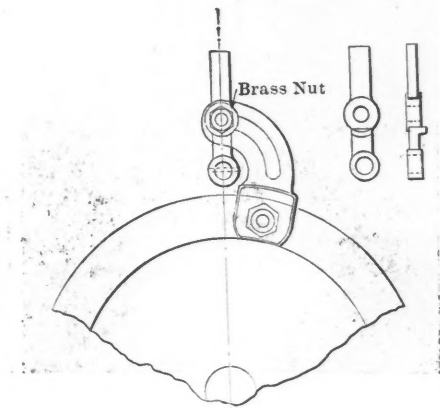


FIG. 5. QUADRANT AND LEVER OF CUSHION VALVE

avoided, while the nut is of the same size as the other nuts about the water end.

PRIMING DEVICES.

A priming device of some sort is really indispensable about a sinking pump. One of the best arrangements I know of for the purpose is to connect the discharge-valve chest with the suction-valve chest by means of suitable passages or piping having a valve of some sort. Such a device has been in use for 20 years or more on pumps in the mines in the West. Yet in face of this fact a certain builder of

to operate an angle-valve or a globe valve.

The plug-cock shown in Fig. 3 has a nut on the end of the stem for turning the plug; this nut is the same size as the others about the chest. Fig. 3 also shows what I am inclined to think was among the first of the priming devices for sinking pumps. It is very simple and cheap and I believe it to be fully as good as, if not better than, the other designs I have referred to.

In case the plug-cock becomes leaky it can be replaced at a trifling cost in a few minutes. I do not advise tapping the

the chamber for some distance, the annular space between the discharge pipe and the walls of the chamber acting as a receiver for the air. This type of chamber is old; it was used at one time by a firm of locomotive builders. The design never became popular with builders of any line of pumps. In fact, the design is absolutely without merit. An air chamber must be of a certain size, i.e., it must have a certain air capacity relative to the discharge of the pump. A perfect pump would not require an air chamber. The best air chamber for a sinking pump is one made of wrought-iron pipe, as shown in Fig. 4. This design takes up less space in the shaft and is less likely to leak air than cast iron. A tap-bolt, or bolts, should always be put in the bonnets so the joints

may be broken without the use of a hammer and chisel. A coating of graphite on the face of the joint will prevent sticking and damage to gaskets. Chalk is about as good as graphite for the purpose.

I have shown the branch pipe, Fig. 1, connecting the suction pipe to the chest as a separate casting. It could be cast with the chest. If it is, provision must be made for the passing of the boring bar through the branch pipe, and instead of the plate *E*, lugs could be used, as shown on the outside top corners of the chest.

It is best to have all nuts that are liable to require adjusting from time to time of the same size, so that only one wrench will be necessary. This may require at times a bolt somewhat out of proportion, but the benefits gained by having all nuts of the same size will offset that small defect in the design.

I have found the cushion-valve quadrant and lever to be poorly adapted for

Mining Laws and Legislation in Santo Domingo

By F. LYNWOOD GARRISON*

AND
ADOLPHE CHALAS†

Some persons, especially Americans, who have had their attention called to mining matters in the island of Santo Domingo, appear to be under the impression that the mining regulations of this Republic are similar to those of the United States. They are, in fact, quite different and should be thoroughly understood by anyone proposing to embark upon mining enterprises in that country.

The Dominican Government, in common with many other modern republican governments, is divided into three sections, legislative, executive, and judicial. Some Americans have supposed and as-

therefore, is in fact a contract between the two parties aforesaid, made for them by act of Congress, and the Government is not a party thereto.

All existing mining concessions in Santo Domingo are those granted under the laws of 1876 and 1904, the latter having displaced the former, which in turn was abrogated this year, but not yet succeeded by a new law.

Concessions made under either of these two systems hold good respecting the laws in force at the date of the grant, thus a concession of 1876 is governed today and for all time, by the law of 1876; a concession granted in 1904 must be likewise subject to the law of that date. This, of course, assumes that the concessionnaire has in all cases complied with the law and paid his taxes, thus keeping the concession alive.

As might be expected of people absolutely ignorant of mining, all the Do-



UPPER NIGUA RIVER



GRAVEL BANKS RESTING ON ERUPTIVE ROCKS,
JAINA RIVER



A JUNGLE STREAM, NORTH COAST OF SANTO
DOMINGO

the purpose intended. The pieces mentioned are sufficiently strong for pumps working under normal conditions, but they are too light to withstand the rough usage they receive in a mine shaft. I have designed one (see Fig. 5) which I know will stand hard usage. I use a 3/4-in. nut and bolt in the quadrant for locking the lever. No doubt a 1/2-in. bolt would be strong enough. I did not care to use a lever, or "tailboard" nut, as it is a common practice to set them up with a hammer of some sort.

Stromeyerite, which is a sulphide of copper and silver (CuAg_2S or Ag_2S , Cu_2S , contains 53.1 per cent. silver, 31.1 copper and 15.8 sulphur, has recently been found in the Foster mine at Cobalt, Ontario, Canada. It has a metallic luster and a dark steel-gray streak and color.

sumed that special legislation is necessary whenever a new concession is granted in Santo Domingo, and that all mining rights emanate from the Congress, that is, from the legislative power. This is not correct, for while Congress can make the laws it is the function of the executive branch to enforce them. Dominican laws are based upon the Code Napoleon, and under this system mining rights constitute property quite apart from land or surface rights, or the actual ownership of the land. It is the duty of the executive (the President and his ministers) to enforce the laws affecting all persons, the mining-concession holder as well as the land owner, in accordance with the specific mining laws that existed at the time the concession was granted. This law,

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†Mining engineer, Paris, France.

minican mining laws up to the present have been defective in numerous respects; some clauses being unreasonably favorable to the concessionaire or the land owner, while others are a serious detriment to both. According to the law of 1876, anyone could apply for a mining concession anywhere and even upon anybody's land, providing the land-owner was duly notified. Within three months from the date of such notification the landlord could claim his so called "preference rights," which would enable him to take possession of the concession if he reimburse the concessionaire for all expenses incurred in prospecting and developing the property.

Under the law of 1876 a government tax of 2 per cent. was imposed upon the gross mineral product of the property, no other impost being demanded; hence by this

law the only effective forfeiture clause was that of non-production. Immense tracts of land were tied up in this way, the concessionaire simply conducting one small productive operation, at any one spot upon the concession, no matter how large the concession may have been. It appears probable, however, that most of these old concessions have now been forfeited, since no mining whatever is going on in the island.

According to the law of 1904 the landowner in claiming his "preference rights" is entitled to 66.6 per cent. of the production of the concession, but he must assume charge of the operation and supply the concessionaire with 33.3 per cent of the net profit of his work. In all the concessions so far granted under this law, as far as we know, none of the landowners could afford to claim their preference rights as aforesaid, and consequently the concessionaires retain their full possession.

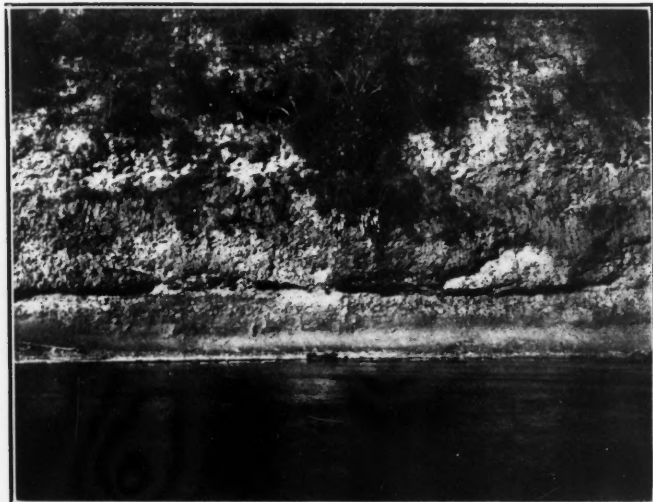
operation in Mexico. Capital can only be attracted by liberal and fair laws, and, when once invested, protected with most scrupulous care. The Dominican Government stands in urgent need of competent advice in framing the proposed new mining code, and such information can only be obtained from experienced mining men familiar with similar laws in different parts of the world. United States laws are good and bad, but on the whole well suited for the conditions in our western States and Territories. They would never do in Santo Domingo, nor would the Mexican and South African (Transvaal) mining laws, unless modified to suit local conditions.

The Code Napoleon considers in a broad way that the mineral in the earth belongs to the State, while our common English law regards the owner of the land as possessing everything from the heavens above to the depths of the earth beneath, as defined and limited by his sur-

Multiple Arrangement of Drills on the Rand

BY EDGAR NICHOLS*

In the Cinderella Deep mine in the Transvaal the system of using three machines rigged on one bar, in pushing forward an ordinary 7x5-ft. drift, was introduced by Manager Girdler Browne. The use of this method established a record, on the Rand, for rapid driving, and this was performed at a depth of over 4000 ft. from the surface. I believe some American tunnels have been advanced at a greater rate and I should be glad to hear from any correspondent, in the columns of the JOURNAL, on the subject. The advance was 225 ft. in a month of 31 working days. Three men with five or six natives and sometimes a white assistant worked in eight-hour shifts. Compressed air was freely used for blowing out the



AURIFEROUS GRAVEL BANKS ALONG THE YAQUI DEL NORTE RIVER

In case the applicant should be a shareowner in the peculiar undivided properties known as *comuneros*, the other co-owners are not entitled to any participation whatever, no matter how small a share the concessionaire may hold in the *comunero*.

Under the law of 1904 there is no government tax on the product, hence the exploitation of the concession is in law no concern to the Government as long as the holders pay the yearly tax of \$10 per 100 tareas (64c. per acre) when for precious metals, and \$5 per 100 tareas (32c. per acre) for concessions taken for all other metals and mineral products. The non-payment of this tax is the only cause for forfeiture. It is well to note in this connection that land is not taxed in any manner whatever in Santo Domingo.

A rich island like Santo Domingo, wherein there is good cause to expect considerable mineral wealth, should be provided with a code of good and just mining laws similar to those now successfully in

face boundaries. It is perhaps a debatable question which of these two fundamental principles is best adapted for the development of a new country.

Long Service Crushing Machinery

The first rock crusher ever used in the southwestern mining region of Missouri is still in operation at the smelter of the Granby Mining and Smelting Company, at Granby, Mo. It is a 10-in. Blake of the original pattern and in 1866 made the trip from New York to Pittsburg, down the Allegheny and Ohio rivers, down the Mississippi to the mouth of Lynn creek whence it was taken as far up stream as possible and finally reached its destination by wagon. A set of Cornish rolls made the same trip 10 years earlier and are still in the service of the same company.

smoke and the rock was wetted after a blast. As soon as the rock was sufficiently shoveled back from the face the miner returned, set up the drills and started drilling while the rest of the rock was being removed. The rock had to be trammed 500 to 800 ft. The best previous drifting record was in the Roodeport district, in soft ground requiring only nine holes per round. The distance driven was 220 ft. in one month. On the Cinderella Deep the quartzites, forming the hangingwall of the banket reef, are very hard. The reef itself is of moderate hardness and the dark quartzites or quartzose slates, under the reef, are usually fairly soft. The illustration shows a normal face bored out with 15 holes. Where the drive gets more into the hangingwall, more holes may be required. Four or five holes may be necessary on either side and perhaps other easers. The bore, which is usually a "double-jack" bar, is rigged as securely

*Mining engineer, Brakpan, Transvaal.

as possible about 4 ft. from the face. One arm is rigged, as shown, to put in a flat hole in the hangingwall; another is fixed directly below this to bore the roof-hole on the other side of the drive. Safety clamps are put on under these two arms and also under the bottom arms. The third arm is rigged lower down to bore the top hole of a three-hole cut. This is generally put in to take advantage of the contact between reef and footwall. The two dry holes and the cut hole are first slaited and then the holes of the face are bored in the rotation shown by the numbers on the drawing. The top machines drill the shoulder holes, No. 4 and 5 without altering the arms.

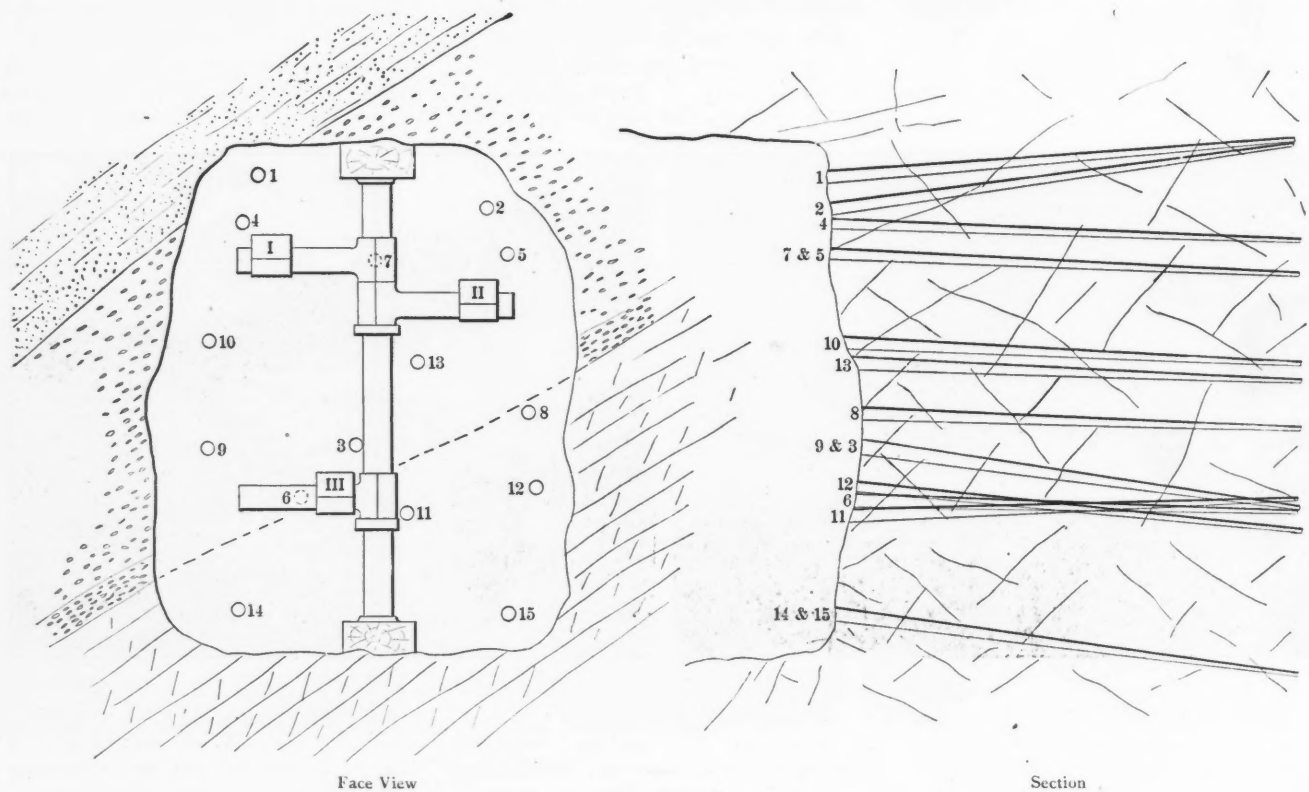
No. 1 machine drills holes 1, 4, 7, 10.
No. 2 machine drills holes 2, 5, 8, 11, 13.

difficult holes for each other. About four 1¼-in. sticks of blasting gelatin are placed in each cut hole and from five to six in the other holes. The cut is blasted first, then the easers, then the shoulder and knee-holes, then the back-holes, and lastly the lifters. No. 8 hole is run in under the contact of reef and footwall to prevent any lump being left on the side of the drift. The drift is run at a grade of one in 150 to 200 and has a single track with sidings every few hundred feet. It is considered quicker to run the drive 5x7 ft., as shown, and to use a single track only, than to take the drive out full width for a double track and to rig four machines. For a long drive the drift is squared off by hand labor to allow of a ventilating pipe being laid along the track.

of chisels were employed. The diameter of started bits was from 2¾ in. to 3 in. and the difference in gage about 0.25 in. I am indebted to H. G. Brickhill for information regarding the arrangement of holes.

New Phosphate Discoveries

According to the U. S. Geological Survey, a bed of blue phosphate rock recently discovered in western Putnam county, Tenn., on the eastern flank of the Nashville dome, or on the side opposite the older phosphate fields, bids fair to be of commercial importance, and recent prospecting has discovered a number of workable deposits in Utah, Wyoming, and



MULTIPLE ARRANGEMENT OF DRILLS AND NUMERICAL ORDER OF DRILLING HOLES

No. 3 machine drills holes 3, 6, 9, 12, 14, 15.

Though No. 1 machine has only four holes to drill, the flat hole in the hanging-wall takes so long that it is not finished much before the others; the No. 2 machine has all water holes to bore and should be rigged under the arm drilling the lifter holes 14 and 15 before No. 2 machine comes down to drill hole 2. No. 2 machine has hole 13 to drill after No. 1 has drilled hole 10. If possible No. 1 machine is not given more to do after it has bored hole 10 as it is almost impossible to work with all the arms low down on bar. Very often when the footwall ground is soft No. 3 finishes first and it can then be used to collar holes for the other machines. In the same way Nos. 1 and 2 machines can cross-collar dif-

ferent holes for each other. Before the regular work of stoping is started the drive is widened out and double tracks are put in.

Several of the Deep mines are installing monorails for tramping, the Langlaagte Deep mine being the pioneer in this work. It is hoped that, by using rails suspended 4 or 5 ft. from the floor on iron brackets, friction will be much reduced and that the installation of some system of mechanical haulage will be rendered practicable. The air pressure employed in the Cinderella Deep was about 80 lb. per sq. in. Machines with 3¼-in. cylinders, made by Holman & Son, Cornwall, England, were employed. These have a combination piston and slide-valve worked by air pressure and controlled by two ball valves. Star-section welded steel bits, up to 5 ft. lengths and longer lengths

Idaho. In Idaho phosphate mining has been begun on a considerable scale in the vicinity of Montpelier, the rock being shipped to Martinez, Cal. The Arkansas deposits are found along Lafferty creek, in western Independence county, and although worked at a distance in an east-west direction, reaching from Hickory Valley, 10 miles northeast of Batesville, westward to St. Joe, in Searcy county, or beyond.

To facilitate the transmission of energy to the working faces of the mines and tunnels, the Yak Mining, Milling and Tunnel Company, Leadville, Colo., has adopted the policy of using small motor-driven compressors to supply the drills. This plan avoids the use of long air lines with the attendant losses.

Professor Christy's Address

BY R. W. RAYMOND

At the dedication, Aug. 23, of the Hearst Memorial building of the College of Mines of the University of California, interesting addresses were delivered by President B. Wheeler; Prof. John G. Howard, the architect; T. A. Rickard, editor of the *Mining and Scientific Press*, and Prof. Samuel B. Christy, dean of the College of Mines. The last we republish in full, in recognition of the great achievement of which the completion of this edifice is the climax and abiding witness.

Professor Christy may well be congratulated upon a result which is so largely his own work. It is everywhere known, though it is not intimated in his address, that to him, more than to any other, is due the organization and progressive development of an American mining school which ranks with that of Columbia University, and, in some respects, even surpasses its elder rival. Himself a graduate of California University, in the days of its modest beginnings, Professor Christy has served his alma mater with loyal fidelity through many laborious years, reflecting credit upon her by his own scientific investigations and publications, and guiding with skill and devotion the growth of the great school which will always be associated with his name. The two activities, indeed, go together; for, since universities began to be, their best means for attracting students has been the fame of their individual professors.

Next to this, they are judged by the practical success of their graduates; and, in this respect also, the California school has already made a creditable record, in connection with which the ingenious and effective methods of combining practice with theoretic instruction which have been originated, or adopted and modified, under Professor Christy's direction, are acknowledged to have formed an important element of its success.

I am glad to see that Mr. Rickard, in his excellent address, besides giving a long list of distinguished graduates, and paying reverent tribute to the memory of Joseph Le Conte, worthily recognized "the rare ability" of Professors Christy and Lawson (the successor of Le Conte). He might have named other instructors worthy of high praise, especially the veteran professor of chemistry, Willard B. Rising; and he might have added, without offense to any one of them, an acknowledgment of the special leadership of the man whose name is indissolubly associated with that of the already famous mining school by the Golden Gate.

One statement made in Professor Christy's address may perhaps require the confirmation which a simple statement of facts will supply. I refer to his assertion that the Hearst Memorial building was the

first of its class, i. e., the first building undertaken in connection with a university and devoted specifically to instruction in mining and metallurgy. This assertion is strictly true, notwithstanding an apparent contradiction frankly stated below.

Prior to 1901, no great university, including a school or college of mining and metallurgy, had provided for that department separate and adequate accommodation. (This statement, of course, does not apply to mining schools and academies, like those of Freiberg, Clausthal and Příbram in Europe, or Houghton, Golden, Reno, etc., in this country, where the buildings and educational plant are devoted exclusively to that purpose.) Everywhere, the work of instruction in mining and metallurgy was done in such spare rooms, basements and sheds as were available for such purposes after the needs of other departments had been supplied.

The Hearst Memorial building was conceived before 1901; the plans were submitted to Prof. H. S. Munroe, of the Columbia University School of Mines, before the construction was begun; this beginning took place early in 1901; and the corner stone of the building was ceremonially laid in October of that year.

Some time later, Columbia University undertook the erection of a building for a similar purpose. The Columbia building, though admirable, covers only about half the area occupied by the California one; and, moreover, its erection was not impeded by an earthquake and a conflagration, such as disorganized the conditions of labor and transportation at Berkeley, though they did not directly destroy the buildings, finished or half-finished, of the University of California. As a result, the Columbia building, begun later, was completed earlier, than the building at Berkeley. The credit of technical or nominal priority in such a case is scarcely worth fighting for; but I feel sure that whatever merit it involves would be, in the present instance, cheerfully conceded by Professor Munroe and his colleagues to Professor Christy and his colleagues.

ADDRESS OF PROF. S. B. CHRISTY, DELIVERED AT THE DEDICATION OF THE HEARST MEMORIAL MINING BUILDING

Mr. President and Friends of the University:

In the history of mining schools, this noble building marks a new achievement. Never, until it was undertaken, had the chief department of a mining school been adequately housed. Everywhere in Europe, as well as in America, the fundamental and necessary, but for this purpose, auxiliary departments, have needed so much space for their laboratories and museums that the department of the mining school which deals with the mining and working of ores; the department in which the work of all the others cul-

minates, has had to struggle with them for room to exist and means to develop.

This condition, partly due to lack of foresight, but chiefly to lack of means, has always been a handicap to the young mining engineer, which the schools have everywhere bravely, but almost vainly, tried to meet. Their graduates went forth too often burdened with elaborate theories, which they were unable to apply to the simplest problem. How many now successful graduates of the oldest and best mining schools of the world have confessed that it has taken them long years to learn the art of applying in practice the knowledge they have acquired in college!

This inevitable apprenticeship can be greatly shortened, only when the department which deals with the mining and working of ores is so generously equipped and endowed that it is in a position to show the student already partly trained in physical sciences how to combine the principles of these sciences, which too often exist in his mind as abstract and unrelated ideas, so that they shall come together in a definite focus upon a few of the important problems of the mining and metallurgic art. He cannot attack all of these problems; he need not attempt many; but he must solve enough of them to have learned something of the art of mastering nature by submitting to her universal laws.

The fact that nothing of this kind had ever before been adequately attempted, made the designing of this building at once a great opportunity, and a great responsibility. It was not lightly undertaken. There is not a mining school in Europe or America which has not contributed some idea that has been, or will be, embodied in this building and its equipment; but it is not, and could not be, a copy of any one of them. It was our task to mold into a harmonious union many useful but conflicting ideas, and to adapt them to our Western needs. Where it was impossible to copy, it was necessary to create.

The problem was, to design a building where the mining student already trained in the elements of physical science might try his 'prentice hand upon some of those lesser problems that lead to the larger ones of the mining engineer; where he might acquire and test that consciousness of power which comes from the mastery of the forces of Nature; where he might learn to lead rather than to follow, to create rather than to imitate; where sound theory, which looks to the future, might lead practice, which looks to the past, to higher efforts and to greater triumphs.

How far this effort has been successful will not fully appear until the equipment of the building, now hardly begun, is entirely completed; but the plans were so carefully studied before work was commenced that there is not a square foot of this great structure, from its basement to its topmost floor, which has not been care-

fully designed to suit the special purpose for which it was intended; and, as nearly as can now be judged, all possible needs of the department have been anticipated for many years to come. Fortunate indeed it was that the architect of this building was one of those rare artists who see, in the outward expression of the inward spirit and purpose of a building, the highest aim of their art. But he needs no praise—his work speaks for him.

We are here to commemorate a noble act.

1. It was a generous deed. Who of us, overwhelmed with sorrow, stops to think of others? We all condone, and even expect, selfishness in those who suffer; and it is only a deeply generous nature that can devise beneficence at such a time. Years of anxious waiting, fire and flood, earthquake and tempest, have passed since the idea of this noble memorial was first conceived; but the mind that conceived it has never stopped to count the cost or to measure the sacrifice.

2. It was a wise deed. Among the strongest passions of human nature, stronger even than the yearning for personal immortality, is the desire that the memory of those who love shall endure in the land of the living. But how seldom is that desire realized! Upon the ashes of our dead we build mountains of marble and erect shafts of bronze that pierce the skies; and yet they, and we in turn, are forgotten. The only permanent monument to the dead is service to the living. The greater and more universal that service, and the deeper its hold upon our common human needs, the more enduring the monument.

Every man's nature reaches out for its own fulfilment. The Garden of Eden, Plato's Republic, More's Utopia, the ideal of the founders of our country, the movement of modern Socialism, are all out-reachings of the human soul, often blind and futile, after that perfection which is its ultimate aim and goal. And yet, how seldom is it recognized that nearly all that is good in modern Socialism has been largely realized in the universities of our country, and perhaps most completely in the universities of our Western States? Not that they are perfect—but the spirit is there, and the fruit, almost perfected. Our Western State universities, erected by the people themselves, express their needs and represent their sacrifices for their ideals: the desire of the father that his son shall have advantages that were denied himself; the ambition of the mother that her daughter shall realize her own girlhood's dreams. They mark the progress of our race onward and upward.

Here, everything is in common. Here exists equality of opportunity; here there is no education too good for the poor man's son. Here, each thirsty soul may drink his fill at the well-spring of learning without exhausting the fountain. Here

exists the "Republic of Letters;" the "Lehr- und Lernfreiheit" of the German universities; and here exists the added idea of service which our Western universities have for the first time realized, and our own President has defended. Here, though everything is in common, we "call nothing common."

It is now universally admitted that genius is confined to no social stratum. From the people have come Shakespeare and Burns, Faraday and Huxley, Watt and Stephenson; Fulton, Franklin and Abraham Lincoln; and out of that seething magma of the common people, which, like a volcanic lava, often seems ready to burst forth and destroy our civilization, will here crystallize our future engineers and men of science; our statesmen and men of letters; our artists and musicians; our lawyers and philosophers; our poets and our prophets. And this memorial of the dead, here devoted to the service of the living, will endure so long as it ministers to that service.

3. It was a fortunate deed. How much better that this noble gift should be entrusted to a great university, with its broader outlook, rather than to a purely technical school, with its narrower aim. It was fortunate for the University, which may be thus invigorated by active contact with those primal and far-reaching problems, in solving which the mining engineer pioneers the way of civilization. But it was still more fortunate for the mining school itself, which, by thus becoming part of a greater organization devoted to all the interests, aims and ideals of human nature, will perforce make every mining student aware of that broader outlook commanded by the general rather than the special view of things—teaching him that language is a tool as necessary as a rock-drill; that words can take a higher polish than a diamond, and an edge sharper than a sword; giving him some touch of that moral and spiritual uplift which comes only from contact with the ideal; and impressing upon him the truth that moral growth is more important to a race than physical progress, and that, in the long run, character counts for more than learning. For the mining engineer, above all men, must take with him to the ends of the earth an honor that shall never be stained, and an integrity that shall never be questioned.

4. It was a timely deed. Is it not strange that to the Argonauts of the West no fitting monument has ever been erected? The figure of Marshall, indeed, stands at Sutter's Mill upon a block of stone, and points where gold was first discovered in California. But where stands a symbol, embodying the creative imagination, the fertile resourcefulness, the cunning skill, the tireless energy, the dauntless courage, that conquered the Sierras and the desert wastes?

There were, indeed, "giants in those days!" Unlearned in geologic lore, they

yet found gold where they were told it could not exist. Untrained as miners, they evolved the hydraulic "giant" which moved mountains into the seas. Out of the crude Saxon stamp they created the California stamp-mill, whose roar now echoes round the world. Out of the clumsy overshot-wheel they perfected the compact and powerful Pelton wheel, which now furnishes power in every land. Untaught as engineers and unlearned in the law, "they yet used the rope with which they hoisted the ore to measure off their claims and—to administer justice." Out of a chaos of social relations they brought a degree of order and a respect for law far greater than exist here today. And yet, what poet has sung the story of these Argonauts of the West? What sculptor has bodied forth their greatness?

Now and here, for the first time, a fitting monument has been erected to one, at least, of those strong natures that possessed not only the creative imagination to see great possibilities of wealth in what appeared to others mere barren wastes of rock, but also the sturdy faith that actually moved mountains to realize those imaginings. Such men have created an empire. It is timely and fitting that a monument should be erected to one of them.

5. It was an adequate deed. Deep-rooted in the eternal hills, this memorial to Senator Hearst, in simple dignity, beauty and strength, lifts its noble head into the luminous air. Hewn from the solid granite of our own Sierra Nevada; molded from the plastic clay of our own valleys, and bound together with bonds of steel; designed with consummate skill, and executed by hands that loved their work; it went through the great earthquake absolutely unscathed, as if Nature herself had marked it with her approval.

And now, may I not endeavor to express the profound sense of gratitude that fills every heart; the deep feeling of responsibility of those who accept this sacred trust; and their unflinching determination that the men who go forth from these walls shall be worthy of their high calling and of their great opportunities!

J. F. Monnot, a metallurgical engineer of Paris, claims to have perfected a process of welding copper to steel wire so as to make a non-corrosive coating. Many advantages will result from use of this new wire such as high tensile strength and elasticity, combined with smaller surface exposed to wind and sleet than would be the case with iron wire of the same conductivity. This wire is especially useful over long spans, as pole intervals may be much greater when it is used.

Flues of reinforced concrete for dust collection are going out of favor as it has been found impossible to prevent them from cracking.

Mine Taxation in Minnesota

SPECIAL CORRESPONDENCE

The ever present question of taxation has been bothering the iron miners of Minnesota of late. Last winter the State legislature attempted to fix a specific tonnage tax on mine products, the amounts mentioned varying from 50c. per ton down to 5c. After considerable difficulty and a campaign of education which paid especial attention to the joint tax committee the proposition for a royalty of 5c. per ton was defeated and tax methods were left as before. It was not so much the 5c. that the mining companies feared, as the system of imposing taxes in that manner, which might easily at any time increase their burdens from a small amount to any figure that some legislature might set, and which would leave them particularly liable to the attention of any blackmailing individuals who might gain membership in the legislative body. A State tax commission of three men was authorized by the legislature, and this commission had recently been securing data as to the tonnage and value of mines. It is rather unfortunate that this work has taken place during the season when iron ore has sold for a higher price than since the mines became of importance, and that the members of the commission are to some extent academic and scholastic rather than practical business men.

The commissioners placed the iron mines of the State in five distinct classes, varying with the character of the ore deposits and the ease and cheapness of mining. They also secured data as to the amount of ore in sight and proved on the ranges of the State. In passing, it may be said that their figures for ore proved up to this time and now in sight on the Mesabi range is about 1,150,000,000 gross tons, and that this figure is reasonably conservative. The commission fixed the value of ore in the ground at \$1.25 per ton for the first class, this being for bessemer ores that are or can be mined by open pit, and dropping down to a value of 25c. for lean but merchantable, non-bessemer ores to be mined underground. As with other realty, the commission takes 40 per cent. of this as the taxable value. The classification, it may be seen, is somewhat crude, but it is the best the commission found itself able to make. Any miner can see where it might be manifestly unjust to individual properties. Under the commission's figures and tentative valuations the taxable value of the iron mines of the Mesabi range is fixed at about \$285,000,000. This year, under the old assessment, it is less than \$70,000,000, and that sum is double any previous valuation. Some mines have been increased 1000 per cent.

This does not mean that the total amount of tax will be similarly in-

creased, for the amounts of money to be raised under a high valuation will be little more than under a smaller one. It does mean, however, that the mines will pay far more to the State and county as their portion of taxes than ever before, and to that extent will militate against them. It is impossible to determine what this actual increase may be; doubtless a great many thousand dollars per annum.

But the method seems unjust and unsound economically. Each mine must pay, each year, on all the ore it has in the ground, a tax based on the full value of all that ore, as if to be mined immediately. That the computation occurs in a year of great prosperity, when prices of ore are higher than at any time since the Mesabi range was opened, is unfortunate, to be sure, but it is immaterial to the argument. It would be as unjust a method were the year of computation a lean one, as it is today. The mere fact of paying, each year, a tax on the value of all the ore in sight will soon accumulate, on the ore remaining, an enormous credit of taxes paid. But this credit is of no avail, for the mine must go on to the end, still paying a full annual value on all ore left. Take the Mahoning mine, for example, with an assessment, on most of its ore, at the highest classification. It mines steadily about 1,000,000 tons a year, at which rate it will take 73 years to remove the ore in sight. Suppose each ton in sight each year pays its regular tax of 10 to 20 mills on the dollar of valuation; what a magnificent sum this remaining ore would have already paid at the expiration of, say, half the estimated life of the mine! At the rate of 10 mills on the dollar, a lower rate than now prevails anywhere on the Mesabi, this mine would pay, each year, a tax of 34c. a ton on the product of that year, or 68 per cent. of the full taxable value of the ore in the ground during a boom year. The absurdity is readily apparent.

Some sort of a tonnage tax, based on the annual product, would seem the fairer and more equitable manner of taxing these mines, if such a system could be established.

A statement by the tax commission on the subject of the valuation of mining properties was published in the *JOURNAL* of Sept. 21.

In small, irregular veins the leaser can invariably do better than the company. He has a keener scent for ore than the average foreman; he is free from administrative expenses; he takes risks that the company cannot; and when the mine is in *borrasca* he will work for less than the regular wage in the hope of recouping himself when the mine comes again into *bonanza*. There is many a mine in the United States which has been unprofitable under company management and has become profitable when turned over to leasers.

The Boleo Report for 1906

The following extracts from the report of the Boleo copper company are taken from *L'Echo des Mines*. The production of ore in 1906 amounted to 304,940 tons as compared with 261,460 tons in 1905. There were smelted 302,499 tons of ore with an average copper content of 3.636 per cent. This grade is somewhat lower than that smelted during 1905, and was intentionally made so in order to carry out the policy of utilizing lower-grade ore according as the price of copper was rising. The shipments over the railroad were 450,487 tons against 436,129 tons in 1905. The working force in January was 2519 and in December had increased to 3024, of which 210 were Chinese coolies.

Since the smelting of lower-grade material was undertaken, it was found necessary to smelt increasing quantities of mineral and the management decided to increase the proportion of more or less refractory ore in the charge in order to utilize the deposit to better advantage. The smelting plant is not now up to the desired capacity and will be increased in the near future. Experiments have been carried out both in Boleo and in Paris with a view of replacing gradually the existing 10 furnaces having nine tuyeres by 12 furnaces having 12 to 15 tuyeres. Alterations of the smelting buildings are also contemplated. Six of the 12 tuyere-furnaces will be in operation by the end of 1906.

The end of the extension of time granted by the Mexican government on the contract for harbor improvements at Boleo comes during the third quarter of the current year. Already 389,896 fr. have been spent on this work and its completion was looked for by the middle of 1907. As in preceding years, new improvements other than those on the port are paid for month by month out of current income. These charges amounted to 535,128 fr.

Difficulties in retaining workmen were as considerable as ever, and were increased by activity in mining in Sonora and especially by copper-mining operations along the border of the United States. A trial advance of wages made in 1905 had but little effect and more radical measures were tried. An increase of 25 to 50 per cent. in pay was given, according to the wages previously received. The effect was immediate in the mines but is still uncertain in the smelter and the shops.

The British Consul at Trieste, Austria, reports that several bauxite deposits have been discovered in Lesina, which is one of the islands in the Adriatic, forming part of the province of Dalmatia. New coal mines have recently been opened up in the same province.

Coal Mining in Michigan

By LEE FRASER*

The coal basin of southern Michigan comprises an area of nearly 10,000 square miles, as shown in the accompanying map. Although mining has been carried on with more or less success in the vicinity of Jackson, Sebawaing and Grand Ledge, the chief producing mines are located in the center of the coal basin near Saginaw and Bay City.

EARLY DEVELOPMENT

Coal was known to exist in Michigan 50 years ago, yet it was not until 1895 that successful and extensive mining was begun in the Saginaw valley. At the present time there are 40 to 50 mines operating in the district, producing in 1904, 1,414,834 tons (2000lb.); 1905, 1,380,307; 1906, 1,372,854 tons.

Never at any time, under the present conditions, will the production of coal in Michigan become so important a factor in the economics of the State as it has in Ohio, Indiana, and Illinois. Neglecting the increased cost of mining in Michigan over other States, Ohio coal has been able to compete with Michigan coal at Lansing, Grand Rapids, Detroit, and other southern Michigan points, because of the difference in transportation charges. In the northern part of the State, lake freighters deliver West Virginia and Ohio coal for \$2.50 per ton, where again, because of the heavy transportation charges, it would be impossible for Michigan operators to sell at a profit. The States in the Northwest, Wisconsin, Minnesota, and the Dakotas, form markets for the larger Michigan producers, supplying those whom the Ohio, Illinois, and Indiana operators fail to reach. Michigan producers, with but few exceptions, are forced to seek their market in local consumption; at the present time they receive from \$2 to \$4 per ton at the mines.

The local market, however, is not sufficiently strong to consume always the full production of all the mines, with the consequence that the actual production is less by about 1,000,000 tons than that of which the district is capable. It is estimated that there remain to be mined between 40,000,000 and 50,000,000 tons of coal in the Saginaw valley district, or sufficient to insure life to the industry for at least 35 years, at the present rate of production.

THEORY AS TO THE FORMATION OF THE COAL-BEDS

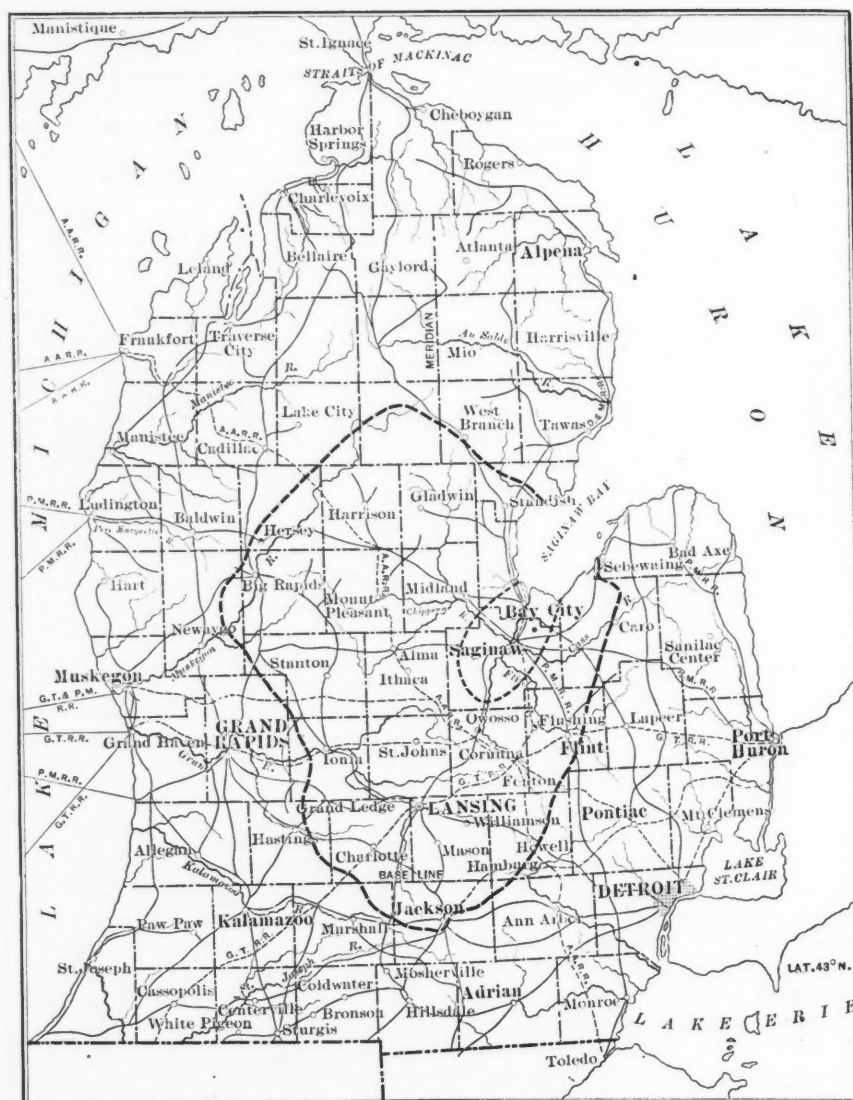
A popular conception of the formation of the coal measures of Michigan, expressed in Part II, Vol. VIII of the State Geological Report, presumes that at one time the central part of Michigan was occupied by an arm of the sea, or some inland lake or sea, which opened toward the

Southwest. The country around the shores of this inland sea is supposed to have settled slightly, overflowing the valleys of the rivers which flowed into it. "Out from the margins in the bays and inlets, may have crept great floating bogs or mats of vegetation, tropical, closely matted, slowly decaying, and weighed down by the ever increasing growth above. Occasionally it became overburdened and sank bodily, or the water-logged part dropped bit by bit to the bottom. This green carpet over the water kept pushing farther and farther out and was somewhat like the ice form-

the sea level remained fairly constant until the sea was largely filled up."

MANY DIFFICULTIES IN DEVELOPMENT

The prospecting and developing of Michigan coal measures is not accomplished with the facility possible in Ohio, Illinois, Indiana, and Iowa. In Michigan the measures are covered with a thick blanket of sand, gravel, mud, and other forms of glacial deposits. The surface is comparatively flat; coal shows only infrequently in outcrops on hill sides or in the river valleys. The river valleys in



LOWER PENINSULA OF MICHIGAN. HEAVY DOTTED LINE SHOWS EXTREME LIMITS OF COAL BEARING ROCKS

ing around the edge of a lake in the winter. Like that, too, an occasional storm would drive it back in winrows and perhaps swamp it. The floating forest shed abundant spores and pollen-like powder, which were blown and drifted over the sea, helping to make a carbonaceous deposit. The rivers contributed their share to filling up the sound. There were probably minor oscillations between the sea and shore, but on the whole for a while, the land sank relatively, and the sea overlapped unconformably on the land. Then

which coal might have been found to outcrop have been filled with the glacial deposits. Owing to the comparatively low position of the beds in relation to the surrounding country—the beds being in or adjacent to the flowing rock well areas—work is always hampered by the great volume of water to be pumped, making a treacherous and dangerous mud and quicksand, requiring special care and expense in shaft construction. Owing to all these natural disadvantages it becomes necessary to make initial expenditure for the

*Saginaw, Michigan.

mine equipment far in excess of that in other States; in Michigan, \$50,000 to \$75,000 for 600 tons daily output; Ohio, \$15,000 to \$20,000 for 600 tons daily output.

COAL BEDS NOT CONTINUOUS

Unlike Missouri, Ohio, Illinois and Iowa, the coal lies in beds or pockets, making it necessary to determine the extent of the seams in all directions with accuracy. No continuous bed extends over the whole area of the basin, the largest comprising in area five to six square miles not all of which is workable. The coal measures vary in shape from long narrow beds to broad irregular patches, and the coal is more abundant near the margin of the large general coal basin. The coal beds diverge and thin out gradually as they

place. The shafts range in depth from 20 to 250 ft. according to the location and are usually sunk with two compartments.

Much difficulty has been experienced in sinking the shafts, work being checked and sometimes totally destroyed by sudden rushes of mud, water and sand. At the Auburn shaft of the Robert Gage Coal Company it finally became necessary to drive steel piling before the work of sinking and constructing the shaft could be completed. The first two shafts were thrown completely out of line by rushes of sand and water so that it became impossible to straighten them.

METHOD OF MINING

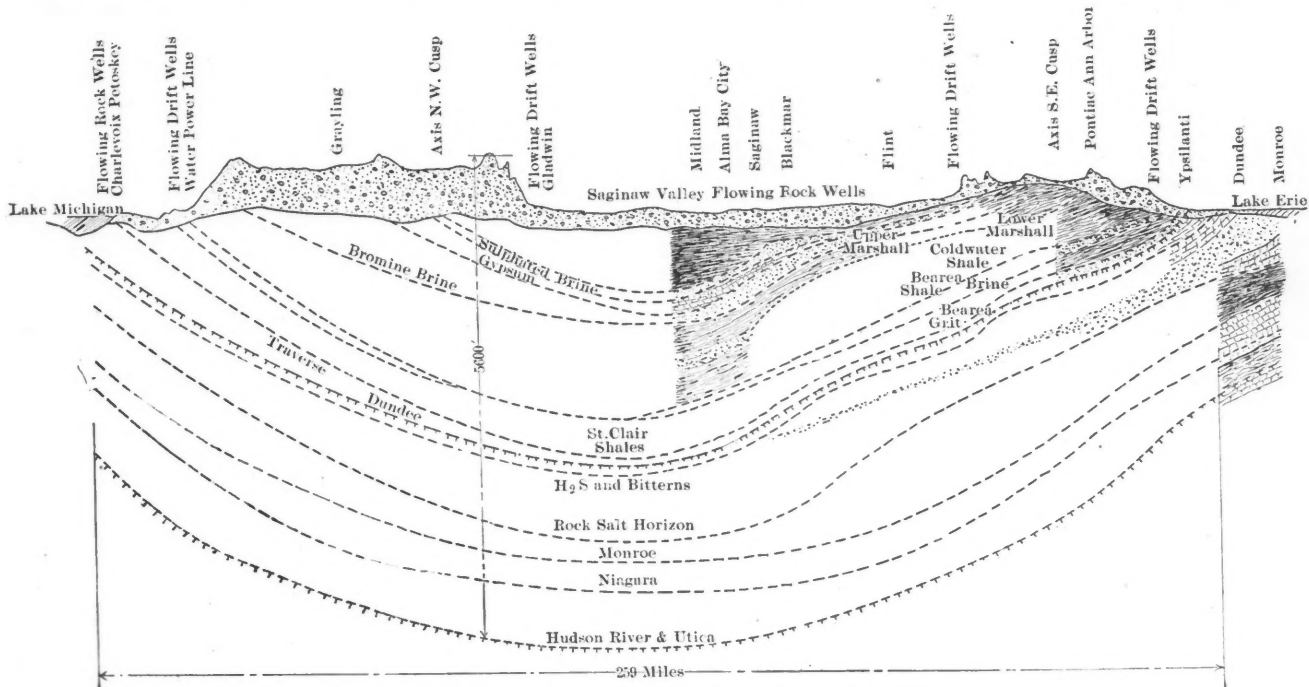
Throughout the entire district the room-and-pillar method of mining is used.

required per room. The footwall is fire-clay occasionally found with beds of sandstone.

The longwall method has not proven adaptable to mining here, and never progressed further than the experimental stage, owing to the heavy bed of fireclay, shale and sandstone underlying the coal measures.

MINES NON-GASEOUS

The mines may be called non-gaseous, although from time to time gas has been encountered in Bay county, but never in sufficient quantities to necessitate any modification in the prevailing method of ventilation. The matter of mine ventilation, as in other States, is a subject for State regulation; and in Michigan, in connection with the State Bureau of Labor, a coal



Cross Section Lower Michigan Basin, State Geological Report.

Horizontal Scale 231 In. = 1 Mile, Vertical Scale .45 In. = 1000 Ft.

get deeper, and lower coals come in. The remaining seams thicken toward the center of the basin; in other directions they thin irregularly and suddenly. The coal was laid with minor undulations, independent of the general dip of the strata, and with slopes dipping as much as 10 to 12 deg. As in other districts, a gradual thinning of the seam is noticeable toward the rise, while in the swale the coal is thickest.

SHAFT SINKING DIFFICULTIES

Occasionally beds of broken sandstone, mud veins and loose gravel are found cutting out the coal, indicating the erosion of the bed by streams, with the subsequent filling up of their courses with glacial detritus. "Rolls" and "wants," "horsebacks" and "bars" are often encountered when the coal suddenly pinches out, the sandstone, clay or shale of the foot or the slate of the roof coming in to take its

Rooms 150 ft. in length are driven off the entries at intervals of 38 to 40 ft. The room neck is 9 ft. in length and at the jaws widens out to not more than 20 ft., leaving a solid pillar of coal from 16 to 20 ft. thick. Breakthroughs are driven however, to afford proper ventilation. Double entries are driven off from the shaft, 25 ft. apart. Almost invariably the entries are made to follow the swale of the coal, as determined by the test holes put down with the drill, and are not driven in any one or two arbitrary directions. The butt entries are driven right and left of the main entries at intervals of 300 ft., and from the butt entries the rooms are driven.

Loose roof is not common, although draw-slate from 4 to 6 in. thick is encountered frequently. Heavy timber is not usually required. Slate packing is generally used for filling in old worked out rooms, while from 40 to 60 props are

mine inspector is appointed to patrol the mines, correcting any evils that he may find, and above all preventing carelessness in the matter of sanitation. Since the inauguration of this department, three years ago, much has been done toward the maintenance of healthful conditions and the prevention of accidents; collected data show that only a percentage of 0.0155 of the total number employed were injured, and of these accidents only 18 per cent. were fatal.

TABLE I. COST AND QUANTITY OF COAL MINED IN MICHIGAN.

Year.	No. Mines Operating.	Employees, Daily.	Mines Using Powder.	No. Kegs Powder, at 25 lb. per Keg.	Tons Coal Mined.	Total Cost.	Average Cost Per Ton.
1904	28	2714	23	65,163	1,414,834	\$2,286,160	\$1.62
1905	33	2732	22	63,076	1,380,307	2,199,307	1.59
1906	38	2119	29	52,507	1,372,854	2,085,688	1.50

Permitted Explosives in British Coal Mines

By JAMES ASHWORTH*

In the year 1905 the only explosive on the permitted list which was reported by the inspectors of mines as having caused gaseous ignitions and bodily injuries to workmen, was bobbinite, but none of these injuries were of a fatal or even dangerous nature. As a consequence, however, of the gaseous ignition it was suggested that it was practically no better than ordinary gunpowder; that it was a dangerous explosive; and that cause should be shown why it should not be removed from the permitted list.

Under these circumstances Curtis & Harvey, Ltd., the owners and makers applied to the principal secretary of state for the Home Department for a special committee, to inquire into, and report upon, the safety and utility of bobbinite as a permitted explosive for coal mines, as compared with other explosives. Early in 1906 this request was granted.

POPULARITY OF BOBBINITE

Both before and after the appointment of the committee, owners, officials, miners and their unions, took immediate steps to defend this explosive, which the majority considered could not be dispensed with, unless it were immediately replaced by one equally good as a coal producer.

As a consequence of this general interest in the inquiry, most valuable and useful information was given to the whole mining world by practical and scientific witnesses, and more was in hand, when the committee decided to postpone taking further evidence until they had secured results from a serious of experiments. The first of these was made at Woolwich in the presence of representatives of the Miners' Federation of Great Britain and some of the committee, and demonstrated most clearly that bobbinite, when properly applied, was a safe explosive. The last series of experiments made for the committee was superintended by inspectors of mines, and was devoted to the utilitarian point of view in ascertaining the percentages of coal and slack produced by four selected permitted explosives, namely, bobbinite, carbonite, ammonite and saxinite, when applied under every day conditions in coal mines, in four different coal fields. The four selected collieries were Whitwood, in Yorkshire; Victoria, Ebbw-vale; Moor Green, Nottingham; and Ystradgylais, South Wales. Further, to make the tests as complete as possible a representative of the firm manufacturing each explosive was permitted to be present. The distinguishing line between coal and slack was a 1½-in. mesh screen in all

cases excepting the Victoria colliery where the mesh was 1⅛-inch.

THE EFFECT OF DETONATING VIBRATION

The results amply supported the evidence given by witnesses that bobbinite produced a larger percentage of round coal than any of the high explosives. In every-day blasting, it is certainly a fact that the majority of coal miners prefer an explosive of the gunpowder class rather than one of the detonating variety, because, (1) they can estimate the weight required more readily than when using a high explosive; (2) they have no detonator to trouble with, and they are free from the risk of exploding the charge while stemming the shot hole; (3) the recovery of a shot in case of a missfire is safer than when a detonator is used. There is, however, another and more insidious danger which is not taken into account by the coal miner, and is not fully recognized by owners and officials, and that is the detonating vibration, which is capable of causing simultaneous explosions in other parts of a colliery, and is frequently demonstrated in great disasters such as Tylorstown, Universal, Albion and Wattstown. The detonating vibrating effect is inseparable from the use of high explosives and no effective protection against its dangers in any fiery mine is known.

Quite recently an explosion was caused by a detonated explosive, geloxite, at the Wingate Grange colliery, which would in all probability never have occurred if an explosive of the gunpowder class had been in use. Still more recently, at the Urpeth colliery, a shot of westfalite, from some reason not fully explained, caused an explosion and the loss of four lives, and it appears that this might be due to the detonation of the gaseous mixture and not to the creation of actual flame through the use of unsuitable stemming. Experiments on the surface such as were made and relied on by W. Hall, inspector of mines, would probably demonstrate that small charges of geloxite and westfalite might be fired, when covered up with coal dust, without causing ignition or explosion. At Courrieres the originating cause of the greatest coal-mining disaster which has ever occurred was laid at the door of another detonated explosive, known in France as Favier No. 1, which in composition is the same as ammonite in the English permitted list of explosives. It is not improbable that the detonating vibration from the explosion of a considerable weight of this explosive, in addition to actual flame, was responsible for the extension of the originating explosion over the very large area devastated by flame, force and carbon monoxide.

Experiments made on the Continent have demonstrated that safe blasting depends not only on the explosive, but also on the weight of the explosive, as compared with the area open for its expansion.

FLAMELESS EXPLOSIVES ALSO DANGEROUS

Whether the imposition of new test will add to the safety of blasting in coal mines is questionable and the accidents quoted above amply prove that if permitted explosives are made to produce less flame than at present, their use will be of quite as reckless a character as at Wingate Grange. It were better that the explosive should be known to require some care in its use than that it should be represented as "flameless" and thus almost encourage a miner to run the risk of its application under dangerous or questionable conditions. The following queries and answers almost suggest themselves: (1) Why do disasters occur from the use of permitted explosives? Mainly because the rules laid down, to render blasting reasonably safe, are disregarded. (2) Why are shots fired in the presence of from 2 to 3 per cent. of firedamp? Because the safety lamps with which tests for explosive gases are made, will not indicate the presence of less than 3 per cent. of firedamp; also because some men's oversight is not sufficiently good to detect even three per cent. of gas. (3) What do the inspectors of mines regard as a safe atmosphere? The answer to this will be found in the evidence given before the mines commission, and amounts to this, that none of the inspectors names the percentage of gas which he considers dangerous, but takes the appearance of a distinct cap in the lamp in usual use as the danger line. If this is to be the indication of a safe mine, blasting may continue to be regularly practiced when from 2 to 3 per cent. of gas is present, and the safety of a mine will not have been advanced one single point. A coal mine may be safe to work in when 2 per cent. of firedamp is diffused in the air, if safety lamps are in use, but it does not follow that a mine is safe for blasting, even when the percentage is as low as one. This narrows the question of safe mining considerably, and the points at issue are: (1) can more than one per cent. of gas be present in the ventilating current and blasting still continue? (2) are we to take chances on the unstable foundation of an explosive which shall withstand a new and more difficult series of tests, and continue to fire shots in air containing any per cent. of gas up to 3 per cent?

ADDITIONAL TESTS TO BE IMPOSED

The bobbinite explosive inquiry has now been closed, as far as its original object is concerned, and although it is obvious that the case against that explosive has completely broken down, yet as a judicial body the committee have not yet delivered judgment, nor do they appear to have thanked Messrs. Curtis & Harvey, Ltd., for the way in which they have, by evidence and experiment, and at a great expense, vindicated the right of bobbinite to appear on the list of permitted explosives. For the time being bobbinite is out of the fray,

*Mining engineer, Old Colwyn, England.

but the committee does not seem likely to be disbanded at present, as notice has now been served on the makers of other explosives on the permitted list that fresh and more stringent tests are proposed, but will not be proceeded with until they have considered any objections which the makers may urge against such tests, although it would appear to be possible to impose additional tests without consulting anyone, as was done on a previous occasion. Appearances therefore suggest that the bobbinite committee may merge into a sub-committee of the mines commission, and thus assist in shortening the labors of the latter.

Subjoined is a list of the explosives referred to in this article, showing the permitted composition of each.

Bobbinite: Nitrate of potassium, 63 to 66 per cent.; charcoal, 18½ to 20½ per cent.; sulphur, 1½ to 2¼ per cent.; rice or maize starch, 7 to 9 per cent.; paraffin wax, 2½ to 3½ per cent.; moisture not more than 3 per cent.

Carbonites: Nitro-glycerin, 25 to 27 per cent.; nitrate of barium and nitrate of potassium, 30 to 36 per cent.; wood meal, 39 to 42 per cent.; sulphuretted benzol, 0½ per cent.; carbonate of sodium and carbonate of calcium, 0½ per cent. The wood meal to contain not more than 20 per cent. and not less than 10 per cent., by weight, of moisture.

Ammonite or Favier No. 1: Nitrate of ammonium, 87 to 89 per cent.; di-nitro-naphthalene, 11 to 13 per cent.; moisture, 0½ per cent.

Saronite: Nitro-glycerin, 58 to 68 per cent.; nitro-cotton, 3½ to 5½ per cent.; nitrate of potassium, 27½ to 30½ per cent.; wood meal, 5 to 8½ per cent.; chalk, 0½ per cent.; or not less than 73 per cent. of these and not more than 91 per cent. with oxalate of ammonium 9 to 27 per cent.; the wood meal to contain not more than 15 per cent. and not less than 5 per cent., by weight, of moisture.

Geloxite: Nitro-glycerin, 54 to 57 per cent.; nitro-cotton, 4 to 5 per cent.; potassium nitrate, 18 to 22 per cent.; wood meal, 5 to 7 per cent.; ammonium oxalate, 13 to 15 per cent. The wood meal to contain not more than 15 per cent. and not less than 5 per cent. moisture by weight.

Westfalite: Nitrate of ammonium, 94 to 96 per cent.; resin, 4 to 6 per cent.; and moisture, 0½ per cent.

The value of the coal raised in East Lancashire, England, mines is given as \$1.88 per ton at the pit's mouth during 1906. This is the lowest price since 1899, when the value was \$1.80. During 1900 and 1901 the values were returned at from \$2.40 to \$2.52. The coal raised in this district contains considerable pyrites and is responsible for the atmospheric gloom which hovers over Manchester and the other cotton-spinning towns in the neighborhood.

Coal in Indiana

SPECIAL CORRESPONDENCE

The publication of the annual report of William S. Blatchley, State geologist of Indiana, has been delayed by an unusual pressure of work in the State printing office. The advance sheets show an interesting discussion of the mineral resources of the State.

According to Mr. Blatchley, if Indiana coal is mined at the same rate as it has been in recent years, by 1910 about 200,000,000 tons will have been taken out. The product of the Indiana mines for the next 20 years will be enormous. Mr. Blatchley further states that the one-fortieth of the total available coal supply in the State has been mined. Working out the coal at this rate year by year, it will be about 800 years before the most available Indiana coal will be worked out and exhausted. According to the information contained in this forthcoming report, the co-called available coal is about one-fifth of the total coal deposits or supply of the State—the remaining four-fifths of Indiana coal being unworkable under present conditions, owing to depth of seams or other drawbacks. The State geologist estimates that the volume of coal within the State is 40,000,000,000 tons, about 8,000,000,000 tons of which are available under present methods and conditions. Up to 1899 about 100,000,000 tons had been worked out, and the next 11 years will see 100,000,000 tons more mined.

According to the figures in the report, 11,422,027 tons were mined in Indiana in 1906, more than in any previous year, the amount comparing with 5,864,975 tons in 1899. However, Mr. Blatchley says that it is not unlikely that by the time the 800 years have passed, methods will be devised to get out the four-fifths now unavailable, which will suffice for 3200 years more at the present rate of consumption.

Mine Accidents from Shot Firing

During the year 1906 there were 282 accidents in mines in Great Britain and Ireland due to the explosives used. In these accidents there were 42 lives lost and 318 injuries. Nineteen of the accidents were caused by premature explosions, 26 by not taking proper cover, and 28 by hang-fires and returning too soon. Seven accidents were due to the firing of charges by electricity while men were still at the shot hole. Forty-three took place during stemming or ramming. Boring and tampering with miss-fire shots and boring into unexploded charges accounted for 31 accidents, and striking unexploded charges during the removal of débris

caused 27 accidents. Seventy accidents had their origin in the accidental contact of sparks or flame with explosives, but none of these had a fatal result.

The Installation and Use of Centrifugal Pumps in Coal Mines

BY H. H. LAWRENCE

Centrifugal pumps should be set upon a foundation that gives a rigid bearing under all corners of the bed-plate. When the pump is secured to its foundation, the shaft must turn freely; should it not do so, the pump or the bed-plate is sprung, and must be adjusted before the pump is started. The stuffing-box should be packed with candlewick soaked with tallow, or with any other good soft packing suitable for the shaft. All the connections, joints and stuffing boxes should be made perfectly air tight to get the best results.

No portion of the suction line should be higher than the suction opening in the pump, as the air which dissolves in the water may collect in this portion and injure the action of the machine. In case the feed-water is to be raised to any height under suction, the discharge pipe should not be less than 4 ft. long and its outer end should be raised sufficiently to keep it full of water.

To charge the pump with the air exhauster, first, close the valve on the end of the discharge pipe; second, open the air valve of the exhauster; third, open the steam valve of the exhauster when the water is thrown by the exhauster, start the pump, close the air valve, shut off the steam to the exhauster. Open the discharge valve while the pump is running. When the pump is not running, the charge may be retained by closing the discharge valve tight.

When pumping sandy or gritty water a stream of clean water under pressure must be supplied to the stuffing box of the front head. The water may be supplied from a force-feed pump or from a boiler feed-pump. The idea is obvious, that the water will keep the fine particles from getting into the bearings and will prevent cutting the shaft.

The causes which prevent the running of pumps properly are; first, leaky joints, second, air confined in the suction pipe the diameter of which should not be larger than the pump openings; third, insufficient pump speed; fourth, too short a tail-pipe line above the pump, and fifth, running the pump piston or disk in the wrong way.

In France the depth of drill holes for blasting is restricted to 1½ meters or about 5 ft. The miner is forbidden to touch a hole after it has once been fired and when a shot is missed, the hole must be drilled over.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

Before connecting the steam pipe to a pump, it is well to blow out the pipe thoroughly with the steam pressure so as to remove all dirt, etc. Experience has shown that by observing the above precautions much expense may be saved and many delays avoided.

A rock-drill pipe line which is frozen may be cleared almost instantly by pouring a very small amount of wood alcohol down the pipe. This will not prevent the reforming of frost, except for a short time, but is excellent for clearing out frost already formed.

To get the best results in firing a boiler, it is necessary that, as the intensity of the draft is increased, the size of the coal be reduced and the depth of the fire be increased. If the thickness of the fuel on the grate is 8 to 12 in., it is more effective than at a less depth. Admission of a little air above the grate may increase the evaporative effect.

In order to remove scale or any other deposit from an injector or its parts, disconnect the injector and plug both the suction and delivery outlets with corks, then open the No. 2 valve and fill the injector with a solution of one part hydrochloric acid and 10 parts water. Allow the solution to remain in the injector over night, in the morning wash out thoroughly with water.

Many experienced mine foremen claim that black powder gives the best results in anthracite mining, not only in its efficiency, as compared with other explosives, but especially in that it produces the least amount of fine coal or culm. Higher explosives of the dynamite group, which produce no flame, are sometimes used in gaseous workings, and for driving gangways and airways when the coal is hard.

The size of a suction pipe should be in proportion to its length. For a lift higher than 15 ft., or a long trail, use pipe one or two sizes larger than the suction connections. When an old pipe is used for the suction of an injector it should be carefully inspected and rust or foreign particles, which would reduce the efficiency of the injector or prevent its action, must be removed. Such suction lines should be as straight as possible.

On portable and light locomotives such as are used around coal mines, the steam should not be taken from the side or end of the boiler, but from the highest part of the center to prevent the injector steam pipe from being flooded with boiler water when ascending or descending hills. The water is liable to be drawn into the in-

jector steam pipe if it is placed near the pipe supplying the engine or from which the steam is drawn for some other use.

The best type of boilers, well set, with natural draft and skilful firing will evaporate from $7\frac{1}{2}$ to 10 lb. of water per pound of high-grade coal. The average rate of combustion of fuel per square foot in such boilers is from 10 to 12 lb. of ordinary anthracite, while 18 to 20 lb. of bituminous coal per hour are necessary under similar conditions. If forced draft is employed, the rate of combustion is increased and from $1\frac{1}{2}$ to two times the above quantity of coal may be burned.

When a diamond drill hole approaches a bed of coal, it is the usual practice of good drillers to run the drill into the vein a few inches, then lift the rods, examine the core barrel, bit, etc., as usual; after seeing that everything is in good order, lower the rods again and run through the vein. By following this method there is no other core to grind away in the core-barrel and come up with the cuttings, or to grind away the core itself. This plan is found best in prospecting for coal.

The successful manipulation of an injector depends on the lift through which the water is raised, and the available pressure of steam. The following are the approximate lifts and pressures required for different given heights of section:

For a 5 ft. lift; 15 lb. of steam pressure is necessary.
 For a 10 ft. lift; 20 lb. of steam pressure is necessary.
 For a 15 ft. lift; 25 lb. of steam pressure is necessary.
 For a 20 ft. lift; 35 lb. of steam pressure is necessary.
 For a 25 ft. lift; 45 lb. of steam pressure is necessary.

No lift should exceed 25 ft., which is about the practical limit of suction. All suction should be airtight, especially on a high lift or when the smaller size of injectors are used.

Carbonado, or "black diamond," which is used in diamond drills, is one of the hardest of known substances, being even harder than the crystallized diamond. It is found in commercial quantities only in La Chapada and Lavaras districts of the province of Bahia, Brazil. The stones range in size from small fragments up to pieces weighing 100 to 500 karats. The term "black diamond" is inaccurate, as carbonado is seldom found of this color, but ranges from black to gray, dull brown being the prevailing tone. Carbonado was first successfully used for drilling purposes by Lehot, a French engineer, in drilling blast holes in the St. Gothard

tunnel. In this country one of the first uses was for excavating marble in the quarries of Vermont.

Experience has shown that the well designed gas engine transforms about 25 to 30 per cent. of the total heat in the fuel into useful work; the best type of steam engine transforms only 14 to 15 per cent. of the total heat in the coal, and the ordinary steam engine will transform and utilize only about 5 per cent. There are many small plants equipped with ordinary slide-valve engines, with poorly designed boilers, in which less than 2 per cent. of the energy in the fuel is converted into useful work. If the service is intermittent, or the power is required for only a short time each day, the gas engine plant has a decided advantage over the steam plant, as the latter has unavoidable losses from radiation and leakage when standing idle under full steam pressure.

The use of machines in mining bituminous coal in the United States has increased rapidly in the last few years. In 1891, 93,177,978 tons of bituminous were mined, 6.66 per cent. being machine-produced. In 1905, 315,259,491 tons of bituminous are mined; 32.79 per cent. was machine-produced. In 1891, 545 machines were in operation; in 1905 the number had increased to 9184. The points of superiority in machine mining are: 1, the cost of mining is lower; 2, the quality of the product is superior; 3, the danger in mining is lessened; 4, working conditions are improved; 5, the mine may be more rapidly developed; 6, the production is increased; 7, application of power to other purposes in the mine, such as pumps, rock drills, etc., is facilitated.

Direct acting steam pumps, both single and duplex, are largely used through the mining fields, and are serving useful purposes where the conditions are crude, and where rapid development is more essential than economy. They are truly extravagant in the consumption of fuel even under the best of conditions, and are liable to great losses from the use of leaky steam valves and pistons. Careful tests under favorable conditions, and the data obtained from actual practice show the following consumption of steam or fuel per horse-power per hour: Triplex power pumps require $1\frac{1}{2}$ to 5 lb. coal per horse power per hour; small steam pumps, 25 lb.; large steam pumps compounded, 13 lb.; pulsometer pumps, 60 to 70 lb.; injector and inspirators, 100 lb. per horse power per hour.

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*Illustrated.	

Curtailment of Production

The boards of directors of the constituents of the Amalgamated Copper Company at meetings Sept. 18 decided to curtail production 50 to 60 per cent. Following this action the management of the Cole-Ryan properties decided to make a similar reduction, as did also the management for W. A. Clark. Phelps, Dodge & Co. will also curtail their output, although the precise amount has not yet been announced. The action of the Lake Superior companies is more uncertain. Some of them probably will curtail, but others will not. It is not expected that the Calumet & Hecla will make any change in its rate of output, its policy having been generally to let the market take care of itself. In any event the reduction in the Lake Superior output will be considerably less in proportion than in Montana, Arizona, or Sonora.

An important effect in the current reduction of output will be the withdrawal of certain companies from the purchase of custom ores. This policy is being generally adopted wherever it is possible in the absence of contracts. Of course, the smelting companies which have been engaged in this business have been heavy losers during the recent decline in the metal, and probably they have reached the point where they cannot afford to take any further chances. Anyway, this is one of the easiest methods of reducing output. It is to be remarked that unless the refineries slow up it will be a matter of two months or so before the curtailment of copper production now begun will become manifest to any considerable extent in the supply of refined metal, but we anticipate that there will be an immediate restriction of the output of some of the refineries.

The producers have been criticized for their action in making this curtailment, but such criticisms do not display careful consideration. If the demand for a commodity is so small that the producers cannot sell what they have been turning out, it is rational to cease turning it out at the former rate. This is quite a different matter from arbitrarily restricting production in order to starve consumers into paying higher prices than open market conditions justify.

Looking at the matter broadly, however, it is generally better in the long run for such producers as can market

their output at a profit to do so, rather than to hold it back indefinitely for the purpose of obtaining a higher price. The most interesting question is how long will the producers who are now restricting their output be content with diminished returns, while others are supplying the market at their full capacity. Until the accumulated stock is reduced, the curtailment by a comparatively few companies is merely a sacrifice in the interest of those which do not curtail, and such a condition is unlikely to be permitted to last long. We have not heard that the Rio Tinto, or any of the large foreign producers, has any intention of restricting.

On Sept. 19 the American Smelting and Refining Company notified the independent producers of the Cœur d'Alene that they must restrict their output 50 per cent. But will they do so? The independent production of lead ore in the Cœur d'Alene is certainly the cheapest production. If the Bunker Hill & Sullivan company, for example, should be satisfied with the profits that it can make from regular operations at a lower price for lead than rules at present, it will probably keep right on. If there were overtures to make a restriction before the price for lead was reduced to 4.75c. it is evident that they were turned down, and if willing to face that figure the independent producers will probably be willing to go lower, if necessary, rather than suffer the derangements to their business by operating at half rate.

The Giroux Mill

The mill which has been erected by the Giroux Consolidated Mines Company, in connection with its property at Ely, Nev., has been put in experimental operation by the contractor, and is expected to be turned over to the company for regular operation about Oct. 1. This is a noteworthy event, inasmuch as it is the beginning of milling of the disseminated porphyry ore of Ely on a large scale. The first section of the Steptoe mill, which is being erected jointly by the Nevada Consolidated and Cumberland-Ely companies, will hardly be ready for operation before the end of 1907. The inauguration of milling by the Giroux company is also worthy of mention, in view of an attack

recently made upon it in a Boston publication.

In this attack the Giroux company was adversely criticized because it located the mill at the mines, where it was alleged there would not be an adequate supply of water. We shall not express any opinion as to the amount of the water supply which will be available under the plan of the Giroux company, but we may point out the absurdity of the charge that such well known and experienced mining men as Joseph L. Giroux, president of the company, and E. W. Walter, manager at the mines, overlooked such an important matter. As a matter of fact, the question of water supply was discussed fully in the report to the stockholders of this company under date of Oct. 15, 1906, and plans have since then been under consideration for the supply of water from the valley by pipe line to the mill, in addition to the water which would be obtained from the mines.

The relative cost of pumping water a long distance up-hill to a mill and carrying the ore by railway down-hill to a mill in the valley is an interesting engineering problem, which cannot properly be discussed in the absence of complete data. The quantity of water used in milling varies over a wide range. Thus the stamp-mills of Lake Superior use as much as 40 tons of water per ton of ore, while the Bullion, Beck & Champion mill, in the Tintic district, Utah, treated 200 tons per 24 hours with jigs and tables and used only 2.7 tons per ton of ore. Besides economy in the use of water in the process, the quantity of fresh water that is required may be largely reduced by clarifying and repumping the water that has passed through the mill. At the Bullion, Beck & Champion mill it was necessary to supply only 0.9 ton of fresh water per ton of ore. In Arizona, New Mexico and Sonora, where water is generally scarce, some remarkable work in milling has been done by proper conservation of a limited supply. At Washington, Ariz., a mill treating 100 tons of ore per day had 216,000 gal. (nine tons per ton of ore) of water in circulation, but required only 6500 gal. per day to replace the loss, which amounted to only 3 per cent. A mill at Broken Hill, N. S. W., a district where water also is scarce, used 1,647,000 gal. per day, but the quantity that had to be supplied fresh was only 30,000 gal., or 2 per cent.

It is to be pointed out, moreover, that the necessity to exercise economy of water in ore-dressing is generally advantageous with respect to the extraction of mineral. There is apt to be less efficient ore dressing in districts where there is an abundance of water than in districts where the supply is short. Philip Argall, in the report of the Canadian Zinc Commission, remarked: "Going almost directly from Old and New Mexico to British Columbia, from places where water is scarce and difficult to obtain for dressing operations, to a moist and well watered land, I was positively astounded at the amount of water used in ore dressing in British Columbia and at the great dilution of the ore pulp. The indiscriminate crushing of slate, porphyry, galena, and * * * freibergite, literally in a veritable torrent of water, gave me a distinct shock. On reflection, I decided that while the Mexicans were undoubtedly struggling with the irreducible minimum, the British Columbia mill men had exceeded a reasonable maximum of water supply, or ore dilution, and that probably the better practice lay near the minimum." This is a conclusion to which most experienced mill men will agree.

We have no intention of arguing that the Giroux company has sufficiently provided itself with water-supply, or has adopted the best plan of conservation, or anything of that sort, because we have in no way studied its data, plans, etc., but we simply call attention, in justice to its engineers, to the fact that ore dressing has been successfully done with an apparently scarce supply of water, and we venture to say that they have given careful consideration to such experience.

The Public Land Question

One of the questions that is now exciting great attention in the West is the matter of taking up public lands—mineral lands, timber lands, coal lands, etc. In this connection there has been considerable adverse criticism of the policy of the administration in withdrawing large areas of land from location, and in making it more difficult for locators to take up lands which have not been withdrawn; in other words, enforcing more strictly the existing laws. No one will deny, we think, that such laws as we have ought to be strictly enforced, but it may

be that in carrying out that laudable policy subordinate officials may lean backward in their rectitude and be unduly drastic and unreasonable in their performances and decisions. At all events there has been considerable complaint on this ground, even from those who in general uphold heartily the policy of the administration. We are free to say, however, that some specific complaints of this character which have been brought to our attention are in our opinion unjustified. Nevertheless, it will be admitted by everyone, that if there are any well-based grievances, they ought to be rectified; and we have no doubt that such will be rectified if the facts are clearly and fairly presented. In this connection, we invite discussion of the subject in our columns. Elsewhere in this issue we print an interesting communication, from a reliable correspondent, which bears directly upon the general question.

IN CONNECTION WITH the interesting and valuable article by F. K. Blue, of San Francisco, on "The Flow of Water Carrying Sand in Suspension," which was published in the JOURNAL of Sept. 21, we overlooked to make the interesting note that the experiments on which this paper was based were hardly finished when the famous earthquake destroyed the apparatus. The beach slid down so far that the space between the delivering tank and the receiving tank increased about 18 in. in the distance of about 50 ft. The notes of the experiments were rescued from the fire by digging through the side of a fallen house, Mr. Blue barely saving his life by running out into the yard before the house fell. By the kindness of Professor Christy, of the University of California, Mr. Blue was allowed to use the mining laboratory at Berkeley the week after the earthquake, and thereby was enabled to complete the determination of the proportion of slime and the sizes of the sand used in the experiments.

THE AMERICAN ELECTROCHEMICAL SOCIETY will hold its fall meeting at New York, Oct. 17-19. A full announcement of the program will be made in our next issue. This is one of the most active and most interesting of the newer technical societies, and the papers and discussions before it are always profitable. It is to be hoped that the forthcoming meeting will be well attended.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Negative Results in Pyritic Smelting

There can be no doubt that Mr. Beardsley, in ascribing to liquation the unfavorable results of the Canadian experiments in pyritic smelting described by him in the Journal of Aug. 24, has hit upon the correct explanation. But the liquation of the sulphides is so general and unavoidable in that process that we must supplement this explanation. All the sulphides that we meet with in mining, except that of zinc, melt at a very moderate heat and, unless they are decomposed almost immediately, will sink into the hearth, to be withdrawn as matte in the course of the work. There are no other substances ordinarily met with that have so low a fusing point, and it may be reasoned that materials like the sulphides of iron, lead, copper, etc., which melt at 1000 deg. C., or thereabouts, must necessarily melt and run away from less fusible things, like quartz, limestone, iron ore, etc., with which they are usually fed. In digging out a frozen furnace one cannot fail to notice the absence of sulphides in all but the upper parts, and it may be reasoned *a priori* that such substances cannot possibly get far down into the hot regions without melting, and it is known that of them melt they form mobile liquids which run like water, and find their way down through the interstices in the charges, and escape from the heat. Other ingredients are found scattered along, according to their degree of infusibility. The general condition of things shows, what we might expect, that the sulphides melt first, and then the slag which has been fed into the shaft; while at a lower level we may find the oxide of iron and pieces of partly burned limestone; lower yet we find the more silicious fragments, chiefly of quartz, attached to which there is almost always a skin of slag, which has not had time to become fluid and get away, but has solidified *in situ*. The mass which collects in the lower part of the pyritic stack, and which in general has a decidedly acid character, I have elsewhere called the quartzose mass, and I regard it as of indispensable value in the process. This silicious mass, occupying that part of the furnace through which the descending molten sulphides are compelled to pass, reacts upon them, decomposing in particular the sulphide of iron. Doubtless it also decomposes the sulphide of copper; but succeeding reactions restore this metal

to the sulphide form. The results of this reaction upon the descending sulphide of iron are two-fold. First, there is the formation of a concentrated or enriched matte; and second, the production of a quantity of the singulo-silicate of iron, which being at the moment fluid, is added to the slag, making up, in most cases, its greater volume. The liquation of the sulphides is, as I remarked, an indispensable feature of the process, for without it they could not be brought into effective contact with the quartz and the very acid silicates, which alone of all the probable constituents of the pyritic charge are able to decompose them. It stands to reason that if a piece of quartz, a piece of iron ore and a piece of pyrrhotite be heated together, the substance which is of the greatest fusibility will melt first and, if conditions admit, will run away from the others. This is liquation. Now pyritic smelting involves not only the melting of the sulphides and the other portions of the charge, but the decomposition of the sulphide of iron and the production from that sulphide and the silica which must be present of the singulo-silicate of iron. In order to bring about this decomposition and recomposition certain conditions must be met. Now what are these conditions? First, there must be heat and free oxygen enough to serve the reactions; second, silica in the proper amount must be present, or in lieu of it a very acid silicate which has the property of reacting upon the sulphide, which neutral silicates will not do. The list of substances which can under such circumstances effect the decomposition of the sulphide, and serve as an acceptable reagent in the pyritic furnace, is not large. Quartz, of course, is the reagent *par excellence*. No other substance is of so much worth, pound for pound, although it is or has been customary to use others from a mistaken notion of their superior efficiency as formers of fusible slags. Clay, of the more silicious sorts, having sand grains interspersed through its mass, fed raw or in the form of bricks, has been used in this as in other forms of smelting; granite and quartz porphyry, whose excess of acid comes from the presence of quartz in intermixed grains, also serve the purpose. Some other silicious rocks, such as quartz diorite and diabase, will also answer to a certain extent. Old slags, produced either in reverberatory or blast furnaces, whose silicious part reaches 50 per cent. and above will have an effect on the process, but always in exact relation to the

amount of silica which remains unsaturated in their make-up. None of the ordinary silicates, such as those of lime, (wollastonite), magnesia (steatite, talc), iron (fayalite), will answer the purpose, nor will compound silicates, such as hornblende, augite, serpentine, or even the ordinary eruptive rocks, be of use in this branch of smelting.

Such substances as the quartzless variety of diorite are useless as fluxes in pyritic smelting, for they are in effect neutral silicates. But in the fusion of roasted ore they may play an important part, as in the presence of oxidized iron they will absorb it to a certain extent, forming a more basic slag than obtains in pyritic smelting. The analysis quoted by Mr. Beardsley shows that the stony matter contained in the Canadian ore is comparable with the natural silicated eruptive rocks, and I take it for granted that it consisted merely of included diorite or its decomposition products and, as a little calculation shows, it constitutes a neutral aggregate incapable of decomposing the ferrous sulphide which makes up so large a proportion of the ore, and would not affect the process except by its own elimination as slag. I do not imagine that the intention, in the experiments described, was to compel these included "residues," so small in quantity and so in effective chemically, to do all the work of decomposing the sulphides, but this point is not made quite clear by Mr. Beardsley, who fails to tell us how the material was intended to be fluxed. But I must say that the behavior of the furnace was so precisely what I and others have observed when such materials were improperly or insufficiently fluxed that I am tempted to ask if that were not the fact in this case. For the reader's sake I will repeat Mr. Beardsley's statement of the composition of the ore. It contained 5.11 per cent. chalcopyrite, 16.05 per cent. of pentlandite (the nickel-bearing mineral); 51.28 per cent. pyrrhotite, with a residue of stony matter amounting to 28.38 per cent. The sulphides, therefore, made up more than 60 per cent. of the whole weight of the ore. There being 7.37 per cent. of copper and nickel combined, and the desire being to secure a matte of 35 per cent. in the two metals, the concentration should have been about five tons of ore into one ton of matte, while it really was less than two tons into one. I for one would be inclined to attribute this poor result to the absence of the proper fluxes, and not to the enhanced tendency to liquate which

is assured to be the effect of the nickel in the matte, for I do not like to go so far afield in the search for a cause which may lie nearer home. Calculation shows that the addition of a weight of quartz amounting to one-sixth of that of the ore would produce the better effect, giving the desired five-to-one concentration, by taking up from the mixed sulphides an amount of iron equal to that in the pyrrhotite. If this amount of properly conditioned silica were supplied, and if the tests were carried on long enough to allow the pyritic furnace to get into working conditions, which is a matter of several days as a rule, I am fully convinced that there would be no "negative results in pyritic smelting" to chronicle. But ample time must be given, because tests that last but an hour or two, or even seven hours, are useless, and generally worse than useless, in demonstrating the feasibility of a process as applied to particular ores. I think we may read sufficiently between the lines of Mr. Beardsley's communication to see that the men in charge were much too careful of their furnace. It would have been more conclusive if they had driven it once to a freeze-up when, by digging out and noticing carefully the state of affairs inside, they would have learned a great deal that would have been of advantage. A freeze-up is a liberal education if rightly taken. No more can a man become a good smelter manager without freezings and diggings out than he can become a physician without deaths and dissections.

This is by no means the first time that experiments in pyritic smelting have met with failure in western Canada. I remember that my advice was once sought by a person interested in the reduction of the copper-nickel ores of Sudbury, who asserted that the ore, when smelted in a pyritic stack, "came out exactly as it went in," meaning, of course, that it smelted, but that there was no practical concentration. By all means let the details of all these experiments be published, that we may know to what to ascribe the adverse influences. We should know forthwith whether the nickel is really to blame, or whether its presumed culpability exists only in the imagination. I look forward to a time when experiments to settle just such metallurgical questions will be carried out under public auspices and at the public expense. Few can realize what it would mean to metallurgical progress did there exist a suitably equipped smelting works, extensive enough to cover all forms of the art, built and run upon a regular working scale, and conducted by men of actual experience in this line and not mere laboratory enthusiasts, to which might be submitted the puzzling and often almost insolvable questions that require not only answer but practical demonstration. Such a plant need be neither very extensive nor very costly, but

it should be a working plant, not a mere makeshift, such as we see at most mining schools and commercial testing works.

HERBERT LANG.

Oakland, Cal., Sept. 12, 1907.

The Location of Mineral Land

A few months since four prospectors found some rich ledges at Wingate, formerly known as Lone Willow, in San Bernardino county near the Inyo county line. From one pocket they got out \$10,000. They kept the find secret until a few weeks ago, and meantime had staked 130 claims for themselves. Under our present Federal mining laws these men will not have to begin their assessment work until the day before Jan. 1, 1909, and meantime most of their claims will doubtless lie idle unless people come and buy them. This is another marked example of the defect in our mining laws. That four men should be able to locate legally what is virtually an entire new district, seems against public policy. It is this sort of thing which is as detrimental to the mining industry as is selling stock in wildcat mines. The men themselves are working on a 35-ft. ledge carrying high-grade gold ore as well as copper and silver, and it would seem as if that might be as much as they could well attend to. But they have staked 129 more claims covering some miles of mineral-bearing ground. These they will naturally be unable to develop, but in the usual dog-in-the-manger style will hold on to them as long as they can until the law finally forces them to work each separate claim. Meantime the district will be virtually closed to other prospectors or miners, who, if they could take up any single claims would doubtless open them, and prove their value. These men, who were recently in Los Angeles, took occasion to warn any who might "make a break" for the new mining field, that nothing can be found there except plenty of water; everything else must be carried in. It's a wonder they did not take up all the water rights too while they were about it, but perhaps they did.

In this connection it may be stated that H. H. Yard and associates are about putting men in the field to do annual assessment work on the placer claims on the north fork of Feather river, extending from above Oroville, Butte county, up into the mountains of Plumas county. A large part of this work will be done on the various claims that were in dispute in the recent hearing before the Land Office officials at Susanville, so it seems that the North California Mining Company, of which Yard is manager, is confident that the decision of the Land Office will be in its favor. Another hearing is yet to be held at the Sacramento land office, involving other claims located by Yard, it

being claimed by the Government that the claims were located more with a view to get the timber on the surface than the minerals beneath.

The North California Mining Company holds by locations and purchase 850 placer claims, and last year paid out \$85,000 for annual assessment work, none of the ground being as yet patented. Great complaint has been made that one company should hold so much mineral ground and all sorts of charges of fraud have been made, so that the land office finally took the matter up and is investigating it. It would seem to be, however, more the fault of the law, than of the men, that so many claims could be taken by one company or individual in one section of the State. Most of these claims had been more or less worked 40 or 50 years ago in a crude manner and subsequently abandoned. Some were still held by possessory title and were partly worked. All of this kind were purchased by Yard. The old abandoned ones were located. They had been open to location for years, but nobody thought it worth while to take them up or work them until Yard devised the scheme of getting them all under single control, and devised also a method of working them jointly by steam shovel, etc., as soon as the Western Pacific railroad line is built along the cañon of the North Fork, so that the gravel can be hauled on trains to a point where it can be washed economically.

Mr. Yard himself maintains that if there is any fault to be found it is with the law itself which permits him or anyone else to locate as many claims as desired. He also maintains that in every instance, each claim has been legally located and recorded, and that upon each, the required annual assessment work has been done and recorded. He therefore affirms that he is in no fear of any adverse decision of the U. S. Land Office by which he will be deprived of any of these claims by reason of fraudulent entry. The land office must abide by the laws of Congress and its own regulations and as long as these laws and regulations are complied with, the locator cannot be deprived of what he holds by possessory right, and may subsequently obtain patents giving him absolute title. The entire proceedings in locating and holding these claims have been carried on under advice of competent attorneys, as it was naturally expected there would be some adverse comment when it was learned that so large an amount of mineral land had come into the possession of one company.

In the matter of location and holding of these numerous mining claims in one continuous chain, many charges and counter charges have been made. It is even maintained that the conflicting interests of rival transcontinental railroads form a prime factor in the controversy. That is a matter, however, known only to the principals, who seldom let such

matters come before the public. Be it as it may, there is no doubt that the North California Mining Company holds now over 850 mining claims in two adjoining counties in California and may obtain more in the same manner if it chooses for their is nothing to prevent, as far as the laws are concerned. That the Federal mining laws never contemplated this there is no doubt; nor is there a doubt that they nevertheless authorize it. That such a state of affairs is against public policy there is also no doubt; yet until the laws are changed others may go and do likewise and there is no way to stop them.

To the defense that unless the company obtained the claims in one body in order to be able to work them to a profit, that they would otherwise lie idle, there are many who will object. Yet on the other hand there is much truth in the assertions as many of the claims in question had been abandoned as worthless 30 or 40 years ago and laid idle ever since. It is at the same time true that the law requires the locator to prove "paying mineral" in each separate claim, yet as most of these claims were once worked for gold, and prospects more or less good may be found in each, it will be difficult to prove there is not paying mineral. In fact that phrase in the law is but doubtful at best, for while these claims may no longer pay to work by rocker, sluice or tom, they may pay on the wholesale system of work to be carried out by Mr. Yard. The old gravel deposits at Oroville and Folsom were worked out many years ago, and given up, but are now turning out more gold than they ever did, as the dredge system has since been invented and put in practice successfully. The decision in these cases by the United States Land Office, will be looked for with interest by the mining community, but the mining community, no matter what the result may be, is generally inimical to the system by which it is possible for one company or individual to control so many hundreds of mining claims in any given locality.

X. Y. Z.

San Francisco, Cal. Sept. 18, 1907.

Negative Results in Pyritic Smelting

I note in my article in the *JOURNAL* of Aug. 24, an error in column 3, line 20. The word *matte* should read *heat*. This changes the sense somewhat, although I think it would be readily understood by technical men.

G. F. BEARDSLEY.

Fruitvale, Alameda County,
California, Aug. 31, 1907.

Chilled steel shot of extreme hardness and adapted to replace diamonds in drilling through many formations, is made by spraying or atomizing molten steel into cold water, thereby chilling it instantly.

New Publications

THE MINING INDUSTRY IN NORTH CAROLINA DURING 1905. By Joseph Hyde Pratt. Economic Paper No. 11, North Carolina Geological and Economic Survey. Pp. 96. 6½x9½ in.; paper. Raleigh, N. C., 1907: E. M. Uzzell & Company, State Printers.

Contents. Introduction. Gold and silver. Copper. Cobalt. Iron. Tin. Abrasive material. Mica. Quartz (flint). Barytes. Monazite and zircon. Talc and soapstone. Precious stones. Mineral waters. Graphite. Coal. Peat. Stone. Sand and gravel. Sand-lime brick. Clay. Summary. Black sand investigations. Mining laws of North Carolina.

Although North Carolina does not rank as an important State in the production of the metals and coal, its mineral industry is of peculiar interest by reason of the great variety of the materials produced. During 1905 the total value of the mineral output was \$2,439,381, divided among 24 different products. Gold yielded \$129,153; silver, \$20,216; copper, \$88,000; mica, \$100,900; and monazite \$107,324. Garnet, corundum, barytes, talc, zircon, graphite and precious stones all added to the total. Promising tin deposits were developed but the output did not figure in the total of 1905. An increase for the year of 24 per cent. shows that in general the industry was fairly prosperous during the period under review.

WATER-WORKS MANAGEMENT AND MAINTENANCE. By Winfred D. Hubbard and Wynkoop Kiersted. Pp. 429; illustrated. 6x9 in.; cloth, \$4. New York, 1907: John Wiley & Sons.

Contents. Part I. Ground-water supply. River-water supply. Pumping-engines. Impounded Supplies. Part II. Plans and Records. Extensions. Service Connections. Meters. Care of Appurtenances. Alterations and Repairs. Maintenance of Quality. Water Waste. Electrolysis. Fire Protection. Accounts Financial Management. Rules and Regulations. Annual Reports. Part III Franchise. Water Rates. Depreciation.

This new book will be welcomed by those who are connected with or are interested in municipal water-works or by students of water purification. There is much valuable data on wells and springs, river water, sands of varying fineness, with reference to percolation and the purification of water by filtration and coagulation. The section devoted to settling tanks or basins and filtration plants contains many diagrams and plans of existing plants.

The cost of valves and fittings and the approximate cost of laying cast-iron pipe is contained in the chapter on extensions; the methods of repairing breaks and leaks in water pipes and mains should prove valuable. Among other subjects dealt with are water waste, meters, electrolysis,

financial management, etc. Part III is devoted to the cost of water production, water rates and depreciation of private and municipal plants and is of value especially to towns and small cities. The book is carefully compiled, well illustrated and contains a wealth of information on water and water distribution.

JAHRBUCH FUER DAS EISENHUETTENWESEN. V. JAHRGANG, 1904. Pp. 448. 6½x9 in.; cloth. Düsseldorf, Germany, 1907: Kommissionsverlag von A. Bagel.

This is the fifth volume of the year-book which performs for German readers of iron and steel literature a service similar to that supplied by the *JOURNAL* in its monthly Mining Index and by THE MINERAL INDUSTRY for mining engineers and the metal industries in general. It is a resumé of the material which appeared during the corresponding period in *Stahl und Eisen*, and is a handy epitome of the year's history, although it lacks the brevity of a catalog and is rather meagerly supplied with the few words of description which in the most satisfactory publications of this kind enable the busy reader to get at the gist of an article without actually reading it. Needless to say, it shows the marks of minute care in preparation, but it covers a period no later than the year 1904, and that will largely destroy its interest, especially for American readers. The contents are classified according to the plan followed in textbooks of the subject, beginning with fuels and refractory materials and ending with alloys of iron and physical tests of materials.

Borax Bricks

According to the *Clay Record*, (Aug. 30, 1907) brick manufactured from borax tailings, minus the boric acid component, will be placed on the market Sept. 15 by the borax concern at Daggett. These bricks, it is stated, will be sold at such a price that they will be used in preference to lumber, which at this time commands a price more than double the probable cost of the borax by-product bricks.

The ore is first ground to 60-mesh, then treated to extract the boric acid; next, the residue is compressed. The brick will be of two kinds, common red and Mexican adobe.

THE AMERICAN INSTITUTE OF MINING ENGINEERS has arranged with Joseph Hyde Pratt, superintendent of the Mines and Metallurgy Building, to set aside space for the use of its members while visiting the Jamestown fair; also to have mail received and held for distribution to individual members. This is rather an important matter since there are several places at which mail might be delivered, but, with characteristic Southern ease, letters are frequently held up or mislaid.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ASPHALT

PROCESS OF MANUFACTURE—Process of Treating Wurtzite or Elaterite and of Producing Fusible Soluble Products. William F. Doerflinger and Leon H. Buck, Niagara Falls, N. Y., assignors, by mesne assignments, to Marcus Stine, New York, N. Y., and Edward F. C. Young, Jersey City, N. J. (U. S. No. 864,836; Sept. 3, 1907.)

CEMENT

CEMENT BURNING—Method of Burning Cement in Rotary Kilns. Benjamin H. Thwait, London, England, assignor to Thos. C. Fawcett, Limited, Leeds, England. (U. S. No. 864,045; Aug. 20, 1907.)

CEMENT MANUFACTURE—Manufacture of Cement and Other Products. August P. Bjerregaard, Mineola, N. Y., assignor of one-half to Robert C. Mitchell, Mount Vernon, N. Y. (U. S. No. 864,068; Aug. 20, 1907.)

COAL AND COKE

COAL-CUTTING MACHINES. A. Hopkinson, Manchester, England. Improved arrangements in coal cutting machines of the chain heading type, with the object of making the machines more compact. (Brit. No. 16,262 of 1906; Aug. 17, 1907.)

COAL-CUTTING MACHINES. W. G. Cowleshaw, Stoke-on-Trent, England. Improved supports and footstep bearings for coal cutting machines. (Brit. No. 4729 of 1907; Aug. 17, 1907.)

COAL HANDLING—Machinery for Handling Coal, Ore, and the like. Jeremiah Campbell, Providence, R. I. (U. S. No. 864,407; Aug. 27, 1907.)

COAL HANDLING—Machinery for Handling Coal, Ore, etc. Charles C. King, New York, N. Y., assignor to C. W. Hunt Co., West New Brighton, N. Y., a Corporation of New York. (U. S. No. 865,913; Sept. 10, 1907.)

COAL-HOISTING APPARATUS. Adolph Suck, Boston, Mass. (U. S. No. 863,668; Aug. 20, 1907.)

COAL WASHING. J. Shaw, York, England. In the washing of coal, the provision of improved means for recovering the fine coal from the washing water. (Brit. No. 20,699 of 1906; Aug. 17, 1907.)

COKE-EXTRACTING MACHINE. Enoch H. Abraham, Uniontown, Penn., assignor to Covington Machine Co., a Corporation of Virginia. (U. S. No. 863,891; Aug. 20, 1907.)

COKE-OVEN. George C. Landis, Connellsville, Penn. (U. S. No. 864,099; Aug. 20, 1907.)

COPPER

COPPER EXTRACTION. J. Gattray, Mons, Belgium. Reducing copper from cupreous chloride by hydrogen generated by the contact of steam with hot fuel. (Brit. No. 18,574 of 1906; Aug. 31, 1907.)

COPPER SCRAP TREATMENT. A. Therot and L. Maye, Avignon, France. Improved methods of regenerating the electrolyte used in recovering copper from various waste metal, sweepings and turnings of brass, etc. (Brit. No. 6502 of 1907; Aug. 24, 1907.)

ELECTRO-DEPOSITION. S. O. Cowper Coles, London, England. Improvements in the inventor's method of electrolytically depositing copper strip on a spirally grooved revolving mandrel. (Brit. No. 21,583 of 1906; Aug. 17, 1907.)

ELECTROLYTIC COPPER. S. O. Cowper Coles, London, England. The addition of sulphate of alumina to the electrolyte in order to produce a smoother deposit of copper. (Brit. No. 20,380 of 1906; Sept. 7, 1907.)

METALS EXTRACTION—Produits Chimiques de Croissy, Paris, France. Extracting

copper and other metals from roasted pyrites by mixing dry with chloride of lime and spraying with dilute acid, the iron oxide being unattacked and sufficiently free from other metals to make it suitable for production of iron. (Brit. No. 17,441 of 1906; Sept. 7, 1907.)

PLATING PROCESS. S. O. Cowper Coles, London, England. Improved methods of controlling the electrodeposition of brass by providing anodes of zinc and copper as well as anodes of brass. (Brit. No. 19,411 of 1906; Aug. 17, 1907.)

GOLD AND SILVER

ORE PULVERIZING—Redruth Foundry Company, Redruth, Wales. Improvements in the inventors' machine for grinding and amalgamating ores, in which the grinding surfaces are in the form of horizontal disks. (Brit. No. 21,423 of 1906; Sept. 7, 1907.)

PLACER MINING—Apparatus for Recovering Values from Alluvial Deposits. Ole T. Crosby, Nome, Alaska. (U. S. No. 863,700; Aug. 20, 1907.)

IRON AND STEEL

CASTING INGOTS—Process or Method of Casting Ingots. Adolphus J. Lustig, Newark, N. J., assignor of one-fifth to Isaac Lehman, Newark, N. J., and one-fifth to Louis Kahn, New York, N. Y. (U. S. No. 863,733; Aug. 20, 1907.)

CHARGING BLAST FURNACES—Method of Charging Blast-furnaces. Arthur G. McKee, Cleveland, Ohio. (U. S. No. 864,795; Sept. 3, 1907.)

CLEANING IRON. S. O. Cowper Coles, London, England. Removing scale from iron by passing the iron through electrolytic baths in which hydrogen is liberated. (Brit. No. 17,672 of 1906; Aug. 24, 1907.)

INGOT CHARGING—Combined Ingot Stripper and Charger. John C. Cromwell and Horace W. Lash, Cleveland, Ohio, assignors to Garrett-Cromwell Engineering Co., Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 865,240; Sept. 3, 1907.)

INGOT-MANIPULATOR. Julian Kennedy, Pittsburg, Penn. (U. S. No. 865,047; Sept. 3, 1907.)

REFINING SUBSTANCE—Material for Use in Refining Iron and Process of Preparing the Same. Horace W. Lash, Cleveland, O. (U. S. No. 864,972; Sept. 3, 1907.)

ROLLING MILLS—Feed Mechanism for Tandem Mills. George D. Evans, Sharon, Penn., assignors to American Sheet and Tin Plate Co., Pittsburg, Penn., a Corporation of New Jersey. (U. S. No. 864,727; Aug. 7, 1907.)

LEAD

PULVERIZING METALLIC LEAD—Apparatus for Pulverizing Metallic Lead. John W. Bailey, New York, N. Y., assignor, by mesne assignments, to United Lead Co., a Corporation of New Jersey. (U. S. No. 864,443; Aug. 27, 1907.)

NICKEL

ORE TREATMENT—Apparatus for Treating with Carbonic Oxide Nickel Ores or Other Material Containing Nickel. Carl Langer, Ciydach, England, assignor to Mond Nickel Co., Limited, Westminster, England. (U. S. No. 865,969; Sept. 10, 1907.)

SULPHUR AND PYRITES

SULPHUR EXTRACTION. E. Gunther and R. Franke, Elselben, Germany. The use of tetrachloride of acetylene for extracting sulphur from ores or in gas purification. (Brit. No. 11,187 of 1907; Aug. 24, 1907.)

TIN

EXTRACTION OF TIN. R. E. W. MacIvor and M. Fradd, London, England. In the inventors' process for extracting tin from ores by the action of producer gas, raising the temperature of the reaction by burning some portion of the producer gas. (Brit. No. 17,002 of 1906; Aug. 24, 1907.)

ZINC

GALVANIZING. S. O. Cowper Coles, London, England. In galvanizing iron wires, using an electric current to make the zinc adhering to the wires more fluid. (Brit. No. 18,910 of 1906; Aug. 24, 1907.)

LEACHING ORES. R. E. W. MacIvor and M. Fradd, London, England. Improvements in the method of dissolving zinc from roasted zinc-lead ores by means of calcium chloride or sulphurous acid, and subsequently precipitating by lime. (Brit. No. 16,912 of 1906; Aug. 24, 1907.)

LIXIVIATING ORES. P. Sherwood, London, England. The use of hot concentrated ammonium salt for dissolving out zinc from roasted complex sulphides. (Brit. No. 16,364 of 1906; Aug. 17, 1907.)

ZINC EXTRACTION. R. E. W. MacIvor and M. Fradd, London, England. Treating residues from zinc distilling furnaces by mixing with sulphuric acid into a stiff paste and heating and leaching out the sulphate of zinc so formed. (Brit. No. 17,001 of 1906; Aug. 24, 1907.)

ORE DRESSING

CLASSIFIER. Snyder L. Hague, Salt Lake City, Utah; William Igleheart special administrator of said Hague, deceased. (U. S. No. 865,301; Sept. 3, 1907.)

CONCENTRATING TABLES. Humboldt Engineering Company, Cologne, Germany. In concentrating tables, improved methods of giving percussive blows. (Brit. No. 10,037 of 1907; Aug. 24, 1907.)

CONCENTRATION—Apparatus for Concentrating Ores. Alexander S. Elmore, London, England, assignor to Ore Concentration Co., (1905) Limited, London, England. (U. S. No. 865,334; Sept. 3, 1907.)

CRUSHER. Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co., Portland, Me., a Corporation of Maine. (U. S. No. 864,513; Aug. 27, 1907.)

FLOTATION PROCESS—Process of Separating Zinc-Blende by Flotation. Auguste J. F. De Bavay, Kew, Victoria, Australia. (U. S. No. 864,597; Aug. 27, 1907.)

FLOTATION PROCESSES. H. L. Sulman, London, England. In flotation processes for separating ores from gangue in which the ore is exposed alternately to the action of air and water, slightly warming the liquid in which the flotation takes place. (Brit. No. 19,944 of 1906; Aug. 17, 1907.)

GRINDING MILLS—Lining for Grinding Mills. Joseph R. Brown, Los Angeles, Cal. (U. S. No. 864,357; Aug. 27, 1907.)

JIGS. W. A. Harris and J. Morgan, Durham, England. In jigs the provision of an intermittent water supply in combination with an auxiliary air tight chamber. (Brit. No. 23,986 of 1906; Sept. 7, 1907.)

MINERAL-SEPARATOR. Richard J. McKeone, Sault Ste. Marie, Mich. (U. S. No. 865,053; Sept. 3, 1907.)

ORE-CONCENTRATING JIG. Henry Foust, Baxter Springs, Kan. (U. S. No. 864,776; Sept. 3, 1907.)

ORE-CONCENTRATOR. Patrick Brophy, South Omaha, Neb. (U. S. No. 865,859; Sept. 10, 1907.)

ORE SEPARATION—Apparatus for Extracting Minerals from Ore. Oscar A. Ellis, San Francisco, Cal. (U. S. No. 865,027; Sept. 3, 1907.)

ORE SEPARATION—Apparatus for Separating Solid Particles from Each Other. Arthur P. S. Macquisten, Glasgow, Scotland. (U. S. No. 865,194 and 865,195; Sept. 3, 1907.)

ORE SEPARATION—Apparatus for Separating Solid Particles from Each Other. Arthur P. S. Macquisten, Glasgow, Scotland. (U. S. No. 865,260; Sept. 3, 1907.)

ORE SEPARATION—Method of Separating the Metallic and Rocky Constituents of Ores. Dudley H. Norris, New York, N. Y. (U. S. No. 864,856; Sept. 3, 1907.)

ORE SEPARATION—Screen Sizing and Separating Machinery. John M. Callow, Salt Lake City, Utah. (U. S. No. 864,827, 864,828 and 864,829; Sept. 3, 1907.)

SEPARATION—Separating Metal from Deposits. Isidor Kitsee, Philadelphia, Penn. (U. S. No. 865,711; Sept. 10, 1907.)

METALLURGY—GENERAL

ALLOYS—Manufacture of Alloys. Walter Ruebel, Hamburg, Germany, assignor to Albert Jacobsen, Hamburg, Germany. (U. S. No. 864,139 and 864,140; Aug. 20, 1907.)

CONVERTING—Means for Preventing Escape of Unfused Ore from Smelting-Converters. Ralph Baggaley, Pittsburg, Penn., Charles M. Allen, Lo Lo, Mont., and Edward W. Lindquist, Chicago, Ill.; said Allen and said Lindquist assignors to said Baggaley. (U. S. No. 864,719; Aug. 27, 1907.)

METAL-MELTING. Samuel Knight, Chicago, Ill., assignor to Waterbury Crucible Co., Waterbury, Conn., a Corporation of Connecticut. (U. S. No. 864,425; Aug. 27, 1907.)

PROCESS OF OXIDATION. J. Thelberg, New York, N. Y. Production from mixed ores, of oxide and sulphate of zinc and sulphate of lead by forcing mixture of superheated steam and air through the ore. (Brit. No. 2789 of 1907; Sept. 7, 1907.)

ROLLING SHEET METAL—Process of Rolling Sheet Metal. Edwin Norton, New York, N. Y. (U. S. No. 865,055; Sept. 3, 1907.)

SINTERING—Method of Sintering Ores. James Scott, Pittsburg, Penn. (U. S. No. 865,658 and 865,659; Sept. 10, 1907.)

SMELTING AND CONVERTING—Process of Smelting Ore and Converting Matte. Arthur M. Day, Bingham Canyon, Utah. (U. S. No. 865,333; Sept. 3, 1907.)

SMELTING PROCESS—Process of Smelting Refractory Ores and Producing Low-Carbon Ferro Alloys. Edgar F. Price, Niagara Falls, N. Y. (U. S. No. 865,609; Sept. 10, 1907.)

TAPPING ARRANGEMENT FOR CRUCIBLES. Lionel Heynemann, San Francisco, Cal. U. S. No. 865,037; Sept. 3, 1907.)

MINING MACHINERY AND APPARATUS

AIR COMPRESSORS—Means for Unloading Air Compressors. Ebenezer Hill, Norwalk, Conn. (U. S. No. 865,390; Sept. 10, 1907.)

BUCKET OR CONVEYER. William F. Jones, Little Falls, N. J., assignor to Claremont Iron Works Co., a Corporation of New Jersey. (U. S. No. 863,045; Sept. 3, 1907.)

CONTROLLING MINE CARS. W. H. Jepson and J. Longden, Rotherham. Improved apparatus for retaining mine wagons on an incline. (Brit. No. 496 of 1907; Aug. 17, 1907.)

CONVEYER. George C. Horst, Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. (U. S. No. 865,591; Sept. 10, 1907.)

CONVEYER AND ELEVATOR. James H. Weston, Tamaqua, Penn., assignor of one-third to John F. Wagner and one-third to George A. Wilford, Tamaqua, Penn. (U. S. No. 865,837; Sept. 10, 1907.)

DRILL-CHUCK for Use on Hammer Rock-Drills. Albert L. Stephens and Thomas McGrath, Silver Plume, Colo., assignors of one-fourth to William C. Champion, Silver Plume, Colo., and one-fourth to Philip T. Stephens, Georgetown, Colo. (U. S. No. 864,270; Aug. 27, 1907.)

DRYING EXPLOSIVES—Apparatus for Drying Explosive Substances. Paul Butler, Lowell, Mass. (U. S. No. 863,834; Aug. 20, 1907.)

DUMPING-CAGE for Mine-Cars. George Trotter, Riverton, Ill. (U. S. No. 864,813; Sept. 3, 1907.)

ELEVATING AND CONVEYING MECHANISM. Axel R. Holmen, Columbus, Ohio. (U. S. No. 865,041; Sept. 3, 1907.)

ELEVATOR-BUCKET. Ira O. Robbins, Millville, Penn., assignor of one-half to Ellis Greenley, Millville, Penn. (U. S. No. 856,611; Sept. 10, 1907.)

HAULING ROPES. J. Wright, Johannesburg, So. Africa. Apparatus for gaging the diameter of hauling ropes, removing dirt and other matter and oiling the ropes. (Brit. No. 16,090 of 1906; Aug. 17, 1907.)

HOIST—Portable Hoist. James L. Pilling, Chicago, Ill. (U. S. No. 864,798; Sept. 3, 1907.)

HOISTING AND CONVEYING APPARATUS. George A. Fox and David Davidson, Tustin, Mich. (U. S. No. 864,637; Aug. 27, 1907.)

HOISTING-BUCKET. Charles S. Wil-

lamson, Pittsburg, Penn. (U. S. No. 864,278; Aug. 27, 1907.)

HYDRAULIC-NOZZLE SUPPORT. Geo. J. Henry, Jr., San Francisco, Cal., assignor of one-half to Pelton Water Wheel Co., San Francisco, Cal., a Corporation of California. (U. S. No. 863,795; Aug. 20, 1907.)

MINE-CAR. Thomas M. Edmondson, Los Angeles, and Duncan Ferguson, Havilah, Cal. (U. S. No. 863,971; Aug. 20, 1907.)

MINE CAR BRAKE—Brake for Mine-Cars. Samuel R. Green, Grassflat, Penn. (U. S. No. 865,378; Sept. 10, 1907.)

MINER'S LOCK. Clarence E. Miller, Fairmont, W. Va., and Quincy L. Pore, Connellsville, Penn. (U. S. No. 865,792; Sept. 10, 1907.)

MINER'S PAN. Penton A. Hardwick, Colorado City, Colo. (U. S. No. 865,178; Sept. 3, 1907.)

ROCK-DRILL. Evan W. Evans, Greenwood, B. C., Canada. (U. S. No. 865,174 and 865,175; Sept. 3, 1907.)

ROCK-DRILL—Hydrocarbon Rock-Drill. John V. Rice, Jr., Edgewater Park, N. J., assignor of one-eighth to Albert Edward Tower, Poughkeepsie, N. Y., and seven-eighths to Fred E. Tasker, New York, N. Y. (U. S. No. 863,646; Aug. 20, 1907.)

ROCK-DRILL. Robert A. Fowden, Germantown, Penn. (U. S. No. 864,838; Sept. 3, 1907.)

ROCK DRILL BITS. W. E. Kimber, Johannesburg, So. Africa. Improved machine for forming and sharpening bits for rock drills. (Brit. No. 21,761 of 1906; Aug. 31, 1907.)

ROCK DRILLS. J. H. and J. M. Holman, Calhorne. Improved dust allayer for use in connection with rock drills. (Brit. No. 17,155 of 1906; Aug. 24, 1907.)

SAFETY-FUSE. Joseph Sachs and Frank D. Reynolds, Hartford, Conn., assignors to Sachs Co., Hartford, Conn., a Corporation of Connecticut. (U. S. No. 863,656; Aug. 20, 1907.)

SAFETY LAMPS. A. Mallet, Lille, France. Improved form of electric safety lamps for mines. (Brit. No. 615 of 1907; Aug. 17, 1907.)

SAFETY LAMPS. W. A. Krozo and W. Best, Morley. Improved method of electrically igniting miners' safety lamps. (Brit. No. 25,283 of 1906; Aug. 24, 1907.)

WELL-DRILLING MACHINE. John R. Griffith and Leslie G. Cosper, Independence, Kan. (U. S. No. 864,730; Aug. 27, 1907.)

METALLURGICAL MACHINERY AND APPARATUS

CHARGING APPARATUS—Vertical Charging Mechanism. Clarence L. Taylor, Alliance, Ohio, assignor to Morgan Engineering Co., Alliance, Ohio. (U. S. No. 864,936; Sept. 3, 1907.)

CONVERTER. Ralph Baggaley, Pittsburg, Penn. (U. S. No. 865,671; Sept. 10, 1907.)

CRANE for Carrying Ladles. Clarence L. Taylor, Alliance, Ohio, assignor to Morgan Engineering Co., Alliance, Ohio. (U. S. No. 864,935; Sept. 3, 1907.)

CRANE—Traveling Ladle-Crane. George R. Ward, New York, N. Y. (U. S. No. 866,247; Sept. 17, 1907.)

ELECTRIC SMELTING APPARATUS. James C. Young, Jersey City, N. J. (U. S. No. 865,285; Sept. 3, 1907.)

ELECTRODEPOSITION. D. Roberts, Nottingham and E. W. Jaffray, London, England. An apparatus for the rapid electrodeposition of metals. (Brit. No. 20,716 of 1906; Aug. 17, 1907.)

FURNACE - CHARGING APPARATUS. Clarence L. Taylor, Alliance, Ohio, assignor to Morgan Engineering Co., Alliance, Ohio. (U. S. No. 864,934; Sept. 3, 1907.)

GAS-FURNACE INSTALLATION. Heinrich Koppers, Essen-on-the-Ruhr, Germany. (U. S. No. 864,545; Aug. 27, 1907.)

GAS-PRODUCER. Guy C. Hellman, Hackensack, N. J., assignor of one-half to Mary A. Herrick, New York, N. Y. (U. S. No. 866,131; Sept. 17, 1907.)

GAS-PRODUCER. William B. Hughes, Cleveland, Ohio. (U. S. No. 866,032; Sept. 17, 1907.)

GAS-PRODUCER. Martin V. B. Smith, New York, N. Y. (U. S. No. 865,954; Sept. 10, 1907.)

GAS PRODUCERS—Poker Mechanism for Gas-Producing. Samuel B. Sheldon, Buffalo, N. Y. (U. S. No. 865,616; Sept. 10, 1907.)

ORE TREATMENT—Apparatus for Treating Ore. James W. Boileau, Denver, Colo., assignor of one-half to James B. Knoblock,

Denver, Colo. (U. S. No. 866,570; Sept. 17, 1907.)

ORE TREATMENT—Apparatus for Treating Ores. Joseph C. Hames, Goldfield, Nev. (U. S. No. 864,642; Aug. 27, 1907.)

ROASTING APPARATUS—Apparatus for Roasting Ores and Separating By-Products Therefrom. Alva D. Lee, Brookline, Mass. (U. S. No. 865,309; Sept. 3, 1907.)

FURNACES

BLAST-FURNACE TUYERE. Henry Seidler, Great Falls, Mont. (U. S. No. 866,312; Sept. 17, 1907.)

ELECTRIC FURNACE. F. M. Chaplet, Paris, France. In an electric metallurgical furnace, the provision of a small chamber connected with the furnace, to act as a preliminary experimental chamber. (Brit. No. 4927 of 1907; Aug. 17, 1907.)

ELECTRIC FURNACE. Walter G. Clark, New York, N. Y., assignor to Electric Furnace Co., Portland, Me., a Corporation of Maine. (U. S. No. 865,016; Sept. 3, 1907.)

ELECTRIC FURNACES. E. Gronvall, A. Lindblad and O. Stahlane, Ludvika, Sweden. In electric transformer furnaces, the provision of extra coils through which current may be passed in order to counteract the action of magnetic leakage. (Brit. No. 7791 of 1907; Aug. 31, 1907.)

ELECTRIC FURNACES. E. Cornelius and L. Pehn, Gothenburg, Sweden. Improvements in electrical smelting furnaces, with the object of obtaining greater heat without damaging the walls. (Brit. No. 14,420 of 1906; Aug. 24, 1907.)

FURNACE for Melting Metal. James V. Martin, Baltimore, Md., assignor of one-third Thomas C. Brain, Baltimore, Md. (U. S. No. 865,789; Sept. 10, 1907.)

ORE-REDUCING FURNACE. John T. Jones, Iron Mountain, Mich. (U. S. No. 866,280; Sept. 17, 1907.)

ORE ROASTING—Apparatus for Roasting Fusible Ores. Albert G. Davis, Schenectady, N. Y. (U. S. No. 866,581; Sept. 17, 1907.)

REDUCTION-FURNACE. Richard L. Baumline, Auburn, N. Y. (U. S. No. 866,323; Sept. 17, 1907.)

INDUSTRIAL CHEMISTRY

ALKALI EARTH PRODUCTION—Electrolytic Production of Earth-Alkali Metals. George O. Seward and Franz von Kugelgen, Holcombs Rock, Va., assignors to Virginia Laboratory Co., New York, N. Y., a Corporation of New York. (U. S. No. 864,928; Sept. 3, 1907.)

AMMONIUM NITRATE—Production of Ammonium Nitrate. Ernst R. Caspari and Otto Nydegger, Uerdingen, and Anton Goldschmidt, Düsseldorf, Germany, assignors to R. Wedekind & Co., M. B. H., Uerdingen, Germany, a Firm. (U. S. No. 864,513; Aug. 27, 1907.)

BLEACHING-POWDER CHAMBER. Max Mauran, Niagara Falls, N. Y., assignor to Castner Electrolytic Alkali Co., a Corporation of Virginia. (U. S. No. 865,651; Sept. 10, 1907.)

ELECTROLYSIS OF FUSED SALTS. Franz von Kugelgen and George O. Seward, Holcombs Rock, Va. (U. S. No. 865,648; Sept. 10, 1907.)

FURNACE PRODUCTS—Process of Baking Carbon Electrodes and Heating by Electricity and Combustion. Edgar F. Price, Niagara Falls, N. Y. (U. S. No. 865,608; Sept. 10, 1907.)

MANGANESE SILICIDE—Process of Producing Manganese Silicide. Edgar F. Price, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 866,597; Sept. 17, 1907.)

NITRIC ACID—Process of Concentrating Nitric Acid. Richard Wolfenstein and Oskar Boeters, Berlin, Germany. (U. S. No. 864,217; Aug. 27, 1907.)

PRODUCTION OF NITROUS COMPOUNDS. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Co., a Corporation of New York. (U. S. No. 865,618; Sept. 10, 1907.)

SULPHURIC ACID—Purification of Arsenical Sulphuric Acid. Julius Raschen, Arthur E. Wareing, and Jeff H. Shores, Liverpool, England, assignors to United Alkali Co., Limited, Liverpool, England. (U. S. No. 863,940; Aug. 20, 1907.)

SULPHURIC ACID CONCENTRATION. L. Stange, Aachen, Germany. Improvements in concentrators for sulphuric acid in which hot air is blown over the surface of acid in warm hot pans. (Brit. No. 91 of 1907; Aug. 31, 1907.)

TOWER for Making Bisulphite Liquor. James Bishop, Carthage, N. Y. (U. S. No. 864,881; Sept. 3, 1907.)

Personal

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

Senator George A. Cox, of Toronto, is making a tour through the Canadian West.

William Brandt, of St. Louis, Mo., has been in Gilpin county, Colo., looking after mining interests.

J. M. Pine, of Denver, has been making an examination of placer property in Routt county, Colo.

Frederick S. Harris, superintendent for the Kansas City-Goldfield Mining Company, has resigned.

P. G. Lidner, of New York, has gone to Nevada on professional business, to be absent about a month.

Victor G. Hills, of Denver, Colo., has left for Mexico to examine mines in the vicinity of Guanajuato.

Oscar B. Perry, engaged in mining in Yukon territory, is visiting his old home in Bloomington, Indiana.

F. H. Calpitts, of Denver, has been examining mines in the Silver Plume district, Clear Creek county, Colo.

W. E. Swartz, of Chicago, has been examining mines in the Georgetown district, Clear Creek county, Colo.

Nathan Hirsch, of New York City, has been looking after mining interests in northern Gilpin county, Colorado.

Prof. G. A. Koenig, of the Michigan College of Mines has returned to Houghton after an extended Eastern trip.

Harold McDonald, of London, England, has taken charge of the Cuadras mine at Santa Barbara, Chihuahua, Mexico.

Edward Thornton, formerly of Velardeña, has opened an office as consulting mining engineer in Torreon, Mexico.

Robert Hauxhurst, Jr., has been appointed general manager of the Poderosa Mining Company, Antofagasta, Chile.

T. S. Lamberson has been appointed superintendent of the Arizona Mining and Trading Company, Nacozari, Sonora.

David Goodale, manager of the Compania Minera de Rio Tinto, Terrazas, Chihuahua, Mexico, is in California.

June Wilson, of the Teziutlan Copper Company, of Vera Cruz, Mexico, has been making a visit to Boulder county, Colo.

Howard Carpenter, manager of the Enterprise property at Eldora, Colo., has returned from a business visit to the east.

Samuel Newhouse returned to New York on Sept. 10, after a trip of several months in England and on the Continent.

Frank L. Cilver, managing director of the Silver Queen mine, Cobalt, has returned from a two months' trip to Europe.

Russell Mason, manager of the De Soto

Mining Company, of Middleton, Ariz., has been making a visit to Colorado points.

Eustace M. Weston has been appointed manager of the Rand Collieries, Ltd. (gold section), Johannesburg, South Africa.

N. C. Bonnevie, consulting mining engineer, of Denver, Colo., was a recent visitor in New York. He returned to Denver last week.

Lucius W. Mayer, of New York, will be absent in Europe for two months in the interest of the American Smelters Securities Company.

George W. Heintz, traffic manager of the United States Smelting, Refining and Mining Company, is in California on company business.

George W. Teal, of Boulder, Colo., has returned from a trip to examine mines near Salmon City, Idaho, in the interests of eastern investors.

Philip Argall, consulting mining engineer, of Denver, Colo., who has been examining mines at Magdalena, N. M., has returned to Denver.

F. C. Lincoln, of New York City, has been appointed professor of geology and mineralogy in the Montana State School of Mines at Butte, Mont.

A. H. Wethey, of Butte, Mont., general manager of the mines and smelter of W. A. Clark, was a visitor in New York last week. He left for Butte on Sept. 21.

J. C. Fleischhutz, manager of the Pe-wabic Consolidated Mines Company, operating near Central City, Colo., is making a two weeks' business trip to eastern points.

Murray Arnold Hines, Ph.D., of the Mallinckrodt Chemical Works of St. Louis, has been appointed assistant professor of chemistry in Northwestern University.

R. A. F. Penrose, of Philadelphia, Penn., who has been spending some time in Chile, has arrived in London on his way home and is expected to reach New York shortly.

W. R. Rathvon, manager of the Inland Oil Company, of Boulder, Colo., has returned from a visit to the East, having purchased a refining plant of 500 bbl. per day at Lodi, Ohio.

Captain H. I. Seamann, of Denver, manager of the Continental Mines, Power and Reduction Company, operating in Clear Creek county, has gone east on a business visit for several weeks.

Robert E. Lee, vice Robert Lee, resigned, was appointed superintendent of the mines of the Coal Valley Mining Company, of Chicago, and will have his headquarters at Sherrard, Ill.

President P. Rayner, of the Redeemer Mining Company, has been making a thorough investigation of this property,

situated in the Dryden gold area, Ont., and has returned to Chicago.

Lafayette Hanchett, of Salt Lake City, Utah, general manager of the Boston Consolidated Mining Company, was a recent visitor in New York. He returned to Salt Lake City, Sept. 20.

Capt. G. A. Anderson, of the Negaunee mine in the Marquette district, has tendered his resignation to the Cleveland Cliffs Iron Company, and will shortly leave for Silver City, New Mexico.

Frank Perry, Manager of the Creston Colorado and Grand Central Mines at Prietas, Sonora, Mexico, has been on a visit to New York for the past month. He expects to return soon to Prietas.

Frank H. Probert, consulting mining engineer, of Los Angeles, Cal., who has been in Europe for the last four months, arrived at New York, Saturday, Sept. 21, and after a brief visit at Boston, proceeded westward.

J. F. Lewis, of New York City and James McAdam, of New Haven, Conn., were in charge of a party who traveled in a special car from New York City to Gilpin county, Colo., to examine the groups of mines owned and operated by the Fifty Gold Mines Corporation.

Louis M. Richard, mining engineer, who has recently been with the Steptoe Valley Smelting and Mining Company, at McGill, Nevada, as assistant engineer in charge of office work on construction, has been elected to the chair of mining engineering at the North Georgia Agricultural College, at Dahlonega, Georgia.

Charles Russell, of Prescott, Ariz., is heading an expedition, the objects and purposes of which are to make a study of the economical geology of the Grand Cañon of the Colorado river. His expedition will leave Green River, Utah, about September 18, and is expected to spend eight or nine months in making a prospecting trip.

Obituary

George Rose, mining engineer for the Mexican Mining and Transportation Company, was shot and killed by robbers near Guanajuato, Mexico, on Sept. 14. Mr. Rose was 34 years old, a native of Benton Harbor, Mich., and a graduate of the Michigan Agricultural College.

Henry Ashe Tilghman, a native of California, died in San Francisco Sept. 10, aged 35. He was a graduate of the Columbia School of Mines, class of 1893. He lived 12 years in South Africa where he filled various important positions, as mine manager and as consulting engineer, both on the Rand and in Rhodesia. Since last January he had been resident manager of the Hot Creek Consolidated Mining Company at Hot Creek, Nevada. A skilful and conscientious engineer, a charming companion, and a courteous

gentleman, his death so early in life will be deeply regretted by his many friends. He leaves a widow and one son.

Lewis Williams, familiarly known as "Don Luis," who, with his brother Benjamin, developed the Copper Queen mine at Bisbee, Ariz., died suddenly at his home in Los Angeles, California. Mr. Williams was born in Swansea, Wales, in 1834, and came to the United States in 1858. He engaged in mining and smelting in Connecticut and in the copper district of Michigan, going from there to Utah and Nevada and finally to Arizona, where the brothers obtained and developed the Copper Queen mine. They later disposed of their interests to the present owners after the mine was an established success. It was largely due to the efforts of Lewis Williams that the town of Bisbee, named after one of his partners, has grown from a hamlet to its present size. His brother Benjamin and his daughter, Mrs. James Douglas, Jr., wife of the present general manager of the Copper Queen mine, survive him.

C. Perry Crawford was instantly killed at Santa Rita, near Silver City, N. M., Aug. 23, by falling into a shaft. Mr. Crawford was very well known and highly esteemed in the Southwest, where he was engaged for 40 years in merchandizing, banking and mining. He was born near East Liverpool, Ohio, in 1845, and at the commencement of the Civil War, he then being at the age of 17, enlisted in the Union army, serving with honor throughout the war until mustered out after the surrender at Appomattox. Among other campaigns, he was at the siege of Vicksburg and in Sherman's march to the sea. In his subsequent career he was recognized as a man of ability and unquestioned integrity, and was one whose active and practical sympathy and kindly manner will be remembered by many, and whose loss will be keenly felt by all who knew him. He leaves a wife, six daughters, and a son who is now in his senior year at the University of California.

Societies and Technical Schools

University of California—The August bulletin of this institution contains the register for 1906-1907, and the annual announcement of courses of study.

Montana State School of Mines—F. C. Lincoln, mining engineer and geologist, New York City, has been appointed professor of geology and mineralogy in this institution at Butte, Mont.

American Electrochemical Society—The fall meeting of the New York section of this society will be held October 17, 18 and 19. Full detailed programs will be issued Oct. 1 to members. Among the papers which will be read are "The Mathematics of the Induction Furnace"

by Gustav Gin, "The Diamond and Moissanite" by George F. Kunz, "Deflocculated Graphite" by Edward Acheson, and "The Electrolytic Separation of Copper and silver" by H. W. Gillett. Visits to the Edison laboratories and to several plants in the neighborhood are contemplated.

Industrial

Prof. Louis M. Richards, North Georgia Agricultural College, Dahlonega, Georgia, is desirous of receiving catalogs from any concerns which may deem it profitable to have their literature before the eyes of mining students.

The American Water Softener Company, 1011 Chestnut St., Philadelphia, Penn., reports that it has taken over the business of the Hungerford Filter Corporation, of Philadelphia, and is now placing the Hungerford filter on the market under its own name.

The Goulds Manufacturing Company, Seneca Falls, New York, in its catalog, recently issued, describes its Triplex power pumps, and their many uses in buildings, factories and mines. The different methods of drive are also discussed and full and useful tables containing dimensions, head, speed and other necessary factors are given.

Max. F. Abbé, president of the Abbé Engineering Company, New York, has just returned after a five months' trip in Europe. He visited England, Belgium, France and Germany. In several of the countries he made contracts for the manufacture of the Abbé tube mills and linings. In Germany he made a contract with the Fried. Krupp Aktiengesellschaft Grusonwerk, at Magdeburg-Buckau, for building Excelsior mills in the United States. The Abbé Engineering Company will be ready within a month to supply the trade with mills of this type.

The Jones & Laughlin Steel Company is a recent purchaser of additional Allis-Chalmers heavy electrical machines in the shape of two 1000-kw., 6600-volt generators wound for 25 cycles, 3-phase, and designed to operate at 94 r.p.m. These units, together with a 600-kw. direct current generator, 2400-volt and operating at 110 r.p.m., will be installed in the new Aliquippa works. A new 500-kw. motor generator set, comprising a synchronous motor rated at 6600 volts, wound for 3-phase, 25 cycles, and a 250-volt direct current generator is also being added to the structural shop to carry a portion of the steel mill load.

One of the two Allis-Chalmers 32x72-in. direct acting Corliss hoisting engines purchased some months ago by the Boston & Montana Mining Company is being erected in a building close to the Tramway shaft near Butte, Mont., for the joint use of the Rarus Tramway, Minnie Healy properties and the Red Metal

Company. This hoist is a duplicate of the hoist recently installed at the Pennsylvania mine. It is of the first motion type weighing approximately 230 tons, fitted with automatic cut-off gear and governor, and also with complete steam reversing gear. Each crank shaft will carry two steel hoisting drums, both provided with friction clutches and brakes, all operated by individual steam cylinders and hydraulic air-controlling cylinders, so that either may be handled independently of the other, or both operated in balance as desired. The hoists will have a lifting capacity of 34,000 lb., each trip, from a depth of 3500 ft. They will operate at 140 lb. steam pressure. This load includes the weight of the rope which is over 10 tons. When working regularly at full capacity, the engines will develop approximately 2500 h.p. The hoists will make from six to seven trips per hour, both night and day. While the ore from the Rarus property will be hoisted, as heretofore, through the Rarus shaft, the ores from the Minnie Healy will be lifted through the Tramway shaft. From the Tramway shaft the ore will be dumped into temporary bins of 50 tons capacity and from these, in turn, the ore will be taken by motor-drawn cars to the railway bins, which will have a capacity of 3000 tons. The ore will be brought to the surface in skips.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. "Lost Time." Pp. 32, illustrated, paper, 6x8 inches.

Baldwin Locomotive Works, Philadelphia, Penn. Record No. 63. Record of Recent Construction. Pp. 32, illustrated, paper, 6x9 in.; 1907.

The Ansonia Brass and Copper Company, 90 John street, New York. Tobin Bronze. Pp. 34, indexed, illustrated, paper, 4x7 in.; March, 1907.

Hohmann & Maurer Manufacturing Company, Rochester, N. Y. Book 50. Gas Works Thermometers. Pp. 47, illustrated, paper, 7x10½ in.

Westinghouse Electric and Manufacturing Company, Pittsburg, Penn. Westinghouse 250-Volt Direct-Current Arc Lamp. Pp. 8. Westinghouse Multiple Arc Lamp, Mill Type, 250 Volts, Direct Current. Pp. 6, illustrated, paper, 3½x6 in. Circular No. 1099. Westinghouse Type R. Direct-Current Motors for Constant Speed Service. Pp. 17. Circular No. 1102A. Westinghouse Direct Current Multiple Arc Lamp for 110 and 220 volts. Pp. 14. Circular No. 1144. Westinghouse Mill Motors for Direct-Current Service. Pp. 11. All illustrated, paper, 7x10½ in.; May and July, 1907.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives
at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Sept. 18—The Turkey Gulch Mining Company at Jenny Lind, Calaveras county, plans to dredge the bed of the Calaveras river above the bridge crossing that stream on the road to Milton. The company will use a suction dredge instead of the bucket chain in use on the boats on the Yuba, Feather, American and other streams in this State. In some places caissons will be used to get the bottom gravel. The suction dredges, heretofore tried in the rivers of this State, have not been successful, yet there may be new features in the one planned which may overcome the difficulties previously met. Below the bridge another company has been operating some years, using, however, the ordinary bucket machine.

The old Union and Alta copper mines in the Low Divide district of Del Norte county have been sold to William Ochs and associates of Long Beach, Los Angeles county. Development work, to prove the mines, will commence at once. In the early days of California, 40 years or more ago, both these mines were worked and shipments of ore were made to Swansea, Wales. There was even then some profit though there was great expense in getting the ore from the mines to Crescent City. The Alta was patented in the sixties and the assessment work on the Union has been kept up ever since by local parties with the hope of a sale some day and at last it seems that the day has come. The first payment has already been made and the date of the final payment is not far distant.

The heavy drop in the price of copper is a matter of considerable concern to Kennett, Shasta county. The Mammoth Copper Company voluntarily raised the wages of its employees last winter, when copper was 22c. or better, announcing at the same time that the scale would be paid as long as copper was 18c. or more. Although copper has fallen there is as yet no sign that the Mammoth company will reduce wages. On the contrary, the management says that inasmuch as the cost of the necessities of life has not declined along with copper prices, there will be no reduction in wages.

Randsburg, Kern county, where the famous producing mine, the Yellow Aster, is being worked, has organized a Board of Trade. There are about 20 producing gold mines in and about the district and many tungsten mines have been opened within the past two years. The object of the new board is to give publicity to the

district and awaken a more general interest in it. It is now preparing a new mining map and other descriptive literature of the camp, showing all the gold and tungsten deposits in the vicinity.

The tailings pile at Oroville, Butte county, owned by the El Oro Dredging Company, has been purchased by the Western Pacific Railroad Company and the material will be used by the railroad as ballast on the road in the immediate vicinity of Oroville. There are at least 50 acres in the tract of country purchased from the El Oro company, and the rock and gravel will fill in a long stretch of railroad. The rock, which is in boulders and large gravel, is hard, and when crushed makes excellent macadam. Judging from present appearances, all of these rock dump piles left by the dredgers will shortly be removed from below Oroville, and be utilized either as railroad ballast or macadam.

The Nevada county mining men erected a "quartz monument" at Colfax on the main line of the Southern Pacific line, and dedicated it on Monday. The object is to attract attention to the quartz-mining interests in Nevada county. Most of the prominent mines contributed quartz for the monument, some of it rich, but most of it of glittering sulphuret ore. Already people have commenced carrying off pieces of this rock, mistaking the sulphurets for gold. The structure is more like a quartz hill than a monument, as it is 63 ft. long, 3 ft. thick and 11 ft. high.

The new wagon road has been completed from the Blue ledge copper mines, Siskiyou county, to Joe Bar. It is five miles in length and cost \$10,000. Supplies are being sent in to the mines by this road from Jacksonville, Oregon, and many persons are now visiting the district. The mines will not begin to ship out ore until a proposed railroad is completed.

At Forest, also in Sierra county, the Young American drift mine owned by the Monjar Mining Company, is now in gravel, after running a tunnel costing \$30,000. The gravel that is being taken out now is paying at the rate of from \$8 to \$10 to the pick for each shift. It is largely of quartz that shows no wash to speak of. It carries considerable fine gold and black sand besides the coarse gold. At a distance in of 150 ft. from the mouth of the main tunnel another tunnel is being run for a quartz ledge. Though in but a short distance, the ledge is showing up well and is widening out and giving prom-

ise of being rich. The Young America has an abundant supply of water for power and washing, and plans are being perfected for extending the sluices and putting in larger bars and a grizzly. At the same place the South Fork mine has its bedrock tunnel in 4680 ft. and has 300 ft. to run to strike the old Bald Mountain channel, which has always yielded handsomely wherever opened.

Salt Lake City

Sept. 20—An important announcement, made within the past week told of the result of a conference between David H. Moffat, promoter of the Denver, Northwestern & Pacific railroad, "The Moffat Road," and Jesse Knight, the millionaire mining man, of Provo, Utah. Mr. Knight is interested in some coal lands in Uintah county and recently signified his intention of developing the property and building a railroad to it over practically the same route intended by the Moffat line. This led to a meeting of the two men with the result that Mr. Knight is to become interested in the Moffat road. Construction will begin from the west end in the near future, possibly before the end of the present year, while the western end of the track out of Denver will be pushed onward as rapidly as possible to the point of meeting. Salt Lake is to be the western terminus, but the route through the Wasatch mountains will be either Provo cañon or a pass favorable for railroad construction east of the town of Springville. Mr. Moffat has made the statement that trains will be operated over the new line between Salt Lake and Denver inside of two years. The line will open valuable grazing, agricultural and mineral lands in eastern Utah as well as in Colorado.

Mine and smelter managers have expressed the belief that the partial shutting down of the mines and smelters at Butte and Anaconda will have the effect of relieving the danger of another fuel famine in Utah during the coming winter. The Utah Consolidated Mining Company has already begun to receive Wyoming coal to supply its smelter near Salt Lake City. Few companies have been successful in obtaining fuel for storage.

The merger of the Uintah Treasure Hill and Creole mines at Park City has been accomplished and the articles of incorporation of the Uintah Treasure Hill Coalition Mines Company have been filed. The company owns some valuable mining ground and its dominions cover

an extension of the same contact vein from which the Silver King mine has made its record as a dividend payer. The property is to be operated through the Creole shaft and will soon be on a shipping basis.

The articles of incorporation of the Lion Hill Consolidated Mines Company will be filed for record during the coming week. This organization is being formed by a strong syndicate of local and eastern mining men, and the basis will be in the Chloride Point, Columbia and Northern Light mines on Lion Hill in the Ophir and Camp Floyd districts. These properties have produced considerable silver ore in the past, and shipments are now being made from the Chloride Point mine.

The stock of the Ohio Copper Company of Nebraska is being exchanged for that of the Ohio Copper Company of Maine, to which the assets of the former were recently transferred. The construction of the mill, which is to handle 2000 tons daily, is progressing satisfactorily. The Mascot tunnel, through which the ore of the company is to be moved to the place of treatment in the future, has entered company ground, and some important developments are anticipated in the near future.

Local officials of the Nevada Douglas Copper Company have been advised that electric power is being delivered, and that the new mine equipment, which includes a 25-drill compressor, machine drills, etc., is in commission.

Butte, Montana

Sept. 21—In furtherance of the agreement between the Amalgamated Copper Company and allied concerns the copper production of the Butte district is being reduced very rapidly. A number of mines have been shut down completely, including the Minnie Healey and Corra of the Butte Coalition company, the Neversweat and Diamond of the Anaconda company, the Berkeley of the Butte & Boston, the Little Mina of the Parrot company, and the Leonard and West Colusa of the Boston & Montana company. Suspension of operations at the two last named properties was also partly due to the fire and gas prevailing in the workings of the Leonard mine. In addition to these suspensions the working forces at all the other mines have been reduced materially, it being the intention of the companies to cut down the copper production fully 60 per cent., and the working force correspondingly. There are employed between 10,000 and 11,000 men about the mines in Butte, and at least 50 per cent. of these will be laid off, according to present plans. Even a greater percentage of reduction will be made at the Amalgamated smelters at Anaconda and Great Falls. The Amalgamated production for September

will not exceed 7,000,000 pounds of copper, and may fall below that. Ordinarily the Amalgamated production amounts to about 20,000,000 pounds per month.

For the purpose of determining the amount of ore in the mines of the East Butte Copper Mining Company and making estimates on the erection of a large concentrating plant, the company's engineer has made a careful measurement of the ore in sight above the 400-ft. level, which he places at 597,404 tons, with a net value of \$2,987,020, after deducting all charges of mining, concentrating, smelting and loss. The drifts on the 400-ft. level have not yet been run to the end lines of the property, and Engineer Clancy says 835,265 tons more will be added when the drifts are completed, and the net value of the ore will then be \$7,163,345. Although some development has been done on the 800- and 900-ft. levels, where the same quality of ore is being opened, those ore-bodies are not included in any estimates. The ore above the 400 carries an average of 3.11 per cent. copper, 2.2 oz. silver and 30c. gold per ton. Along with all other mining companies the East Butte has curtailed its expenses, and will mine no ore on its own account until there is an improvement in the market conditions. Lessees continue work above the 400 level, however.

Bisbee, Arizona

Sept. 18—The effect of reduced operations at the Copper Queen mine, of Bisbee, is being shown at the smelters, and September production will be less than for any month this year. Development work, on the other hand, has increased, and extensive new operations are planned for the winter. The Calumet & Arizona mine has also curtailed output, and next month its copper production should not be more than 1,500,000 lb. The underground development here, too, will keep the full force employed. At the Superior & Pittsburg mine, on the other hand, there is an increase of shipments, from both the Hoatson and Junction shafts. The former is looking better than ever, and it is very evident that faith in this part of the property has not been misplaced.

There is a large amount of development under way in the district east and south of the Needles, on the line of the new Santa Fe line from Phoenix. Several properties of much promise have been opened. At Paradise the San Simon Copper Company has started assessment work and will do about \$3300 worth. The Manhattan and Duncan properties are also doing assessment work. It is estimated that there are more than 1000 claims taken in the Chiriachuas, and on nearly all of these assessment work must be done this fall.

At Tucson, in the case against the pro-

motors of the Cadena de Cobra Mining Company, for promotion profits amounting to 550,000 shares of its total capital stock issue of 1,000,000 shares, Judge Campbell rules that in no case does the Arizona law warrant the payment to promoters of expenses incurred before the organization of the company by funds or assets taken from the company treasury. In this case the promoters simply thought that they were entitled to a share of the stock and gave it to themselves, without saying anything about it for a year or more.

The east and west railway line of the Southern Pacific, which was under concession to run from Cananea to a connection at Imuris with the Guaymas branch, is to go to Nogales, on the international line, and will pass through the new copper fields of Santa Cruz. Ten miles of grading out from Cananea was done before the concession was changed, and new men and teams are being hired to continue the work from the end of the grade to the new terminus.

Toronto

Sept. 20—On Sept. 13 the Canadian Government issued on *order-in-Council* in reference to the application made on behalf of the Florence Mining Company for the disallowance of the special act, passed by the Ontario Legislature, validating the title of the Cobalt Lake Mining Company to the bed of Cobalt lake. The order directs the Ontario Government to show cause why the act should not be set aside and to answer the reasons advanced for the disallowance of the measure. On Sept. 17 the court, in Toronto, granted a postponement of the trial of the action brought by the Florence Mining Company against the Cobalt Lake Company until the matter of the validity of the act had been decided. The Cobalt Lake Company asked for an order to protect any mining operations carried on while the case was pending, but the application was refused so that any work done by the Cobalt Lake Company until the question of title is settled is at its own risk.

It is stated that lead has been discovered on locations near Black river, in Hyslop township, by J. P. Morgan and T. W. Ellison, who were developing silver claims. Two 7-ft. veins were struck, one carrying between 60 and 70 per cent. lead and the other good peacock copper in addition to silver in both cases.

George Wallace, a Detroit mining investor, who has returned from visiting the new gold discoveries five miles from Temagami station and about 30 miles south of Cobalt, states that the finds are very rich. The vein is 18 in. wide, consisting of quartz and chalcopryrite, and the ore is stated to assay as high as 15,000 oz. gold to the ton, in addition to 4 per cent. copper.

Mining News from All Parts of the World

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

THE CURRENT HISTORY OF MINING

California

AMADOR COUNTY

Fremont Consolidated—In this mine, Drytown, another strike of rich ore has been made. The high-grade ore is found on the 700-ft. level.

Little Illinois—This mine on the east lode, near Drytown, which has been idle 40 years, is being reopened. The timbers, etc., are in good state of preservation. A hoist will be installed.

BUTTE COUNTY

Pinal Butte Gold and Copper Mines Company—This Los Angeles company has purchased the Hazelton quartz mine near Forbestown, and is enlarging the mill.

Southern Cross—Arrangements are being made by D. S. Scoville, of Chicago, Ill., and J. L. Rosenthal, of San Francisco, to open this mine near Enterprise.

CALAVERAS COUNTY

Melones Mining Company—This company near Fourth Crossing will have 100 stamps in operation when the big flume washed away last spring is completed. The high water this year has retarded reconstruction work.

NEVADA COUNTY

Aurora Mining Company—This company, now opening the Aurora mine near Grass Valley is putting in a new engine.

Belle Union—Active operations are shortly to begin at this mine, and a site for the machinery has been selected. A pump is to be put in.

California Montana Mining Company—This company was recently incorporated, with its principal office in Boston, Mass., to open and work the Montana mine in Nevada City. Three shifts of men are running a drain tunnel.

Cold Spring—In this drift mine, northeast of Nevada City, a good body of gravel is being developed as the center of the channel is approached.

Ethel Mining Company—High-grade ore is coming from the chute in the winze sunk from the tunnel. The company is about to purchase the Baltic, the adjoining claim.

Ironclad—This mine is to be provided with a new 10-stamp mill, a 16-in. Cornish pump and a three-compartment shaft.

Meadow Lake District—This district, famed for its "rebellious" ores, is being

thoroughly prospected this summer and many new mining locations are being recorded.

Morning Star—This mine, at Randolph Flat, near Grass Valley, is yielding specimen ore at present. The rock was taken out by the James Bros. at 125 ft. depth.

Norambagua—This mine is shortly to be provided with a 5-stamp mill.

North Star Mines Company—This company at Grass Valley is materially enlarging its cyanide plant. Two new 500-h.p. motors are among the equipment.

ORANGE COUNTY

Western Zinc Company—This company which is working the old Dunlap mine in Silverado cañon has lately come upon high-grade silver ore.

PLACER COUNTY

Barton—Machinery for operating a 100-stamp mill is being hauled to this mine at Westville, where J. R. Sherman is in charge.

Kittler—This very old mine in Ophir district is being pumped out and new electric machinery is being installed.

PLUMAS COUNTY

Nuggets—The recent find of gold nuggets valued at \$4500 by W. S. and C. A. Cooley at Smith Bar, about two miles below Rich Bar, on the east branch of the Feather, has turned the attention of local mining men to that section. The nuggets were secured from a part of the channel that had been worked in early days.

Plumas Mohawk Mining Company—At this property, Johnsville, the company is putting in a new Huntington mill.

SAN BERNARDINO COUNTY

Hanson Bros. Camp—At this place at Ord mountain, 12 miles south of Daggett, a rich gold strike has been made, causing a stampede from Daggett and other places.

Colorado

LAKE COUNTY—LEADVILLE

Emerald Mining Company—This company now operates a tunnel in the Birdseye section. The bore is in 371 ft., and has passed through 30 ft. of heavily mineralized quartz. The tunnel will be driven to cut the surface veins.

Favorite—Work is being carried on in the first contact of this mine in South

Evans gulch, and some excellent ore is being shipped. The lessees will probably sink the shaft another 100 ft.

Greenback—Work has been resumed on this property at Carbonate hill, consisting of surface improvements and getting the machinery in shape; when this is completed the work of unwatering the shaft will be commenced.

Horseshoe District—This district, on the Park county side of the range, has had but little work done during the last two years on account of the heavy transportation charges of which lessees have been afraid. Recently the New Monarch Mining Company secured a long lease on favorable terms on the Hill Top and Only Chance claims, and work is now in full force. The lead-silver ores will be shipped to the company's smelter at Salida. During the week L. R. Johnson succeeded in interesting Eastern capital in the Dauntless and Eureka claims close to the Hill Top, and in a few weeks work will be started. On the claims are two incline tunnels, down about 100 ft. each, with ore in sight in both, and a shaft down 60 ft. on the Dauntless, also in ore. Mr. Johnson intends to go further down the hill and start a new tunnel that will cut both veins at greater depth. The ore is in the limestone, the porphyry having been eroded, leaving the lime exposed. Samples taken from both dumps give returns of \$20 per ton in lead and silver. The ore will be hauled by wagon five miles to the track at Fairplay.

Musk Ox—A vigorous campaign of development work is being carried on at this property, in Empire gulch, and a regular lime-porphry contact has been opened carrying small values in gold and silver; so far the main ore shoot has not been reached.

Neusitz Placer—The drill hole on this property is now down 550 ft., and is just getting out of the lake bedding and entering the porphyry; at this point water was encountered, which retards the progress of the drill.

Nisi Prius—This property on Rock hill is being operated by the Big Sunflower Mining Company. The old drifts are being cleaned out, and when completed prospecting for the ore shoot will be pushed vigorously.

Twin Lakes District—Work done this summer in the different gulches in this district has been greater than for several years past. At the Ruby, Lincoln gulch, the new mill is turning out 30 tons of

concentrates daily, which are shipped to Aspen; the high-grade ore is sacked and shipped to the Arkansas valley plant at this point; the ore nets \$10,000 per carload. The Penny Bros., working the Professor claim in the same gulch, are shipping ore that yields \$200 per ton. Adjoining the Ruby, Hughes & Osborn have been at work on a group of claims, developing the vein by an open cut, and in places it is 70 ft. wide. In the Red Mountain section, A. A. Christiansen is working the 1701 claim.

Wellington Development Company—Recently an important deal was made between this company and Tingley S. Wood, whereby the former takes over all of the holdings of the latter in Leadville and Lake county; the total area involved is about 3000 acres. The principal holdings of Mr. Wood in Leadville consist of the Benton Mining Company and the Park Mining Company, both on Carbonate hill and lesser scattered acreage. At Lackawanna gulch he owns 123 acres of patented ground on which the company will start work in the near future. The section is a free gold milling proposition, and the formation is porphyry, quartz and oxidized material. It is the intention of the company to work the claims vigorously, and a large stamp mill will be erected. The first installment of the purchase price has been paid, and it will be followed by monthly payments until the whole settlement has been made. The price has not been made public.

Illinois

VERMILLION COUNTY

Merger of Coal Properties—The formation of a merger of 25 coal properties is said to be in progress according to a report from Danville. The properties include mines in Danville and Clinton districts in Illinois and the Kelly, Oak Hill and Dering mines in Indiana.

Missouri

ST. FRANCOIS COUNTY

Federal Lead Company—Work on the two shafts which were to be sunk 700 ft. deep on the old Pim tract, has been discontinued; also construction on the branch railroad.

Iron Mountain—Pittsburg men are exploring this famous old property.

National Lead Company—The trolley electric system replaces mules for underground tramming in the No. 2 mine.

St. Joe Company—The company has completed the construction of a complete water supply and sewer system for the town of Bonne Terre. The new roasting plant at Leadwood is in operation, and five pot plants have been installed at Herculaneum to replace the Freiberg roasters.

JOPLIN—ZINC-LEAD DISTRICT

Missouri-Kansas Mining Exchange—This organization, the headquarters of which are to be located in Joplin, has successfully passed through the preliminary stages. Fully 100 prominent men of the Missouri-Kansas district, Arkansas, have signified their desire to join in the movement.

Nevada

CHURCHILL COUNTY—FAIRVIEW

Fairview—The directors of the company propose to undertake the construction of a railroad to connect the mine with Fallon, which is the nearest station on the Southern Pacific system and is about 42 miles northwest of Fairview. It is hoped, however, that they can get the Southern Pacific company to undertake the construction.

Montana—The new mill has been closed down for a few days on account of an accident to one of the tube mills. The main shaft in the mill proved to be weak to withstand the strain placed upon it and a new one has to be made at the Tonopah foundry.

West End—Shaft sinking to the 400-ft. level is being expedited. The new main shaft is now down to the 240-ft. level.

ESMERALDA COUNTY—GOLDFIELD

Combination Extension—A ledge over 30 ft. in width and carrying low-grade ore has been cut in the bottom level. The entire drift is in a heavy black sulphide ore carrying a large quantity of pyrites of the same character that gave the big values in the old Frances Mohawk lease. No high values have been obtained in the Combination Extension thus far.

Golconda—The shaft will be continued from its present depth of 80 ft. to the 300-ft. level as soon as possible. A new 15-h.p. hoist has been erected on the lease.

Goldfield Clara—The shaft is down 80 ft. and the owners are preparing to resume sinking.

Jumbo Annex—A pay shoot averaging \$250 per ton and over 4 ft. in width has been cut in an upraise from the 176-ft. level. The course of the shoot is toward the Higginson lease on the Jumbo.

Jumbo Extension—The shaft on the Frances Mohawk lease block has reached a depth of 445 ft. and sinking is progressing at the rate of 6 ft. a day.

Jupiter—The whole face of the drift in the 300-ft. level is in a body of ore of milling grade. If this ledge continues to develop well in the lower levels the company will erect a crushing mill on the mine.

Little Florence—A rich ore pocket has been developed at the 400-ft. level at a distance of 185 ft. east of the shaft. The

vein is 5 ft. in width. The returns from a recent shipment to the smelters, weighing a little over one ton, amounted to \$16,500.

Mohawk-Combination—About 100 tons of high-grade ore are being shipped daily from this lease, the average value being \$100 per ton. The ore is being broken in the 285-ft. level and up to the 145-ft. level.

Mohawk-Jumbo—Drifts are being run on the vein, recently cut at a point 70 ft. east from the shaft, on the 500-ft. level. The lessees are shipping 100 tons of ore daily, which is taken from the drift at the 400-ft. level. Large reserves of high-grade shipping ore are being developed in other portions of this lease.

Potlach—A drift is being run from the 200-ft. level with the view of cutting one of the rich veins known to traverse this mine. Shaft sinking will be resumed to the 400-ft. level as soon as the vein is cut.

Red Hills—A promising ledge 5 ft. wide and carrying milling ore has been cut in the 250-ft. level at a distance of 120 ft. from the shaft in a crosscut running west from that point.

Sandstorm—The crosscut at the 400-ft. level is being run to tap a vein which yielded bonanza ore to lessees in the upper levels. This crosscut is expected to strike the vein in the sulphide zone below the water level.

HUMBOLDT COUNTY

Nevada Superior—This mine, which has been developed by shafts to a depth of several hundred feet, is to be tapped by a tunnel 1700 ft. long. The company is also planning to erect a mill at the mouth of the tunnel to treat the product of the mine.

LYON COUNTY—YERRINGTON

Ludwig—An official report of the new copper strike in one of the bottom levels of the mine, which is owned by the Nevada-Douglas Mining Company, states that in driving a crosscut at the 550-ft. level, a water course was encountered carrying 0.72 per cent. copper. Simultaneously chalcocite was encountered in a white quartz gangue lying against the limestone.

NYE COUNTY—BERLIN

Richmond—This mine is employing about 12 men and is developing well. The main working tunnel has been run into the hill a distance of about 300 ft., with drifts from the tunnel on the vein. About 1500 tons of high-grade milling ore has been placed on the dump. Ten stamps of the 30-stamp custom mill at Berlin are now dropping on this ore. The ore carries gold, silver and copper.

WHITE PINE COUNTY

Giroux—The concentrating mill of this company was put in operation about a

fortnight ago. It is still in the hands of the contractors, who are running it for tuning-up purposes. It is expected to be ready for regular operation by the company about Oct. 1.

Oregon

BAKER COUNTY

Conundrum Mountain—A discovery of copper ore has just been made in the Conundrum Mountain country lying between Goose Creek and Sparta.

Eagle Mountain—An increased force of workmen is busy in development work. The management will start a shaft down from the surface to test the portion of the ground northeast of the Red Bell.

Goose Creek Camp—C. C. Cox has sold to M. T. Weum, of Minneapolis, a third interest in a large group of claims controlled by Cox in the Goose Creek camp. Weum, Cox and Keating will push development work through the summer and winter.

Indiana—Deep sinking at the Indiana mine, 20 miles east of Baker City, resulted in the discovery of black oxide copper ore.

Peacock—Wm. Henry Harris and George W. Boggs, who own a 10 years' lease of a one-third interest in the Peacock mine, Seven Devils district, Idaho, are shipping ore by way of Council, Idaho, to the smelter at Sumpter, Oregon. They have just struck a ledge and are sacking and shipping the ore.

South Pole—Superintendent P. Brady, of this mine, adjoining the Kelley group, 15 miles west of Baker City, is making an up-raise on the first ore shoot from the lower level which shows itself to be 12 ft. wide and 300 ft. long and has struck ore on the hanging wall of high grade. The rest of the ore is of good quality for milling and is being piled on the dump.

Pennsylvania

ANTHRACITE COAL

An equity suit was begun in Scranton this week by Frank P. Christian, formerly of Pottsville, where he figured as promoter of the Black Diamond Coal Company, against former Congressman Thomas H. Dale, of this city, to recover thousands of dollars commission for the sale of coal lands to the Delaware and Hudson Coal Company, in Schuylkill county. The company paid \$1,500,000 for five tracts which were purchased in the name of the Schuylkill Coal and Iron Company, and the options for the same were held by Mr. Christian and Mr. Dale. Mr. Christian claims that the movement for the acquisition of the lands was begun by him, and in 1901 an agreement was entered into between him and Mr. Dale to equally divide the profits of the proposed

sale. In 1905 Mr. Christian claims that he found a purchaser in Peter B. Whitney, of New York, who agreed to purchase the tracts. It is alleged that about this time Mr. Dale secured a purchaser in the Schuylkill Coal and Iron Company, who finally purchased the property. Mr. Christian claims that he is entitled to one-half of the commissions and asks court to determine the amount due him. The amount of his claim is not mentioned.

As the result of several test holes being drilled, it has been found that the fire which has been raging for thirty years in the Heckscherville workings, near Pottsville, has been extinguished. Preparations have already been made to drive several tunnels to drain the old workings which were flooded to extinguish the fire. About 35 years ago an explosion occurred in the mine, setting the timber work ablaze, and, as the fire fighting methods of those days were not so successful as those of the present, the fight was abandoned and the openings sealed, it being thought that the fire would soon burn itself out. The workings are valuable ones, and will give a decided increase in the tonnage of the Philadelphia & Reading Company.

The Delaware & Hudson Coal Company, which secured extensive coal lands in Schuylkill county, has expert workmen in the vicinity of Silverton, proving the coal veins. As soon as they are properly located, the sinking of the openings will be proceeded with.

A very large stripping is now being uncovered at the operations of G. B. Markle & Co., at Harleigh, Penn.; the coal already uncovered is 30 ft. in thickness. The workings will employ 500 men.

Dolan Bros., of Pottsville, have been given the contract to sink a new shaft for the Philadelphia & Reading Coal Company, at Coalcastle, in the Heckscherville valley. The shaft will be 800 ft. deep, and the inside timbering will be 31x31 feet.

At the annual convention of the ninth district of the United Mine Workers, held in Mt. Carmel, Penn., this week, a charge was made that there had been fraud in connection with the election of a district board member. The finances for the year showed a deficit of \$2,992.64, with \$28,999.17 in the treasury. Eight locals had been disbanded during the year, while six new ones had been organized. There are 161 locals in the districts, of which 125 are in good standing. The district has 9654 members in good standing.

Many complaints are heard daily in the anthracite region of the reports appearing in the metropolitan press regarding imminent strikes in this region. There is absolutely no ground for the reports, as the wage scale does not expire until April, 1909. Now and then there are small local troubles, but nothing which affects the entire region as reported.

South Dakota

LAWRENCE COUNTY

American Eagle—The framework for the new 200-ton cyanide mill in course of construction on Bald Mountain is up. Lumber shipments are so tardy that the mill may be delayed in completion until next spring.

Gilmore—This ground above Deadwood, embracing a large acreage in the copper belt, has just been examined by an expert representing the British-South Dakota Enterprise, Ltd., of London, a new company organized to operate here on an extensive scale.

Rochford-Wyoming Oil Company—George Ferrall, of California, has made an exhaustive expert report on the oil fields beyond Spearfish with particular reference to this company and declares that oil exists in considerable quantities.

Wasp No. 2—Manager Gray reports that 200 tons per day is being handled by the dry crushing process. He has just placed an order for electric equipment for the mill on Yellow creek.

PENNINGTON COUNTY

Canton—A quantity of free gold was struck in the shaft of this mine.

Gold Bug—A new station has been cut on the 100-ft. level and cross-cutting the ledge is now in order.

Golden West—A new saw mill is turning out product for the new 200-ton mill the company will erect this spring. The present mill is being overhauled and repaired for an all-winter run. Heretofore it has only operated during the summer months.

Mariposa—In nearing the main ledge, some rich stringers of high-grade gold ore were encountered by Superintendent John Wise.

Utah

Boston Consolidated—It is expected that the concentrating mill at Garfield will be ready for operation about the middle of October, but probably no attempt will be made to run it at full capacity until the copper market clears up. The tunnel on the railway line from the mine has not yet been completed, but rapid progress is now being made.

IRON COUNTY

Jennie Gold Mining Company—This company has plans about ready for the doubling of the capacity of the mill, which will include the installation of a cyanide department. The mine and mill are situated at Gold Springs.

JUAB COUNTY

Tintic Shipments—A total of 140 cars of ore were shipped during the week ended Sept. 14. The contributing mines

and amounts were: Beck Tunnel, 8; Bulion Beck, 1; Carisa, 8; Colorado, 9; Centennial Eureka, 51; Depue, 1; Eagle & Blue Bell, 8; Eureka Hill, 1; Grand Central, 7; Gemini, 1; Mammoth, 12; May Day, 7; Ridge & Valley, 3; Scranton, 7; Tesora, 1; Uncle Sam, 7; Victoria, 3; Yankee Consolidated, 6.

Aper—The shaft in this mine is now down 1000 ft. This is a property acquired by F. Augustus Heinze during the past year.

Godiva Mill—This plant has been closed for the past week to undergo some needed repairs.

Lower Mammoth—The new electric hoisting equipment for this mine is in commission.

Tintic Smelting Company—This company has its new sampling mill almost completed and the construction of the smelter is progressing satisfactorily. The grading of the railroad, to connect the plant with the principal mines, is finished and ready for track laying.

Utah—This property, at Fish Springs, has been reclaimed to the fifth level of the shaft which was destroyed at the time of the burning of the hoisting plant last winter. The mine is shipping regularly and paying dividends of \$3000 monthlv.

SUMMIT COUNTY

Park City Shipments—A total of 2,366,940 lb. of ore was shipped to Salt Lake smelters during the past week, the contributing mines and amounts being: Silver King Coalition, 1,339,940; Daly Judge, 686,000; other mines, 41,000.

Silver King Mill—The construction of the addition to this plant is progressing favorably. The capacity of the plant is to be doubled.

TOOELE COUNTY

Consolidated Mercur—The mill at this property is now treating 500 tons of ore daily; three roasting furnaces are in operation, also four filtering tanks. In connection with the slimes plant, recently installed, a close saving is being maintained, all but about 50c. per ton of ore treated being saved. The material and equipment for the addition to be made to the slimes plant has been ordered. Late developments in the Brickyard mine have been important and in the future a large portion of the ore for the mill will come from there.

United Mercur—This company has decided to install an electric hoisting plant and the equipment has been ordered.

Wisconsin

ZINC DISTRICT

Benton—The large Etna mill has been completed and this mine is now a large producer of lead and zinc. The ore runs

unusually high in lead. The 30-ton magnetic plant at the Empress is finished, which enables it to ship 60 per cent. zinc ore instead of 20 per cent. The Frohtier mine has closed a contract for a new mill and new mills are under construction at the Ollie Belle and Vanelwenter mines. The Pittsburg-Benton mine has found the extension of the rich body of lead ore that the Corr mine is working.

Cuba City—The Muckers Grove mine is erecting the mill and roasting plant that it purchased from the Morrison Company. The orebody underlies the bottom of Fever river at a depth of only 40 ft. and is a flat of rich disseminated ore. The Midway mine has begun the erection of a new milling plant of 70 tons capacity.

Dubuque—The new Avenue Top mill is about completed, which will do custom work besides mining its own 25 per cent. ore.

Galena—The old Black Jack mine has shipped 600 tons of concentrates and has nearly as much ready for shipment that assays from 30 to 35 per cent. zinc.

Highland—The Kennedy mill was destroyed by fire, caused by the spontaneous combustion of a 100-ton pile of coal; it will be rebuilt. The Redjacket mill is nearly ready to run, with a new equipment of Cooley or Joplin type of jigs.

Plattville—Three new mills have started at the Acme, Royal and Hodge mines and the Empire has completed the installation of a new \$15,000 electric power plant without interfering with the payment of its regular dividends of \$10 per month.

Wyoming

Penn-Wyoming—The smelting works of this company was put in operation last March, but was destroyed by a fire in May. Since then it has been rebuilt, and operations were begun again this month.

Canada

NOVA SCOTIA

Dominion Iron and Steel Company—Judge Longley, who presided at the trial of the action, brought by the Dominion Steel Company, against the Dominion Coal Company for breach of contract in failing to supply coal suitable for operating the steel plant, gave his decision, on Sept. 16, in favor of the plaintiff. He finds that the action of the steel company in refusing to accept unsuitable coal, furnished between Nov. 1 and Nov. 9 last, was justifiable and did not constitute a breach of contract, and that the contract is still in force, and recommends the appointment of a referee to determine the damages sustained by the Dominion Steel Company by reason of the failure of the Dominion Coal Company to supply coal, and also by the additional cost of coal to the steel company and the temporary sus-

pension of the plant. The judgment further decrees specific performance of the contract. As regards the interpretation of the contract the judge said, "I think, as a matter of law, that the contract of Oct. 20 on its face is a contract to supply coal to the steel company for the purpose of operating the iron and steel plant. I do not have to read into it any implications. I have only to make the necessary and inevitable deduction that the coal, to operate the iron and steel plant, must be coal with which such plant can be operated, for the object and purpose of the coal contracted for is expressly stated in the contract."

The Dominion Coal Company has decided to appeal the case and, if necessary, will take it to the Imperial Privy Council.

Nova Scotia Steel and Coal Company—Shipments of coal for August amounted to 81,590 tons as compared with 74,873 tons for August, 1906. The shipments for eight months ending Aug. 31, were 404,880 tons as against 410,598 for the corresponding period of 1906.

ONTARIO—COBALT DISTRICT

Cobalt Ore Shipments—Ore shipments from Cobalt for the week ending Sept. 14 were as follows: Buffalo, 60,000 lb.; Foster, 62,950; La Rose, 43,800; Silver Queen, 120,000. Total, 286,750 lb.

Cleveland—Development is going forward on two shafts, each of which is down about 50 ft. The gas producer recently installed is in successful operation.

Cobalt Central—The vein on which the main shaft was put down, which was 4 in. at the surface, was widened to 16 in. at a depth of 160 ft. At a distance of 110 ft. from the main shaft, on the 115-ft. level, a rich streak of solid smaltite and silver has been found 6 in. wide. Enough low-grade ore has been stored to keep the 100-ton concentrating mill, now being installed, at work for several months.

Australia

TASMANIA

Mount Bischoff Tin Mining Company—This company was formed for a term of 35 years and this period elapses on Aug. 1, 1908. At a recent meeting of the board of directors in Launceston it was decided to re-form the company for a new period of 100 years and to alter the articles of association with the view to enable the company to enlarge the scope of its operations by acquiring or leasing other tin mines. The rich surface alluvial deposits of the Mount Bischoff mine are practically worked out, but the manager reports that by cleaning up the old workings the plant can be profitably employed for the next six or seven years. In addition to the alluvial ore the mine contains inexhaustible deposits of low-grade sulphide ore in the form of porphyry dikes. No method has yet been found for working this class of ore profitably.

Metal, Mineral, Coal and Stock Markets

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

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Sept. 25—The general market is continuing strong and the demand is extremely good throughout the country. The best coals are out of the market, which puts the lower grades in good demand. Certain producers have the idea that good grades of steam coal will sell as high as \$1.75@2 at the mines this winter. This belief is confined to those producers which have small mines and unsold stocks. The larger producers do not share this belief, but they express themselves as being of the opinion that conditions will remain good and that prices will be no lower until spring. The far East will be stocked up in about a month from now and this should help the supplies of coal in other parts of the country, because producers are busy closing up their shoal-water contracts, and are using most of the available vessels.

One of the things that is affecting the market is the shortage of cars. This is especially noticeable not only in the Pennsylvania regions and in the New England all-rail trade, but also all over the country. This will naturally affect the deliveries of coal and will tend to maintain prices.

Reports from the South state that in the Alabama coalfields all the mines are producing every ton of coal possible and readily disposing of the output.

There has been a heavy tonnage sent up the lakes and consumers in the upper ports are fairly well stocked with coal.

Anthracite coal is extremely quiet except for small steam sizes, which are scarce and in large demand, especially for pea and buckwheat No. 1. The West reports fairly good activity for prepared sizes, but they are dull in the local market. Small sizes command a premium and prepared are now at the regular winter schedule of prices.

COAL-TRAFFIC NOTES

Shipments of coke and coal originating on the Pennsylvania Railroad Company's lines east of Pittsburgh for the year to Sept. 14 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	3,044,572	3,957,648	I. 913,076
Bituminous.....	22,216,325	27,155,938	I. 4,939,613
Coke.....	8,860,122	9,868,460	I. 1,008,338
Total.....	34,121,019	40,982,046	I. 6,860,81

The total increase this year was 20.1 per cent.

Shipments of Broad Top coal over the Huntington & Broad Top Railroad for

the week ending Sept. 21 were 19,599 tons, and for the year they were 732,039 tons.

New York

ANTHRACITE

Sept. 25—The market for prepared sizes is dull and the demand is not as good as it has been for several weeks. Among the small steam sizes, however, the demand is exceptionally brisk and the supply is no better than it has been for some time past. It is reported that producers are making large inroads in their culm banks and this would naturally tend to decrease the supply of small steam coal. The scarcity is more apparent in pea and buckwheat No. 1 sizes. Prices are quoted as follows: Broken, \$4.75; egg, stove and chestnut, \$5; pea, \$3.25; buckwheat No. 1, \$2.75; buckwheat No. 2 and rice, \$2.15@2.25; barley, \$1.75; all f.o.b. New York harbor.

BITUMINOUS

Trade in New York harbor is strong and all coal coming to tidewater is quickly absorbed. A considerable amount of coal is going from this port to other territories and this in itself tends to keep the market strong. Good grades of steam coal readily bring \$2.75 per ton, while some of the fancy grades bring much higher prices.

Pocahontas, New River and other southern West Virginia coals are in good demand, but the supply is extremely limited and the trade is taking on considerable coal from Pennsylvania regions.

It is predicted that prices will remain firm and will in all probability advance during the winter. This prediction is based upon the exceptional demand, the scarcity of cars at present, and upon the scarcity of labor at the mines, many of the miners preferring to work on farms, where they can earn more money.

In the far East the demand continues strong and producers and dealers are working hard to clean up shoal-water contracts before Nov. 1. The condition in this territory is better, brought about by the dropping of freight rates and easier condition in the vessel market. Vessels are by no means as scarce as they were and are now eagerly seeking contracts. To offset these conditions is the scarcity of coal. Along the Sound there is a strong demand for the better grades of coal and there is a fair de-

mand for the lower grades. Sound barges are in poor supply.

All-rail trade is easy except that going to New England, which is being restricted by an inadequate car supply. Transportation from mines to tide is slow, cars often taking from 10 days to two weeks to run through. In the coastwise-vessel trade vessels are in fair supply, but freights are weak. These are quoted as follows: From Philadelphia to Boston, Salem and Portland, 90c@\$1; to Lynn, Newburyport and Bangor, \$1.10; to Portsmouth, and Bath, \$1; to Saco and Gardiner, \$1.25 and towage; to the Sound, 80c.

Birmingham

Sept. 23—Alabama coal mines continue active, and every ton of coal possible is being mined. The transportation facilities are being pushed some to furnish cars necessary to handle promptly all the coal that can be mined. The plans of the "Frisco" railroad, to bring about an equal distribution of cars with which to handle the business of all the operators, cannot be followed by all the systems, so it is stated, as there are more mines along the Southern Railway and the Louisville & Nashville Railroad than on the "Frisco."

The development in hand in this district is of no mean proportions. The big Cahaba Coal Company has been organized by Edwin C. Chairsell and associates, with a capital stock of \$25,000. The new company controls coal lands near Hamburg, in the lower part of Jefferson county, and as soon as an extension of the railroad can be built to the place coal mining will be under way.

Good prices obtain for coal. Winter contracts are being made now, according to reports heard, and the prospects are for a steady operation of all mines. The local consumption promises to be heavier this winter than ever before. The railroad consumption is large at present, and there are no prospects of any abatement of the conditions. The production of coke is on the increase in Alabama.

Chicago

Sept. 23—The wholesale coal market continues strong, for both bituminous and anthracite. Car shortage is influencing the market and there is a scarcity of supplies, both eastern and western, that keeps up prices and adds to the general strength of the market. The market for western

domestic is exceptionally strong, while steam sizes show no weakening. Fine-coals of the western sizes alone are weak and doubtless will continue so for the rest of the calendar year. The market on eastern coals is strong, owing chiefly to transportation difficulties.

Lump and egg from western mines, Illinois and Iowa, bring \$1.90@2.65; run-of-mine holds at \$1.60@2.10 and screenings at \$1.05@1.50. Eastern coals are quoted at: \$3.50 for smokeless, Pocahontas and New River, run-of-mine; \$3.25@3.35 for Youghiogheny, ¾ in.; \$2.90 for Pittsburg No. 8, 1¼-in. lump; Hocking, \$3.30 for lump. Brazil block is in good demand at \$2.95.

Anthracite seems to be improving, reports from the country indicating that larger stocks than usual for the season are being laid in.

Cleveland

Sept. 24—The coal market is strong and prices higher this week owing to the continued and serious shortage of cars. Local dealers are anticipating a troublesome time in filling deliveries this fall and winter and are stocking up. On the other hand pressing orders from the consumers are demanding practically all of the available supply, and the wholesale and retail trades are both in a nervous state. Cars for the ore trade are in only fair supply and these are diverted through the State on their return to the mines to take care of the situation inland. In consequence coal shippers are unable to ship their own product to this market. Wholesalers opened the week with the following prices quoted on No. 8 district (Ohio); grades: Slack, 65@80c.; run-of-mine \$1@1.10; ¾-in. \$1.10@1.25; lump \$1.35@1.50; all f.o.b. mines. As the car requirements of the mill trade are heavy and increasing, local shippers are looking for a higher market in coal prices and a continuance of the same through the winter months. It is therefore probable that retailers will advance prices above the usual winter scale.

Pittsburg

Sept. 24—The demand for spot coal has increased and prices are much firmer than a week ago. While the general quotations are based on mine-run coal at \$1.20@1.25, sales have been made for immediate shipment, at about 10c. a ton more. The mines are being operated to capacity as far as possible, but the bulk of the tonnage is being rushed to lake ports to fill contracts in the northwestern markets. It is a safe prediction now that the shipments will greatly exceed all former years. The river mines are being fully operated, and there will be plenty of coal for the southern markets this winter unless something should occur to interfere with navigation. This does not seem likely, as there has been a good

boating stage in the rivers every month this year.

Connellsville Coke—Coke prices are stronger than a week ago, and the demand continues heavy despite the fact that a number of furnaces have gone out of blast. Standard Connellsville furnace coke is quoted at \$2.00@3.10 at ovens and foundry coke at \$3.25@3.60. These prices are for both prompt delivery and on contract for fourth quarter. Contracts for coke, however, are usually made for the entire half year. Some consumers were unable to arrange for their full requirements, and are buying for future needs. The *Courier* in its report for the week gives the production in both fields at 425,423 tons. The shipments aggregated 14,006 cars distributed as follows: To Pittsburg, 4756 cars; to points west of Connellsville, 8138 cars; to points east of Connellsville, 932 cars.

Iron Trade Review

New York, Sept. 25—The iron market is not characterized by any particular demand for iron, but there have been a number of inquiries, mostly for the last quarter of 1907, but there have also been some for the first quarter of 1908. What business there has been has been on small contracts, large consumers still holding aloof.

It is believed that stock-piles are generally low, and that users of pig iron must soon be forced to enter the market. Producers, at any rate, are not making marked concessions in price, as they believe that active buying will soon begin. Foundries throughout the country are active, and this is especially the case among makers of cast-iron pipe and those doing work for steam and electric railroads. Inquiries from pipe works in the central West for 10,000 to 15,000 tons of Southern iron were reported last week, but no sales were recorded. Most of the sales last week were for off-lots of basic, high-phosphorus and malleable iron. Very little bessemer was disposed of. The demand from western New York was principally for malleable and small lots of high-silicon foundry iron, and at Philadelphia there were a few sales of and inquiries for basic iron.

Blast furnaces are receiving iron ore, bought at high figures, using high-priced coke and employing costly labor. These conditions, together with tight money and slow collections, make it imperative that they book substantial orders in the near future.

Baltimore

Sept. 23—Imports for the week included 2455 tons ferromanganese, 3260 tons speiseisen, and 189 casks of ferrosilicon. Receipts of iron ore were 11,300 tons from Cuba. The imports also in-

cluded 1050 tons pig iron from Middleboro and 5980 bars of copper from Liverpool.

Exports for the week included 1255 short tons of copper in cakes, bars and ingots to Glasgow, Rotterdam, Bremen and Hamburg.

Birmingham

Sept. 23—The Alabama pig-iron market has a little more strength than was noticeable during the past two or three weeks, and the manufacturers are once more in a good frame of mind. With three-fourths of the probable output for the balance of the year sold ahead, and some sales being made for early delivery, the market is assuming a strong position. There is no iron to be had now at \$18 per ton, No. 2 foundry. The product brings easily \$18.50 per ton, and from 60 to 90 days is required for delivery. No buying is reported for delivery during the first half of 1908. It is evident that, while consumers are bound to get into the market for needs, they are holding off until the last minute in the hope that quotations will go down. That there is going to be a strong demand for iron is not denied, but it is evident that the buying is not going to start in until the consumers are forced to it.

The shipments of iron from this district are equal to the production, and transportation facilities are still good, both in the orefields as well as in the handling of the finished product. But little change is reported in the raw-material supplies, despite the great effort being made to increase the output of iron ore.

The iron output in this section is off a little. The Southern Steel Company and the Shelby Iron Company have recently put a furnace out of blast. The Shelby company has one furnace, making charcoal iron, for which product there is a good demand, with prices high and firm.

The renewed strength in the market gives much encouragement in this section. Manufacturers are confident that the buying will shortly start in and that prices will improve. No iron is being quoted for next year's delivery, although reports are current that \$17 is the high price for No. 2 foundry. As stated above, \$18.50 is being asked for iron, this year's delivery.

No change in the condition of the steel market is reported. The plants in this district continue to operate, and the output is shipped out as quickly as it can be loaded. Changes among minor officials at plants of the Tennessee Coal, Iron and Railroad Company are announced nearly every day. Finished iron and steel are in good demand, with favorable quotations obtaining. Soil-pipe plants are running a little slack, but no time whatever is being lost at the cast-iron pipe plants. Southern stove foundrymen have advanced prices 5 per cent.

Chicago

Sept. 23—Sales of pig iron continue light. The only activity in the market is for sales on quick delivery, and these are not noticeably greater in number. It is still a waiting market, with the hopes of selling agents kept up by the general conditions of the market. Beyond doubt the needs of the melters of this district, both immediate and for the next six months, are large, and will continue so. It is professed by leading sales-agents that the absence of weakening in the market must soon force the buyer to general contracting for the future as heretofore. With the coming of autumn weather and conditions of business this would seem highly probable in the near future.

Southern remains at \$18@18.50 Birmingham (\$22.35@22.85 Chicago) and Northern at \$23.50, for No. 2 iron for last quarter delivery. For the first quarter of 1908, No. 3 Southern holds firmly to \$17@17.50 Birmingham, with special delivery lots bringing occasionally 50c.@\$1 for spot delivery. Lake Superior charecoal is quoted at \$27@27.50 for last-quarter delivery in small lots.

Coke is strong at \$5.90 for the best Connelville.

Cleveland

Sept. 24—The movement of ore for this month promises to be large as the weather and excellent dock facilities have combined in assisting shippers. Movement of ears from dock to furnace is not characterized by car shortage as in the coal trade.

The pig-iron market remains about stationary. The following prices are quoted for the balance of the year: Bessemer \$22.90; No. 1 foundry Northern, \$22@22.50; No. 2, \$21.50@22.50; No. 3, \$20.50@21.50; No. 2 Southern, \$22.85; gray forge \$20@20.50. A dull tone prevails in the scrap market and prices are quoted on the down scale. Coke is fairly active with \$3 the quoted price on furnace for the balance of the year and \$3.25@3.50 for foundry.

Duluth

Sept. 21—September will doubtless be the biggest month of the year and ore shipments may possibly reach 7,000,000 tons from all ports. The trade will decline in October and fall off materially in November. From the mines of Minnesota alone shipments are averaging better than 1,000,000 tons per week, and the Duluth, Missabe & Northern will make better than 2,000,000 tons for the term. Rain is bothering the mines to some extent this week, but far less than might have been expected from the severity of the storms.

At the James mine, near Iron River, there is a small stockpile accumulated in progress of development, but no shipments have been made. Tracks have been built

to the mine and ore will be moved this fall. Development on this mine seems to indicate that the main ore deposit is lower and that it will be necessary to sink further. The Mineral Mining Company has the property under option for lease and purchase.

Philadelphia

Sept. 25—About the only difference in the pig iron situation between to-day and a week ago is that a greater number of buyers are asking for prices for delivery during last quarter of 1907 and first quarter of 1908. The inquiries are from large consumers who buy heavily. Agents are much encouraged by these inquiries, and are counting on some large sales. Basic pig negotiations are on, but the details are guarded. Good sized lots of forge will be contracted for within a week for mills in this territory.

No. 2 Foundry is quoted at \$20.50@21; Gray Forge, \$19; Basic, \$19, and low phosphorus, \$27.50.

Steel Billets—A large business has been done this week for ordinary steel, as the outcome of negotiations which have been hanging fire. Consumers are becoming more interested in future requirements, but makers are as yet not offering inducements. Sales have been made at \$31.

Merchant Bar—Sales of refined iron are more numerous, and steel bars are exceptionally strong where early deliveries are specified. Consumers have permitted stocks to run down, and mill people are confident that October will witness more active buying and at full card rates notwithstanding weak pig iron.

Sheets—More business than usual was done this week in small lots. Mill men say a great deal of small buying may be looked for this fall and winter. No large orders have been booked for several days. Business prospects are good and prices firm.

Pipes and Tubes—Very little business has been done in merchant pipe. Boiler tubes are strong in price, but it is said heavy orders can be placed at shaded prices.

Plate—Large quantities of plates are being hurried to manufacturers who ordered early in the summer. The new business of the past six days has been light. The smaller users of plate, especially boiler plate, are good customers, but will not contract far ahead, preferring to pay a trifle more for material to be promptly delivered. Tank is 1.85c.; boiler steel, 1.95c.

Structural Material—A very satisfactory business is being done with contractors and builders for local and near-by construction requirements. There are rumors of large new requirements for terminal necessities which will come to Pennsylvania mills. Prices are strong at 1.85c.

Rails—Large conditional orders have been placed pending an adjustment, the announcement of which is looked for about Oct. 10. Orders for light rails flow in, but they are for small lots.

Scrap—Sales are larger and cover a greater variety of material. No. 1 steel scrap is \$16.50; railroad scrap, \$18; machinery castings, \$18; other kinds are quiet.

Pittsburg

Sept. 24—The iron and steel markets continue dull although there is a fair run of small orders in various finished lines. Owing to the lack of new business some mills are being closed and it is believed a large number will be idle next month. The bessemer departments at the Duquesne and Homestead works have been closed, the latter for repairs and at the former, open-hearth furnaces are to be installed. One of the causes for the present situation seems to be a lack of confidence in the future and consumers are only buying for immediate requirements. The uncertainty is felt in all lines but it is regarded as probable that when the railroads and rail makers agree on specifications, and contracts are placed for 1908 delivery confidence will be restored and the markets will again become active. The joint committee to adjust the specifications on rails is scheduled to meet in New York this week. It is said that while prices may be higher this fact will not prevent the railroads from placing their orders. The Lorain works of the National Tube Company of Ohio is still on standard rails for the Carnegie Steel Company and likely will continue so until Nov. 1, rolling probably 30,000 tons. This will permit the Carnegie company to keep its Ohio works on steel billets, there being a great scarcity. No bessemer billets can be had for prompt shipment and the nominal quotation is \$30, but for future delivery \$1 less is now being named.

There has been a falling off in the demand for tin plate and the American Sheet and Tin Plate Company is taking advantage of the lull to make repairs. On Saturday it closed the two 8-mill plants at New Kensington, near Pittsburg, and both will be completely overhauled. The Shenango works, New Castle, 30 mills, the largest of its plants, was closed July 1 for the installation of automatic stokers in the power plant, and is still idle. The company is operating 154 tin mills this week.

The market for iron bars shows some activity and the tonnage in small orders booked so far this month is reported to exceed last month's business. A number of inquiries have been received during the week that may result in good contracts within a few days. Prices are firm, the minimum quotation being 1.70c. Pittsburg.

There is considerable business in structural material. The Wm. B. Seafie Sons Company, Pittsburg, has booked an order

calling for 2500 tons of steel for the new plant of the Henry Cowell Lime and Cement Company, Concord, Cal. The McClintic-Marshall Construction Company received orders aggregating 1200 tons and the John Eichlay, Jr. Company has taken contracts for more than 2000 tons of steel. There is a lull in the pipe market and some shading in boiler tubes is reported. All the mills are busy but have caught up on deliveries and will have some open capacity for the rest of the year. The Carnegie Steel Company during the week booked about 2000 tons of light rails but no new orders for standard sections have been received for over a week.

Pig Iron—Since the purchase of 6500 tons of bessemer pig iron by an independent producer there has not been a single transaction of any consequence and in the absence of sales no change in prices is reported, except in bessemer, producers insisting on \$22, Valley furnaces, which may be regarded as the minimum price. As the last sales of bessemer iron were at 50c. under this price it is likely the furnaces are determined to maintain a higher price and expect a buying movement to start at an early date. As consumers have not fully covered for fourth-quarter requirements it would not be surprising to see some active buying soon. If all come into the market at the same time there is a possibility that prices will stiffen. An indication that there is to be a demand for bessemer iron may be seen in the haste to reline No. 4 furnace, at Sharpville, Penn., of the Shenango Furnace Company. This furnace went out for repairs on Sept. 4, was blown in on Sept. 21 and was producing iron on the following day. No. 2 foundry has weakened and is quoted at \$21 and basic and Gray Forge at about \$20, Valley furnaces.

Steel—It is impossible to buy bessemer billets for prompt delivery and \$30, Pittsburg, is the nominal quotation; but for future delivery \$29 probably could be done. Open-hearth billets are \$31@31.50. On Sept. 20 the Carnegie Steel Company reaffirmed the price of \$31 for sheet bars for fourth-quarter delivery. Steel bars remain at 1.60c. and plates at 1.70c.

Sheets—There is no change in the sheet market. Small orders are still being booked and the mills are busy on specifications on old contracts. Black sheets remain at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—The market continues to go down. A sale of 80 per cent. English ferro-manganese was made today at \$58, Pittsburg.

Sault Ste. Marie

Sept. 14—The official statement, just published, shows that the total freight through the Sault canals from the opening of the season to Sept. 1 was as follows, in net tons:

	1906.	1907.	Change ^s .
East-bound.....	24,204,547	25,603,655	I. 1,399,108
West-bound.....	5,749,731	7,922,733	I. 2,173,002
Total.....	29,954,278	33,526,388	I. 3,572,110

The total number of vessel passages this year was 12,178, showing an average cargo of 2753 tons. The mineral freights included in the totals were as follows, in net tons, except salt, which is in barrels:

	1906.	1907.	Changes.
Anthracite.....	513,783	836,924	I. 323,141
Bituminous.....	4,412,419	6,328,963	I. 1,916,534
Total coal.....	4,926,202	7,165,877	I. 2,239,675
Iron ore.....	21,247,365	22,485,323	I. 1,237,958
Pig & manu. iron	221,579	187,908	D. 33,671
Copper.....	62,033	42,497	D. 19,536
Building stone...	1,472	320	D. 1,146
Salt, bbl.....	276,564	276,267	D. 297

Iron ore was 67.1, and coal 21.4 per cent. of the total freight reported this year.

Cartagena, Spain

Sept. 7—Messrs. Barrington & Holt report on iron and manganiferous ores: The local market continues dull and not much ore is being shipped. Freight rates continue firm and f.o.b. buyers consequently appear to be holding back from chartering, especially as many iron works are reported to be well stocked with ore and in no hurry for deliveries. Shipments for the week ending Sept. 7 were 4600 tons to Great Britain.

For iron ore, prices are f.o.b. shipping port: Ordinary 50 per cent. ore, 9s.@9s. 3d.; special low phosphorus, 10s.; specular ore, 55 per cent., 12s. For manganiferous ores, same delivery, No. 3 ore, 35 per cent. iron, 12 per cent. manganese, is 13s. 9d.; no higher grades on the market.

The production of iron and manganiferous ores in Spain during 1906 was 9,511,355 tons.

Pyrites—The price of iron pyrites, 40 per cent. iron and 43 per cent. sulphur, is 11s. 9d per ton, f.o.b. shipping port.

Exports for the week ending Sept. 7 were 165 tons of iron pyrites and 400 tons of copper pyrites to France.

Dusseldorf, Germany

Sept. 2—The German Iron and Steel Union reports the production of pig iron in Germany in July at 1,113,966 metric tons, the highest monthly output this year. The increase over June was 69,660 tons, or more than was due to the longer month; the daily average having been 34,879 tons in June, increasing to 35,934 in July. For the seven months ended July 31 the production was as follows, in metric tons:

	1906.		1907.	
	Tons.	Per Ct.	Tons.	Per Ct.
Foundry iron....	1,226,784	17.1	1,268,874	17.0
Forge iron.....	497,671	6.9	461,016	6.2
Steel pig.....	533,114	7.4	593,903	7.9
Bessemer pig....	276,696	3.9	277,669	3.7
Thomas pig.....	4,637,008	64.7	4,868,457	65.2
Total.....	7,171,273	100.0	7,469,919	100.0

This shows increases of 42,090 tons in foundry; 60,789 in steel pig, which includes

spiegeleisen, ferromanganese, ferrosilicon and all similar alloys; 973 in bessemer and 231,449 in Thomas pig, with a decrease of 36,651 tons in forge iron; the total gain being 298,646 tons, or 4.2 per cent.

Metal Market

NEW YORK, Sept. 25.

Gold and Silver Exports and Imports

At all United States Ports in Aug. and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Aug. 1907..	\$ 4,596,262	\$ 3,196,161	Exp. \$ 1,400,101
" 1906..	598,078	7,972,868	Imp. 7,374,790
Year 1907..	48,375,360	28,075,590	Exp. 20,299,770
" 1906..	33,511,040	80,344,979	Imp. 46,833,939
Silver:			
Aug. 1907..	6,748,085	4,678,879	Exp. 2,069,206
" 1906..	4,049,173	2,776,976	" 1,272,197
Year 1907..	41,922,336	30,461,715	" 11,460,621
" 1906..	41,847,028	29,731,510	" 12,115,518

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

Gold and Silver Movement, New York

For week ending Sept. 21 and years from Jan 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 133,840	\$ 1,370,327	\$ 104,195	
1907.....	32,553,587	7,687,837	38,271,914	2,024,002
1906.....	5,964,743	66,537,234	41,967,183	1,526,395
1905.....	32,285,443	1,450,700	25,169,367	3,187,523

Exports of silver for the week were to London and Havre. Imports for the week both gold and silver were from London, Cuba, Mexico, and South America.

The silver market has ruled quiet and dull, with lower tendency, but closes firm at 31 1/16d. in London. The Indian demand is improving, and the present indications are that it is likely to continue, as crops have been good and Indian business is generally prospering. Indian exchange has been stronger and the Council bills offered in London were taken at 16d. per rupee.

The joint statement of all the banks in the New York Clearing House for the week ending Sept. 21, shows loans \$1,097,579,000, an increase of \$8,608,800; deposits, \$1,057,023,600, an increase of \$12,171,200, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	\$190,536,500	\$198,909,900
Legal tenders.....	76,592,300	69,221,900
Total cash.....	\$267,128,800	\$268,131,800
Surplus.....	\$11,315,925	\$ 3,875,900

The surplus over legal requirements shows a decrease of \$3,042,800, as compared with the previous week this year.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.52 1/2	\$0.54 1/2
Peruvian soles and Chilean.....	0.47 1/2	0.49 1/2
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.87	3.92
Spanish 25 pesetas.....	4.78	4.80

SILVER AND STERLING EXCHANGE.							
Sept.	Sterling Exchange.	Silver.		Sept.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
19	4.8545	67 $\frac{3}{4}$	31 $\frac{1}{8}$	23	4.8590	67 $\frac{3}{4}$	31 $\frac{1}{8}$
20	4.8550	67 $\frac{3}{4}$	31 $\frac{3}{8}$	24	4.8590	67 $\frac{3}{4}$	31 $\frac{1}{8}$
21	4.8580	67 $\frac{3}{4}$	31 $\frac{3}{8}$	25	4.8565	67 $\frac{3}{4}$	31 $\frac{1}{8}$

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Sept.	Copper.			Tin.	Lead.	Spelter.	
	Lake Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			Cts. per lb.	Cts. per lb.
19	15 @15 $\frac{1}{2}$	14 $\frac{3}{4}$ @15	67	36 $\frac{3}{4}$	4.75	5.05 @5.15	4.90 @5.00
20	15 @15 $\frac{1}{2}$	14 $\frac{3}{4}$ @15	68	37	4.75	5.10 @5.20	4.95 @5.05
21	15 @15 $\frac{1}{2}$	14 $\frac{3}{4}$ @14 $\frac{3}{4}$	.....	37 $\frac{3}{4}$	4.75	5.15 @5.20	5.00 @5.05
23	14 $\frac{3}{4}$ @15 $\frac{1}{2}$	14 $\frac{3}{4}$ @14 $\frac{3}{4}$	65 $\frac{1}{2}$	37 $\frac{3}{4}$	4.75	5.15 @5.20	5.00 @5.05
24	14 $\frac{3}{4}$ @15 $\frac{1}{2}$	14 $\frac{3}{4}$ @14 $\frac{3}{4}$	64 $\frac{1}{2}$	37 $\frac{3}{4}$	4.75	5.20 @5.25	5.05 @5.10
25	14 $\frac{3}{4}$ @15 $\frac{1}{2}$	14 $\frac{3}{4}$ @14 $\frac{3}{4}$	65 $\frac{1}{2}$	37 $\frac{3}{4}$	4.75	5.20 @5.25	5.05 @5.10

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper—Since last Wednesday there have been rather large sales of both electrolytic and lake copper chiefly for export, although more or less business has been done for domestic consumption—the aggregate being greater than in any week since the decline started. In anticipation of the reduction by the largest selling interest to 15c. in its asking price for electrolytic, other interests sold freely at further concessions. The expected reduction was announced on Saturday, when electrolytic was offered at 15c. and lake at 15 $\frac{1}{2}$ c., delivered, 30 days. Other sellers had previously quoted these figures and are now shading the same. However, concessions are being made more cautiously, and there are no longer the wide differences which have heretofore existed between the prices of the leading interest and other sellers.

As noted above, the business of the week, induced by the lower prices, was chiefly for export, domestic buyers having placed orders sparingly as yet, but the increasing interest on their part, which is reported in all quarters, causes the impression to become more and more general that the price now is not very far from the bottom, if it be not already at the bottom, and it is expected that the market will soon manifest a stronger tendency.

Certainly the feeling at the end of this week is decidedly more hopeful.

The close is steady at 14 $\frac{3}{8}$ @15 $\frac{1}{8}$ c. for lake and 14 $\frac{1}{2}$ @14 $\frac{7}{8}$ c. for electrolytic. Casting has averaged 14 $\frac{3}{8}$ @14 $\frac{7}{8}$ c.

An interesting feature of the week was the sale of some electrolytic copper for export to China. It will be remembered what part the exports in that direction played in the copper market in 1905.

The standard market in London displayed rather a reactionary tendency during the early part of the week, but throughout shows a very sensitive tone. This is due to the fact that the short interest is reported to be very extensive. The close is firm at £66 for both spot and futures.

Refined and manufactured sorts we quote: English tough, £63@64; best selected, £70@71; strong sheets, £76@77.

The consumption of foreign copper in Germany for the seven months ending July 30, 1907, was, according to Messrs. Aron Hirsch & Son, 68,763 tons against 68,659 tons for the same period of 1906. The total imports were 73,732 tons and the exports were 4969 tons. The combined consumption in England and France for the same period is stated to be 60,513 tons as compared with 75,557 tons during the first seven months of 1906.

It is reported that a portion of the arsenical copper produced at Lake Superior is to be refined electrolytically, owing to the slowness at times in marketing that grade in its original form.

Copper Sheets—There has been a decline in the base price of copper sheets, but the new figure has not yet been announced.

Copper Wire—The base price for copper wire, No. 0000 to No. 8, was reduced to 16 $\frac{1}{4}$ c. per lb. Sept. 19. Allowing 2c. per lb. for the charge for drawing, the present price corresponds to 14 $\frac{1}{4}$ c. per lb. for wire bars.

Lead—The price of the American Smelting and Refining Company for desilverized remains 4.75c., New York, and 4.67 $\frac{1}{2}$ c., St. Louis. Independent producers have been liberal sellers at 4.65c., New York, while at St. Louis 4.55c. has been accepted for Missouri brands.

The London market is very firm. The scarcity of supplies continues, and near-by shipments are selling at a considerable premium. The close is cabled at £20 10s. for Spanish lead and £20 12s. 6d. for English.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena: Price of pig lead on wharf for the week ending Sept. 7 is 92.25 reales per quintal, equivalent to £17 16s. 8d. per long ton f.o.b. Cartagena. This compares with 94.25 reales per quintal on Aug. 31.

Exports of desilverized lead for the week from Cartagena were 350 tons to England and 66 tons to France, a total of 416 tons.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull at the late decline. Missouri brands sold lightly on the basis of 4.55c. and only a small business was done at this figure.

Tin—The London market, especially for spot material, has been very firm throughout the week, and while business in this market was of small proportions only, premiums for spot metal have been obtained. Toward the close a little more selling pressure was apparent, and prices declined from their high point of 37 $\frac{1}{2}$ to about 37 $\frac{1}{8}$ c.

London closes at £169 for spot and £165 15s. for three months.

Spelter—The low prices have had a tendency to reduce the ore production in the different mining centers, and a situation is being created which will make it very difficult for the sellers to secure adequate supplies. In recognition of this a number of them have withdrawn from the market, and a steadier tone followed very quickly. Consumers who had held off for some time, were attracted by this change in the tendency, and have been placing orders in much more liberal volume. As a result, the market has advanced from day to day, and closes firm at 5.20@5.25c. New York, and 5.05@5.10 St. Louis.

The London market eased off slightly, and the close is cabled at £20 17s. 6d. for good ordinaries and £21 2s. 6d. for specials.

The decision in the zinc-ore importation case which was expected last May has not yet been rendered. The delay has been due to the illness of the judge of the circuit court, in which the case came up.

Antimony—The market, both here and abroad, has become strong, and there has been considerable forward buying. Prices have advanced and, for the first time in years, Hallett's brand is selling at a higher figure than Cookson's. Quotations in the market are 10 $\frac{1}{2}$ c. for Cookson's; 10 $\frac{3}{8}$ c. Hallett's, and 10 $\frac{1}{4}$ @10 $\frac{1}{2}$ c. for ordinary brands.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Quicksilver—Current prices in New York are \$39.50 per flask of 75 lb. for large quantities and \$41 for smaller orders. San Francisco orders are \$37.50@38.50 per flask, according to quantities, for domestic orders, and \$36.50@37 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Platinum—With the opening of the universities throughout the country the demand for platinum ware usually increases and causes the price to advance. However, the price this week has fallen off 50c. per oz., but no reason is given

for the decline. Manufacturers state that the demand is good and that with the closing down of the Russian mines in the fall the price should advance rather than decline. Quotations are \$28 for ordinary and \$30 for hard metal. Scrap is quoted at \$22@23 per oz. troy.

Missouri Ore Market

Joplin, Mo. Sept. 21—The highest price paid for zinc was \$43 per ton, the assay base ranging from \$38@42, with some inferior grades selling as low as a \$35 base. The average price, all grades, was \$39.78.

The highest price paid for lead was \$53, medium grades bringing \$49@51, and all grades averaging \$51.32.

The restriction movement has passed the zenith of effectiveness, if it can be so classed, as several of the mills have re-started and more will resume operations Monday. Producers assert the belief that it has prevented prices reaching a point \$3@5 per ton lower than present quotations, notwithstanding the reduction of \$1@2 per ton of the current week. Predictions by purchasing agents have placed the lowest point probable at \$30@35 per ton of 60 per cent. zinc. Such reduction would need no concerted action to restrict the output, on the part of producers, as only a few could produce zinc at so low a figure with lead as low as at present.

Following are the shipments of zinc and of lead from the various camps of the district for the week ending Sept. 21:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,525,890	259,100	\$58,516
Joplin	1,743,140	259,230	43,281
Badger	883,980	.....	18,564
Galena	670,870	97,770	15,526
Aurora	488,380	18,700	10,234
Duenweg	425,090	58,460	10,233
Granby	660,000	20,000	9,040
Oronogo	370,580	55,920	8,878
Prosperity	402,300	10,820	8,528
Alba-Neck City	256,430	.....	5,513
Reeds	126,070	.....	2,521
Spurgeon	93,740	36,550	2,035
Sherwood	71,180	15,380	1,851
Cave Springs	89,700	1,710	1,801
Baxter Springs	.....	65,680	1,675
Wentworth	82,290	.....	1,645
Playter	63,890	5,100	1,381
Miami, Okla.	60,600	.....	1,210
Carthage	52,120	.....	1,120
Zincite	45,790	.....	961
Totals	9,111,940	904,420	\$204,513

38 weeks.....443,063,530 67,382,350 \$12,654,744
Zinc value, the week, \$181,305; 38 weeks, \$10,139,679
Lead value, the week, 23,208; 38 weeks, \$2,515,065

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51	45.98	May	78.40	79.56
June	43.83	44.82	June	80.96	73.66
July	43.25	45.79	July	74.31	58.18
August	43.56	43.22	August	75.36	59.54
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.13	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

Platteville, Wis., Sept. 21—Ore sales and shipments throughout the district for the week ending Sept. 21 were unusually slight. Spelter fell off during the week, to 4.90c., but the price of 60 per cent. zinc ore was held up to \$41 per ton, which would appear to show evidence that the smelters are sincere in attempting to stave off any temporary shut down. Lead ore took another tumble and went as low as \$21 per 1000 lb. for standard grades.

The highest price recorded for zinc ore in this district was \$42, which was paid for a product assaying above 60 per cent. There is practically no demand for lead, even at reduced figures, the buyers holding off till the market becomes more settled, while producers are not inclined to let go at low figures.

As yet there has been no concerted action for a general shut-down of the mines of this district because of reduced prices. A meeting of mine owners, operators, stockholders, and other interested parties is called to meet at Mineral Point, Wis., Sept. 26, to discuss general conditions now prevailing in this field. Unless a further decline in the price of zinc ore occurs, it is not likely that a general shut-down of the mines will result.

Following is the shipment of the district, by camps, for the week ending Sept. 21:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Galena	217,000	.....	.....
Hazel Green	131,800	.....	.....
Benton	411,760	.....	.....
Cuba City	.....	.....	.....
Platteville	.....	.....	.....
Rewey	.....	48,000	.....
Livingston	140,000	.....	.....
Total for week	900,560	48,000	.....

Owing to the conditions of the wires no report could be secured on output from northern camps.

Chemicals

New York, Sept. 25—The general market is a little firmer than it has been and prices fluctuate but little. Antimony salts had a rise recently and sodium and potassium salts are strong, but at normal prices.

Copper Sulphate—The market has a tendency to uncertainty on account of the weak metal market. Large dealers and producers, however, report fair business. Prices are quoted at \$6.50 per 100 lb. for carload lots and \$6.75 for smaller quantities, although it is claimed that these prices can be shaded 25c. per 100 lb. by independent dealers.

Nitrate of Soda—The market is exceedingly firm and the demand is increasing. Shipments from the West Coast have not been so heavy as usual, and this has brought about the present strength.

Prices are quoted as follows: For spot

and 1908 delivery, 2.45@2.50c.; for 1909 delivery, 2.40c. for 95 per cent. grade, while 96 per cent. is quoted 0.05c. higher.

Mining Stocks

New York, Sept. 25—The course of the stock market continued downward in some cases and stationary in most of the other stocks. The copper stocks were as a rule weak and recovery at the close was not remarkable. A few stocks rallied earlier in the week but the support behind them was not strong enough and what was gained was lost at the close. Amalgamated Copper sold up to \$62½ but closed at \$60½ which was fractionally lower than a week ago. American Smelting common showed slightly more strength, closing at \$92¼, a gain of nearly \$2 for the week. United States Steel common and preferred fluctuated very little and closed about the same as a week ago at \$28¾ and \$91¾ respectively. Other closing prices were Anaconda, \$39½; Balaklala, \$57½; Homestake, \$70½; Granby, \$88; Newhouse, \$9½; and Tennessee Copper, \$31¼.

The curb was heavy and little interest was displayed in the securities offered. Nipissing showed a slight tendency to rise and advanced to \$8¾, but lost some of this later and closed at \$7¾. Green Cananea showed some activity and was in fair demand. It advanced slightly during the week and closed at \$9¾. Other closing prices on the curb were as follows: British Columbia, \$5¾; Cumberland-Ely \$6¾; Dominion Copper, \$3¾; Nevada-Consolidated, \$9½; Standard Oil, \$447. The Nevada stocks were fairly active and closed about the same as last week.

Boston

Sept. 24—There seems to be little demand for copper stocks and the market is all but dormant. Here and there are active spots, although prices have not gone below the records made a week or so ago. There has been pretty thorough liquidation in copper shares which gives the market a stable appearance at present. It would seem as if permanent lower prices would have to come through bear selling. That further reduced dividends must ensue is inevitable. The Amalgamated Copper dividend is expected to be cut in half, which means a reduction in the Anaconda and Boston & Montana rates. The Old Dominion will be obliged to pass its dividend and others are yet to be heard from.

As a rule copper shares in this market are a trifle better than a week ago although North Butte was the storm center at one time. It sold off \$1.25 to \$45.50, from which it rallied to \$52, with sales today at \$48. Copper Range stiffened \$2.50 to \$60.50, losing all but a fraction of it. Amalgamated, after going back to \$59.50, in this market spurted to \$62.

12½, closing tonight at \$60.75. Utah rose \$2.50 to \$37.50, reacting to \$36 tonight, and Old Dominion advanced \$1.25 to \$26, tonight again.

Calumet & Hecla is up \$21 per share net for the week to \$631; Franklin \$2 to \$9.50; Quincy \$1 to \$81; Tamarack \$3 to \$68 and Wolverine \$7 to \$122. Osceola is off \$2 to \$93. The only news of importance during the week is the fact that the Shannon Company's new 1000-ton furnace has been blown in, after a three months' delay, which will greatly reduce the cost of production. The Balaklala smelter is not expected to be blown in for another six months. Declaration of the regular Nipissing dividend strengthened that stock on the curb.

STOCK QUOTATIONS

NEW YORK Sept. 24		BOSTON Sept. 24	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	.....	Adventure.....	2
Am. Nev. M. & P. Co.	.....	Allowez.....	30
Amalgamated.....	60%	Am. Zinc.....	.....
Anasconda.....	39%	Arcadian.....	4
Balaklala.....	3%	Atlantic.....	9%
British Col. Cop.....	6	Bingham.....	9
Buffalo Cobalt.....	2	Boston Com.....	18½
Butte & London.....	1½	Calumet & Ariz.....	112
Butte Coalition.....	16	Calumet & Hecla*	631
Butte Cop. & Zinc.....	.....	Centennial.....	19%
Cobalt Contact.....	.....	Con. Mercur.....	40
Colonial Silver.....	.....	Copper Range*.....	58½
Cum. Ely Mining.....	6½	Daly-West.....	13
Davis Daly.....	8½	Franklin.....	9%
Dominion Cop.....	3½	Greene-Can.....	9%
El Rayo.....	2½	Isle Royal.....	15%
Foster Cobalt.....	.67	La Salle.....	10%
Furnace Creek.....	1	Mass.....	3%
Giroux Mine.....	5	Michigan.....	9%
Gold Hill.....	1½	Mohawk.....	57
Granby New.....	.....	Mont. C. & C. (new).....	9½
Greene Gold.....	1½	Nevada.....	49
Greene G. & S.....	1½	North Butte.....	24½
Greenw'r & D. Val.....	75	Old Colony.....	93
Guanajuato.....	3½	Old Dominion.....	93
Guggen. Exp.....	180	Osceola.....	14
Hanapah.....	35	Parrot.....	81
McKinley Dar.....	3%	Phoenix.....	.....
Micmac.....	3%	Quincy*.....	.....
Mines Co. of Am.....	1½	Rhode Island.....	2½
Mitchell Mining.....	10½	Santa Fe.....	67
Mont. Sho. C. (New).....	3%	Shannon.....	14%
Nev. Utah M. & S.....	9%	Tamarack.....	48%
Newhouse M. & S.....	2%	Trinity.....	.....
Nipissing Mines.....	2%	United Cop. com.....	.....
Old Hundred.....	1%	U. S. Oil.....	.....
Silver Queen.....	31%	U. S. Smg. & Ref.....	38½
Stewart.....	1%	U. S. Sm. & Re. pd.....	38
Tennessee Cop'r.....	1	Utah Copper*.....	36
Union Copper.....	5%	Victoria.....	.....
Utah Apex.....	.....	Washington.....	6
West Columbus.....	.11	Winona.....	122
		Wolverine.....	.....
		Wyandotte.....	.....

N. Y. INDUSTRIAL		
Am. Agri. Chem.....	92½	
Am. Smelt. & Ref.....	.....
Am. Sm. & Ref. pf.....	.....
Bethlehem Steel.....	.....
Colo. Fuel & Iron.....	22½	
Federal M. & S. pf.....	12	
Inter. Salt.....	51½	
National Lead.....	.....
National Lead, pf.....	10	
Pittsburg Coal.....	.....
Republic I. & S.....	.....
Republic I. & S. pf.....	.....
Sloss-Sheffield.....	447	
Standard Oil.....	.....
Tenn. C. & I.....	.....
U. S. Red. & Ref.....	28½	
U. S. Steel.....	91½	
U. S. Steel, pf.....	.....
Va. Car. Chem.....	.....
Wa. I. Coal & Coke.....	.....

ST. LOUIS Sept. 21		
N. of Com.	High.	Low.
Adams.....	.40	.25
Am. Nettle.....	.04	.03
Center Cr'k.....	2.25	2.00
Cent. C. & C.....	68.00	67.00
C. C. & C. pd.....	79.00	78.00
Cent. Oil.....	110.00	105.00
Columbia.....	4.00	2.25
Con. Coal.....	27.00	25.00
Doe Run.....	140.00	130.00
Gra. Bimet.....	.35	.30
St. Joe.....	16.00	14.00

S. FRANCISCO Sept. 18

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher.....	.30
Best & Belcher.....	.85
Caledonia.....	.46
Chollar.....	.20
Con. Cal. & Va.....	.75
Crown Point.....	.33
Exchequer.....	.22
Gould & Curry.....	.91
Hale & Norcross.....	.56
Mexican.....	1.22
Ophir.....	.08
Overman.....	.11
Potosi.....	.69
Savage.....	.42
Sierra Nevada.....	.41
Union.....	.05
Utah.....	1.17
Yellow Jacket.....	.....
TONOPAH STOCKS	
Golden Anchor.....	.10
McNamara.....	.20
Montana-Pitts. ex.....	.05
North Star.....	.20
Rescue.....	.12
GOLDFIELD STOCKS	
Black Ants.....	.05
Blue Bull.....	.32
Columbia Mt.....	.44
Comb. Frac.....	1.97
Conquerer.....	.10
Daisy.....	1.25
Florence.....	3.97
Frances-Mohawk.....	1.05
Goldfield Con.....	7.32
Grandma.....	.15
Great Bend.....	.55
Red Hills.....	.46
St. Ives.....	.74
BULLFROG STOCKS	
Amethyst.....	.16
Bonnie Claire.....	.39
Mayflower Con.....	.30
Montgomery Mt.....	.10
Original.....	.05
MANHAT'N STOCKS	
Gold Wedge.....	.07
Manhattan Mg.....	.06
Pine Nut.....	.06
Ruby Wonder.....	.09
Stray Dog.....	.....
Yellow Horse.....	.....

NEVADA Sept. 25

Name of Comp.	Clg.
TONOPAH STOCKS	
Tono'h Mine of N.....	11.00
Tonopah Exten.....	1.50
Montana Tonop'h.....	2.70
Belmont.....	2.00
Tonopah Midway.....	.75
West End Con.....	.60
Jim Butler.....	.72
GOLDFIELD STOCKS	
Sandstorm.....	.40
Kendall.....	.22
Red Top.....	3.25
Jumbo.....	3.25
Goldfield Mining.....	1.30
Dia'dfield B. B. C.....	.21
Atlanta.....	.36
Mohawk.....	15.00
Silver Pick.....	.46
Laguna.....	1.30
BULLFROG STOCKS	
Mont. Shoshone C.....	6.00
Tramps Con.....	.36
Gold Bar.....	.46
Bullfrog Mining.....	.12
Bullfrog Nat. B.....	.16
Homestake Con.....	.....
MANHAT'N STOCKS	
Manhattan Con.....	.37
Manhat'n Dexter.....	.10
Jumping Jack.....	.10
Stray Dog.....	.10
Indian Camp.....	.07

COLO. SPRINGS Sept. 21

Name of Comp.	Clg.
NEW DIVIDENDS	
Acacia.....	.....
Black Bell.....	.....
C. C. Con.....	4%
Dante.....	.....
Doctor Jack Pot.....	6½
Elkton.....	50
El Paso.....	37½
Findlay.....	.....
Gold Dollar.....	6½
Gold Sovereign.....	3½
Isabella.....	21
Index.....	.....
Jennie Sample.....	.....
Jerry Johnson.....	6%
Mary McKinney.....	.....
Pharmacist.....	3½
Portland.....	112
Un. Gold Mines.....	5%
Vindicator.....	80
Work.....	17

Company.	Payable.	Rate.	Amt.
Am. Agri. Chem. pfd.....	Oct. 15	\$3.00	\$544,590
Am. Iron & Steel.....	Oct. 1	0.62½	31,875
Am. Iron & Steel, pfd.....	Oct. 1	0.62½	37,500
Am. Sm'g & Ref. Co. com.....	Oct. 1	2.00	1,000,000
Am. Sm'g & Ref. Co. pfd.....	Oct. 1	1.75	875,000
Calumet & Arizona.....	Sept. 21	5.00	1,000,000
Calumet & Hecla.....	Sept. 28	15.00	1,500,000
Central C. & C. com.....	Oct. 15	1.50	76,875
Central C. & C. pfd.....	Oct. 15	1.25	23,438
Col. & Hocking C. & L. pf.....	Oct. 1	1.50	103,866
Copper Range Con.....	Oct. 1	2.00	767,562
Granby Con.....	Sept. 30	3.00	405,000
Guggenheim Expl.....	Oct. 1	2.50	262,500
Inter. Nickel, pfd.....	Nov. 1	1.50	131,123
New Idria.....	Oct. 1	0.20	20,000
Nipissing.....	Oct. 21	0.15	180,000
North Star.....	Sept. 27	0.20	50,000
Pennsylvania Salt.....	Oct. 15	3.50	210,000
Pioneer, Alaska.....	Oct. 10	3.00	150,000
U. S. Reduction & Ref., pfd.....	Oct. 1	1.50	59,187
Utah Con.....	Oct. 15	1.00	300,000
Va. Car. Chem., pfd.....	Oct. 15	2.00	360,000
Wolverine.....	Oct. 14	7.50	450,000

Assessments			
Company.	Delinq.	Sale.	Amt.
Belcher, Nev.....	Sept. 18	Oct. 9	\$0.10
Bullion, Nev.....	Sept. 12	Oct. 4	0.05
Caledonia.....	Sept. 12	Oct. 2	0.10
Douglas, Idaho.....	Sept. 16	Oct. 4	0.003
Etna-King, Cal.....	Sept. 15	Oct. 15	0.02
Grand Pacific, Cal.....	Aug. 10	Oct. 2	0.02
Helios, Cal.....	Sept. 17	Oct. 15	0.02
Imlay, Nev.....	Sept. 26	Oct. 16	0.01
Morrison, Nev.....	Sept. 16	Oct. 3	0.01
Nassau Cop., Cal.....	Sept. 16	Oct. 14	0.10
Nevada-Fairview.....	Sept. 23	Oct. 28	0.02
Occidental Con., N.....	Oct. 3	Oct. 28	0.10
Oro Cobre, Cal.....	Sept. 24	Oct. 14	0.02½
Raymond-Illinois.....	Aug. 29	Sept. 14	0.00½
Raymond-Illinois.....	Oct. 16	Nov. 1	0.00½
Raymond-Illinois.....	Dec. 2	Dec. 18	0.00½
Sailor Consol., Cal.....	Sept. 10	Oct. 7	0.01
Sheba G. & S., Utah.....	July 30	Nov. 2	0.10
Sierra Nevada, Nev.....	Sept. 4	Sept. 25	0.10
Wabash, Utah.....	Sept. 9	Oct. 1	0.05
Yellow Jacket, Nev.....	Sept. 23	Oct. 30	0.15

Monthly Average Prices of Metals

Month.	AVERAGE PRICE OF SILVER			
	New York.		London.	
	1906.	1907.	1906.	1907.
January.....	65.288	68.673	30.113	31.769
February.....	66.108	68.835	30.464	31.852
March.....	64.597	67.519	29.854	31.325
April.....	64.765	65.462	29.984	30.253
May.....	66.976	65.981	30.968	30.471
June.....	65.394	67.090	30.185	30.893
July.....	65.105	68.144	30.113	31.366
August.....	65.949	68.745	30.529	31.637
September.....	67.927	.....	31.483	.....
October.....	69.523	.....	32.148	.....
November.....	70.813	.....	32.671	.....
December.....	69.050	.....	32.003	.....
Year.....	66.791	.....	30.868	.....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

Month.	NEW YORK.				LONDON.	
	Electrolytic.		Lake.		1906.	1907.
	1906.	1907.	1906.	1907.		
January.....	18.310	24.404	18.419	24.825	78.869	106.739
February.....	17.869	24.869	18.116	25.236	78.147	107.356
March.....	18.361	25.065	18.641	25.560	81.111	106.594
April.....	18.375	24.224	18.688	25.260	84.793	98.625
May.....	18.475	24.048	18.724	25.072	84.867	102.375
June.....	18.442	22.665	18.719	24.140	83.994	97.272
July.....	18.190	21.130	18.585	21.923	81.167	95.016
August.....	18.380	18.356	18.706	19.255	83.864	79.679
September.....	19.033	.....	19.328	.....	87.831	.....
October.....	21.203	.....	21.722	.....	97.269	.....
November.....	21.833	.....	22.398	.....	100.270	.....
December.....	22.885	.....	23.350	.....	105.226	.....
Year.....	19.278	.....	19.616	.....	87.282	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January.....	36.390	41.548	July.....	37.275	41.091
February.....	36.403	42.102	August.....	40.666	37.667
March.....	36.662	41.313	September.....	40.516	.....
April.....	38.900	40.938	October.....	42.852	.....
May.....	43.313	43.149	November.....	42.906	.....
June.....	39.260	42.120	December.....	42.750	.....
			Av. year..	39.819	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.</
